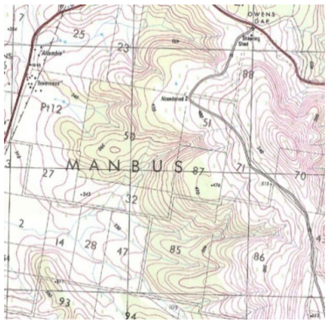
Kyoto energypark



Development Assessment Planning Report
under Part 3A of the
Environment Planning and Assessment Act 1979

Environmental Assessment Report

Kyoto Energy Park at
Mountain Station and Middlebrook Station, Scone

November 2008

prepared by

pamada

HDB
TownPlanning&Design

Environmental Assessment

This Environmental Assessment has been prepared in accordance with Part 3A of the *Environmental Planning and Assessment Act* 1979 (as amended).

This Document has been prepared by:

Company:	Pamada Pty Ltd
Project Manager	Mr Mark Dixon
Position	Project Manager
Qualifications	BE Civil Mast Prop Development
Sections	All Sections

Company:	HDB Town Planning and Design
Project Manager	Mr Kerry Nichols MPIA CPP
Position	Principal
Qualifications	Grad Dip URP Cert. Civil Eng. L & ESD
Sections	Part Sections 4/16/20

Proponent. This Report has been prepared for:

Company	Kyoto Energy Park (Scone) Pty Ltd
Project Director	Mr Mark Sydney
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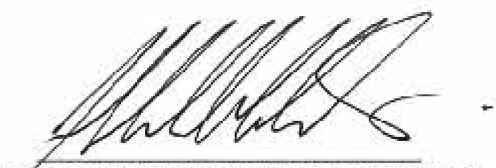
Declaration

I certify that the following Environmental Assessment Report has been prepared in accordance with the requirements of Part 3A of the Act and that, to the best of my knowledge, the information contained in this report is not false or misleading.

Mr Mark Dixon

Pamada Pty Ltd

Mr Kerry Nichols



Hunter Development Brokerage Pty Ltd

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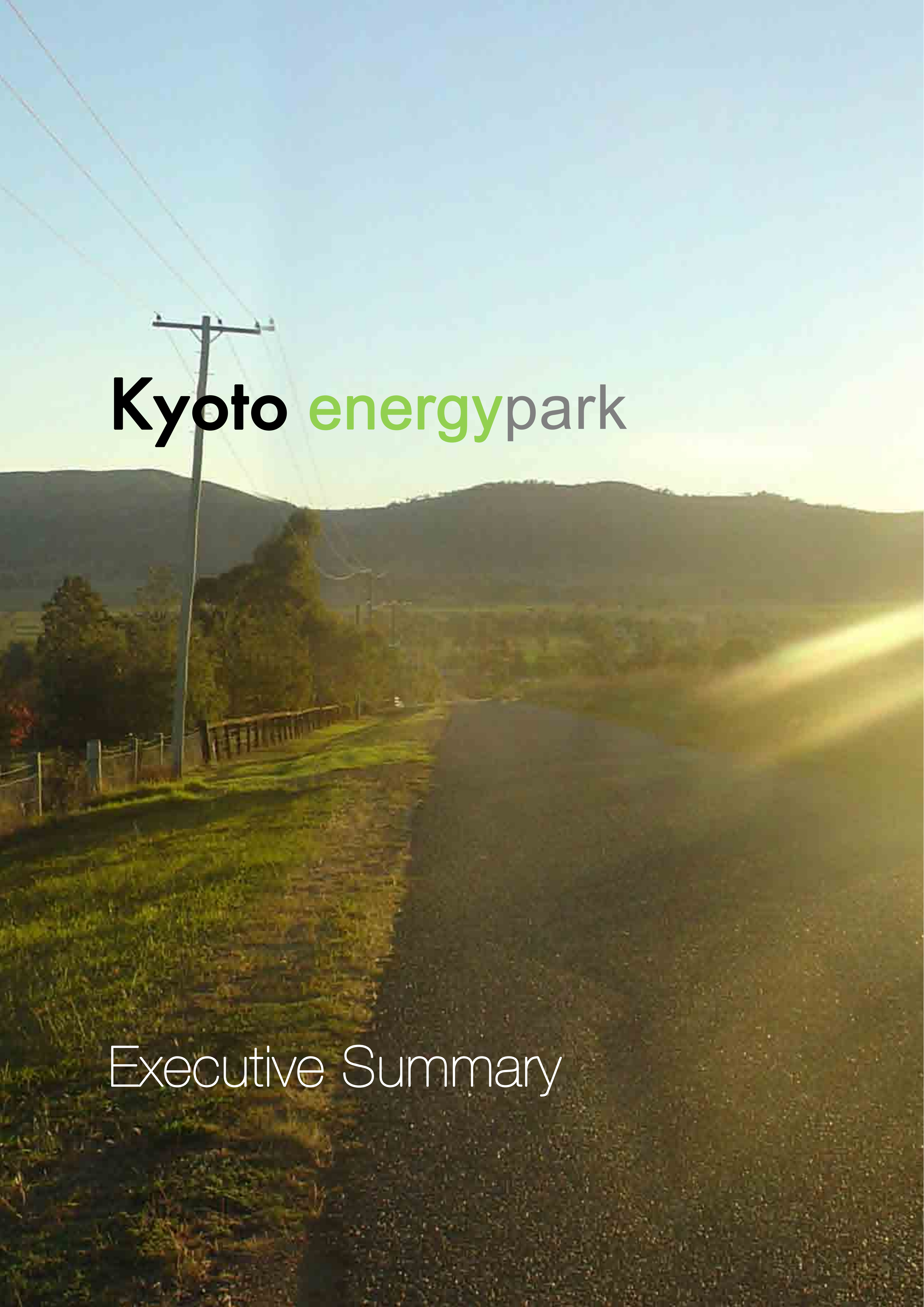
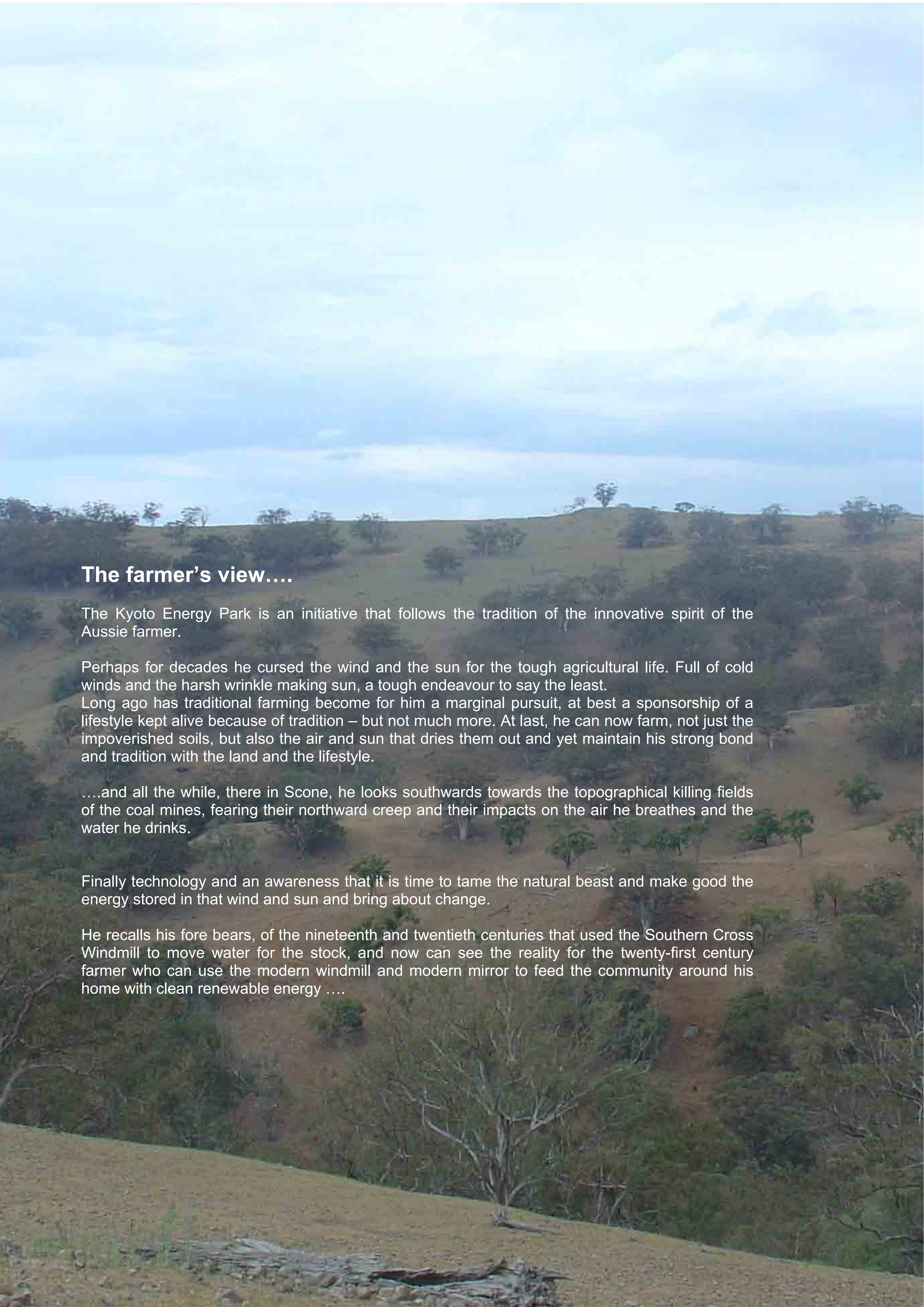


Kyoto energypark

Executive Summary



The farmer’s view….

The Kyoto Energy Park is an initiative that follows the tradition of the innovative spirit of the Aussie farmer.

Perhaps for decades he cursed the wind and the sun for the tough agricultural life. Full of cold winds and the harsh wrinkle making sun, a tough endeavour to say the least.
Long ago has traditional farming become for him a marginal pursuit, at best a sponsorship of a lifestyle kept alive because of tradition – but not much more. At last, he can now farm, not just the impoverished soils, but also the air and sun that dries them out and yet maintain his strong bond and tradition with the land and the lifestyle.

….and all the while, there in Scone, he looks southwards towards the topographical killing fields of the coal mines, fearing their northward creep and their impacts on the air he breathes and the water he drinks.

Finally technology and an awareness that it is time to tame the natural beast and make good the energy stored in that wind and sun and bring about change.

He recalls his fore bears, of the nineteenth and twentieth centuries that used the Southern Cross Windmill to move water for the stock, and now can see the reality for the twenty-first century farmer who can use the modern windmill and modern mirror to feed the community around his home with clean renewable energy ….

EXECUTIVE SUMMARY

The Main Points

The Kyoto Energy Park is a genuine attempt to bring to the world, Australia, the Hunter and all its people, a path towards a clean and sustainable future.

The Kyoto Energy Park seeks to create electricity, fed into the national grid, using the completely renewable and non-impacting natural resources of wind, solar energy and gravity. By integrating the numerous technologies, the project seeks to optimise the specific characteristics of the location and make for a genuinely sustainable enterprise.

The key elements of the park are:
- **3-10MW Solar Photo Voltaic Array;**
- **42 Wind Turbines;**
- **1 MW Closed-Loop Hydro Plant; and**
- **Visitor and Education Centre**

The main benefits are:
- The natural wind and solar resources are strong and combined with elevational change, the natural attributes of the site are excellent for an integrated Energy Park;
- Demand for electricity is close by and will make the use of the electricity generated from the Kyoto Energy Park highly efficient, producing enough **green power** for approximately **62 000 households**;
- The creation of the Kyoto Energy Park provides short term and long term **employment** and creates a **new tourism** destination for the Upper Hunter;
- The **Moobi Foundation**, an initiative of the Kyoto Energy Park shall **invest into the community** of the Upper Hunter through a Not-For-Profit structure (using community leaders);
- The Kyoto Energy Park is proposed to create clean and renewable electricity and create a transition to **less reliance on the burning of coal** as the main form of creation of electricity; and
- Creation of an enterprise that may continue without the time constraint of the resource that is harvested (such as coal) running out…. Wind and sun shall continue

The main impacts are:
- The placing onto the landscape of the 42 wind turbines, creating for some, an unacceptable visual intrusion and with others a positive visual beacon of commitment to making and keeping the Upper Hunter a clean green place, without coal mines and the ecological destruction that coal mining brings;
- The overall footprint (i.e. developable area) utilized by the Kyoto Energy Park components and facilities is in the order of 0.5 % of the sites' area. Overall damage and disturbance of the landform is extremely minimal. Upon completion of the life of the generator components (solar, wind, hydro) new technology can be easily installed to replace outdated technology or fully decommissioned, without any land degradation;
- The opportunity to **remove the equivalent of 82 000 cars** off the roads in terms of greenhouse gas abatement (which includes approximately **9.5 million tonnes of CO_2 gases** over the initial life of the proposed technology);
- The opportunity to create electricity with negligible use of water, leaving the water in the landscape not loosing it in the cooling towers of a coal powered power station - the **saving** of approximately **700 million litres of potable water annually** – or the equivalent of about **12 Olympic pools daily!**;
- Clean and renewable energy production free from other air pollutants such as coal dust, heavy metal compounds, carbon monoxide, sulphur and nitrogen oxides;
- Large scale significant **investment into rural Australia, rural jobs**;
- **Short and Long term jobs, reinforcing the Hunter as a region of high skills in the generation of Electricity**

The main matters consistently raised by the community relate to:
- **Intrusion into their visual reference and the potential loss of property values;**
- **Support for the concept of renewable energy, but not in the Hunter;**
- **Bird strike and Bushfire risk; and**
- **Noise Concerns.**

This Environmental Assessment Report identifies issues and the matters appropriate for consideration in the assessment of the proposal.

E1.0 Introduction

This Environmental Assessment supports an application for Planning Approval for the construction and operation of an Energy Park (a combination of wind turbines, solar photovoltaic plant (solar PV), and closed loop mini-hydro plant) that generates electricity for direct supply in the local electricity grid.

The Kyoto Energy Park is to be located in Scone in the Upper Hunter Valley, NSW. The project is known as the Kyoto Energy Park Scone. The proponent for the project is the Kyoto Energy Park (Scone) Pty Ltd, a Sydney based company, 100% owned by Australian investors who believe in the creation of a sustainable future.

This Environmental Assessment Report has been prepared for Kyoto Energy Park (Scone) by Pamada Pty Ltd, with some sections completed by HDB Town Planning Pty Ltd. The Environmental Assessment Report addresses the NSW Department of Planning's Director General's requirements (DGRs) for the scope and content of the Environmental Assessment. In addition, it addresses issues specified by relevant stakeholder agencies, including Upper Hunter Shire Council, the Department of Environment and Conservation and other key government departments.

The Kyoto Energy Park comprises two (2) separate landholdings referred to as Mountain Station and Middlebrook Station, both located on elevated ridgelines of the Great Dividing Range, commencing about 7-9 kilometres west to north-west of Scone as shown below.

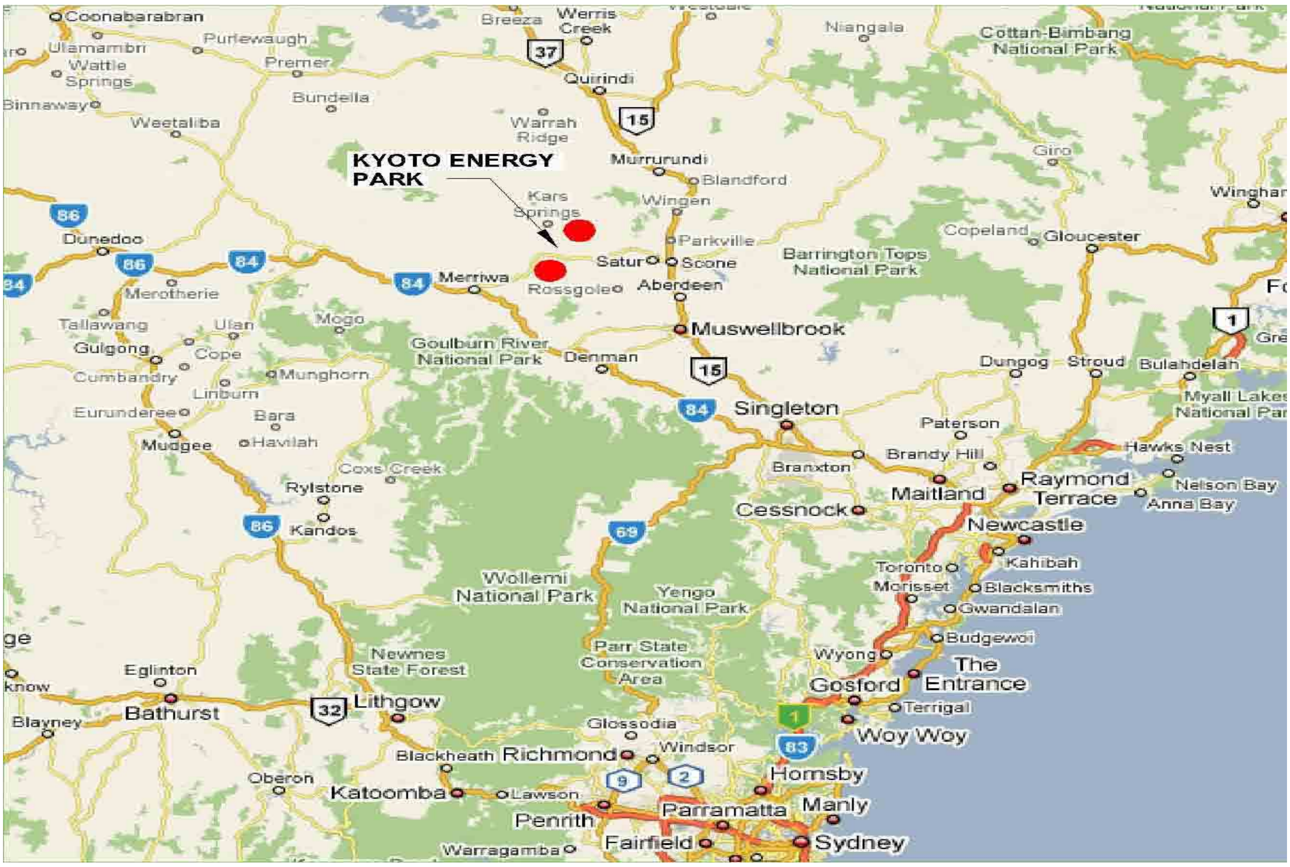
The two sites are large rural properties of approximately 2000 hectares each that have been extensively cleared and predominantly used for grazing of sheep and cattle. Both sites are entirely within the Upper Hunter Shire Council local government area (LGA).

The project involves the installation of 42 wind turbines (31 on Mountain station and 11 on Middlebrook Station). The actual number of wind turbines installed will depend on the selected equipment supplier and the final layout adopted. Each wind turbine will have a generation capacity of about two to three megawatts. The wind turbine structures comprise a three bladed rotor of about 90-100 metres diameter mounted on a steel tower of up to 105m high. The top of the blade sweep is a maximum of 150 metres above ground level. The turbines are linked by underground cables to a substation where the output voltage is raised from 33kV to either 66kV or 132kV.

The Kyoto Energy Park project will also require the augmentation of electricity transmission infrastructure. There are two preferred options for connection to the grid. The first is a 66kV connection to the new Scone STS currently under construction, replacing the old substation at Scone. The second is a 132kV connection to the existing Muswellbrook STS, just north of Muswellbrook. Other variations to these options have been considered and included in this report.

The two (2) preferred options for transmission have been selected based on detailed environmental investigation involved in this report. Final route will depend upon final Kyoto Energy Park capacity, a detailed connection study based on final capacity, and discussion over private easements.

pamada HDB



Kyoto Energy Park Location Plan

Construction works will occur over a single stage for approximately 20 months duration from commencement of operations.

Works will broadly comprise the forming of internal access tracks, preparation of footings for the wind turbines, transportation and erection of turbine structures, transportation and installation of the solar PV plant and mini hydro plant (Closed loop), construction of a site substation and Maintenance shed, trenching and installation of underground cables, transmission line for external connection to the grid, construction of a Visitor's and Education Centre and Manager's residence and restoration of the site.

E2.0 The Strategic Imperative

Governments globally, including Australia now recognise the urgency with which we need to address climate change. Unless we do this quickly, we will reach the tipping point of no return and the world as we know it and the natural beauty, the regular climatic patterns as we have come to expect, are to change forever and not well…..

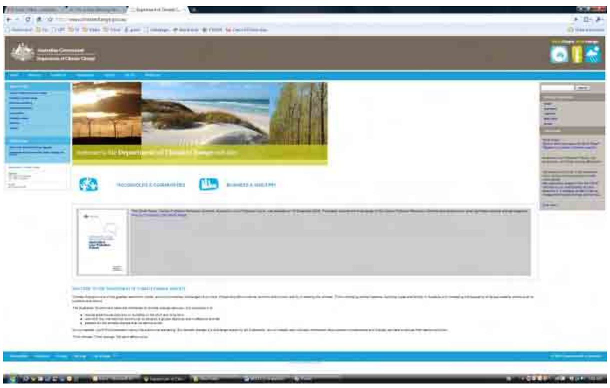
Without doubt, mining, and in particular coal mining is very important to Australia's economy and the economy of many regions, including the Hunter Valley. Many in our community benefit greatly from the lucky and rich resource Australia has. The innovation and skill with which we, as a nation have harvested the natural mineral resources is a testament and incredible compliment to the competency of the Australian nation. The task, whilst clever and without pun intended, the resourcefulness in which we plunder our soils however, in the broader picture, brings us more long term pain than perhaps is justified by the short term gain.

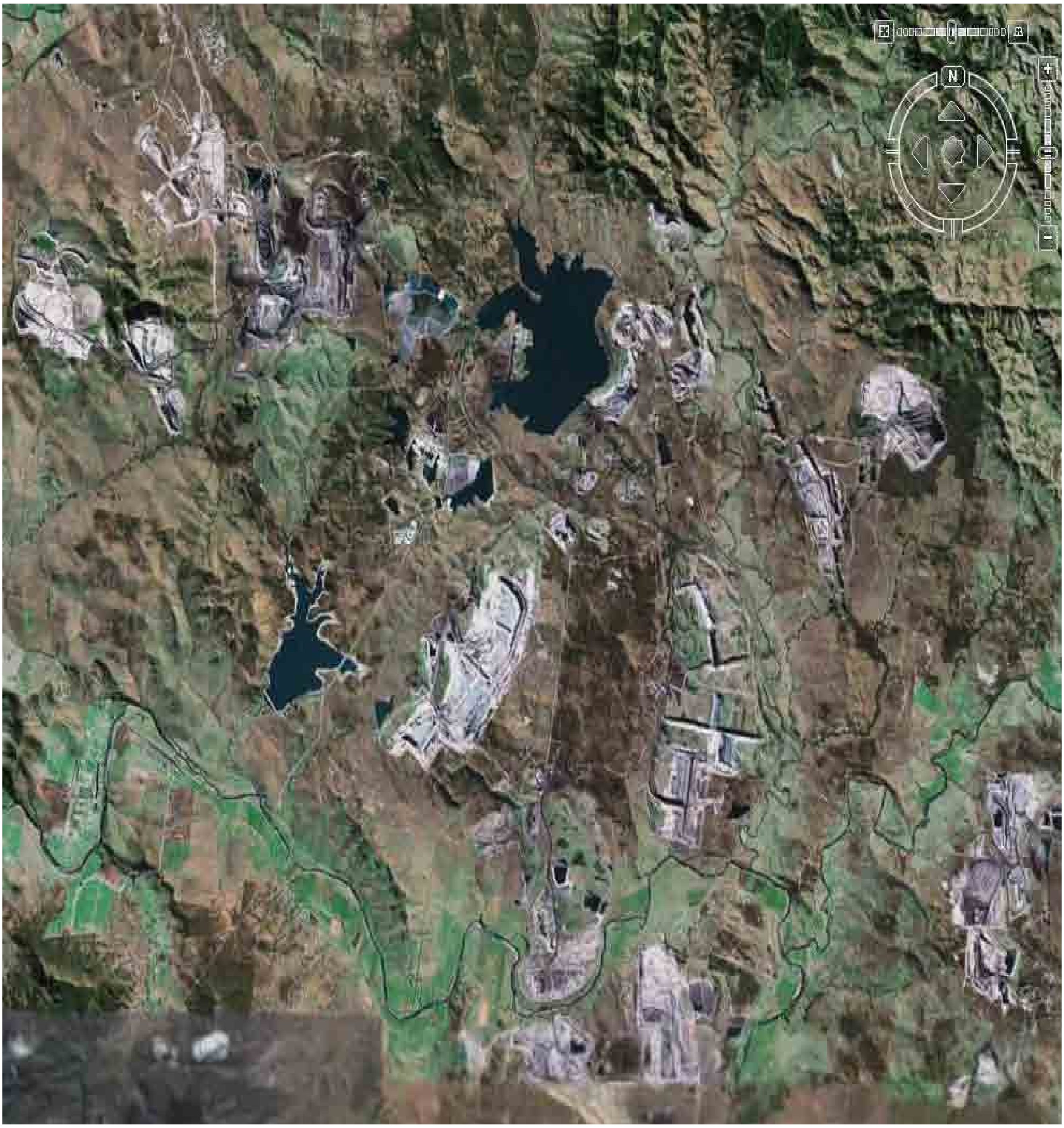
And finally the world has understood this, and it isn't only a few hippies…. We all, as citizens of the world are making changes to the way we use energy, the way we manage our resources.

Our newspapers are full of stories, the leaders of the largest economies are all finally recognising it, and recently serious scientific muscle has come out to say that unless we drastically address our creation of CO_2, we may get to the point of no return, if we haven't already got there.

They say we have to spend billions today to save trillions later. Probably true, and it will always be difficult to measure, but no amount of money will compensate people for dying because of reduced air quality, rising oceans, worsening droughts, more severe storms and less water.

The time is now, to undertake all means to build the framework for a green future.





Hunter Valley Mines circa 2004

E3.0 REGIONAL PERSPECTIVE and BENEFITS

The Hunter Valley is famous for its wines, horses, green hills, valleys and picturesque landscapes. The Hunter is home however, to coal mining and power industries, two industries with vast impacts over land, the wealth of the population, the visual amenity of a whole region as well as health, natural habitats, natural landform amongst many. The Coal Industry is a very important part of NSW and Australia's community and economy, with the Hunter playing a vital role. Coal is undeniably a driving force in the economy of the region and many community groups deserve to recognize the coal industries' support.

The majority of mining and energy production occurs in the Muswellbrook and Singleton Shires immediately south of the Upper Hunter Shire.

There are numerous proposals and feasibility studies underway investigating non renewable forms of coal and gas electricity production in the Upper Hunter Shire. As clean, renewable resources, rather than fossil fuels are used in the process of electricity generation, there are zero emissions and adding to the greenhouse effect. This will aid the move toward a 'cleaner' more sustainable environment available for future generations of the Hunter. The renewable energies as proposed are free from CO^2, noxious air pollutants and clean water requirements. This will be particularly important for the residents and natural environment of the Upper Hunter region with current plans to further expand fossil fuel based electricity production (coal and gas) in the Upper Hunter.

The open cut mining sites and power stations in the Muswellbrook area use over 5000 hectares (15000 acres) of high quality farming land. The same coal fired power plants produce tonnes of CO_2 ozone depleting gases, speeding up the impact of global warming. And that coal, (the majority) which is excavated and exported to other countries rather than used in the local power stations, nevertheless contributes to global warming overseas at increased inefficiencies.

Over the past ten years the rapid pace of development of the coal industry has seen more mines, larger mines, mines that were previously closed, reopened, mines that were underground and now proposing to be open-cut. The landscape is changing around the region so quickly, that the largest dominant landscape feature around Muswellbrook today is the large coal slagheap to the west. The coal industries attempt to conceal the changes to the land with densely landscaped batter built up against roadways but the experience of driving through the Hunter is no longer one of a rolling valley with the backdrop of mountains, but one of impact after impact of the mines along one's journey.

Recognising a need to create a cleaner, more renewable future, a large scale solar array is proposed near Singleton which is proposed to generate approximately 3MWh of energy. This is in comparison to 2600 MWh currently being produced by the 3 power stations in the Muswellbrook Shire.

And recognising a need to address renewable energy, the Upper Hunter Shire has actively promoted the investigation and implementation of alternative renewable energy generation. As soon as Council discovered its Local Environment Plan did not allow eco-generating works, it sought to change the LEP and make it possible for projects such as the Kyoto Energy Park to be assessed.

Despite the changing topography of the Hunter as a result of the mines, many other changes have occurred in the region. The wineries, coastal development and the improved road system, successful horse breading and training in the Scone area, all have brought a new awareness to the region about the sensitivity of the land and the air we breathe and generated a ground swell of support for a future less reliant on the coal industry to power our homes and the world.

Accordingly, the opportunity has emerged and with the Kyoto Energy Park is the hope that all residents in the area, whether they subscribe specifically or not, with the development of the Kyoto Energy Park, will use green, renewable energy to power their community.

Local interest in participating in the financial entity remains high and once all regulatory approvals have been met, the local community will be provided with an opportunity to ‘own’ a piece of their own green power supplier in preference to a broader offer to the public.

With the ‘ownership’ of the Kyoto Energy Park education programmes and a refreshed even greener regional identity can further develop and that will reinforce the message that Scone is clean and green and acts in accord with its values.

The Kyoto Energy Park is a great opportunity for the region to shout its support of renewable energy, rather than simply accept the landscape degradation of the mining activities. It is supportive of the strong support in the region for a shire without coal mines and clean and green activities supporting the horse industry.

E4.0 Project Description

At its core, the proposal for the Kyoto Energy Park is to align the opportunity for numerous renewable energy technologies to work together to create electricity from renewable sources.

Proven Technologies

Enormous global investment and research into energy generating devices from renewable sources over the past twenty years has seen a vast uptake in feasible, efficient and practical solutions to the ever growing demand for energy. Much of global progress has been on the back of financial support from governments. This is changing with government support reducing generally. Costs for renewable energy have been reducing as well as costs in traditional forms of energy generation (coal and hydro) becoming more expensive or seen as environmentally unacceptable. Communities around the world are realizing the true cost and impact of their reliance on coal and hydro-electric energy is harming our global environment, possibly to levels which degrade our environment that we'll never be able to recover from.

Renewables are a realistic alternative. The main reason to continue to develop energy from renewable sources is that if new technologies emerge over time, making current solutions less efficient or practical, the impact of removal of these, or the impact of having had the renewable solutions working for us in the meantime is zero. The impact of coal and nuclear is unfortunately with us for hundreds if not hundreds of thousands of years thereafter.

The proposed eco-generating devices proposed for the Kyoto Energy Park are in all cases proven and use long-tested technology, highly sophisticated and have successfully proven decades of use around the world.

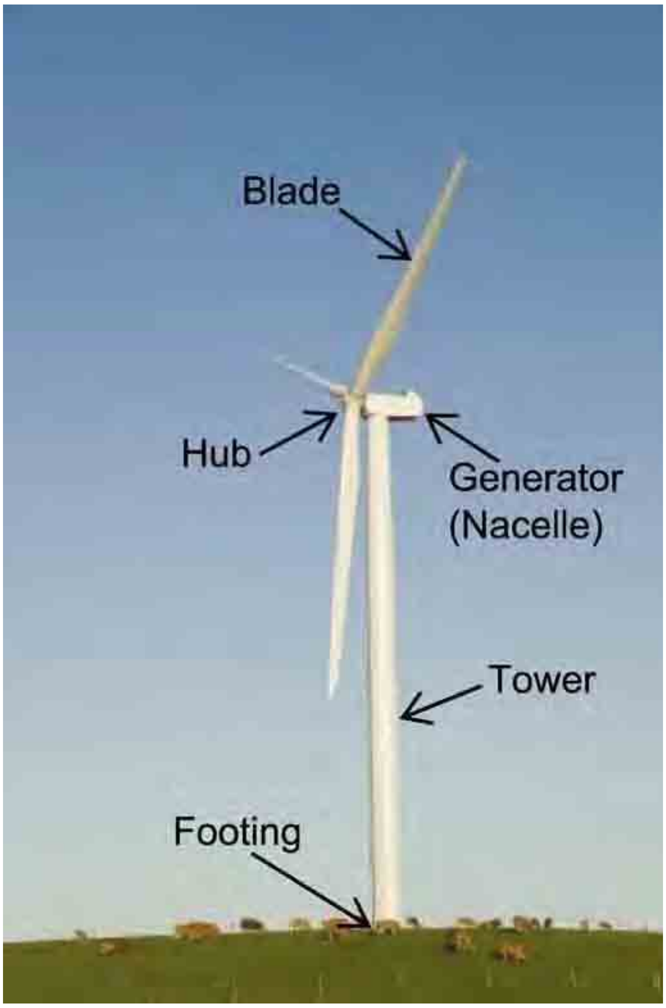
The design of the Kyoto Energy Park will take into consideration all of the proposed energy generation methods. The following is a general description of the proposed technologies.

E4.1 Wind Turbine Generators

The project involves a total of 42 wind turbine generators each capable of generating about 2 to 3 megawatts of electricity. The wind farm component of the Kyoto Energy Park will be located on two separate sites referred to as Mountain Station and Middlebrook Station three dominant ridge lines within the project boundary.

Each turbine will comprise a footing, tower structure (tower tubes), a wind turbine comprising a rotor assembly (nose cone, three blades),a nacelle, meteorological equipment, control and communications. The turbine footings will comprise either a gravity or anchored reinforced concrete block footing with final dimensions dependent on final design. Following construction of the footing the base will be back-filled with soil and revegetated with native species.

The tower will be constructed from five sections of about 20 metres length each. The tower will taper from the base to the top. Each of the turbine blades will be approximately 45-50 metres long and weigh 6 to 7 tonnes each. The turbines will have a hub height of about 105 metres and be of variable speed design with rotation at between 7 and 18 revolutions per



Component parts of a typical wind turbine generator minute or rpm. The turbine operation will commence at a wind speed above about 3 metres per second (11 kilometres per hour) and cut out above 25 metres per second (90 kilometres per hour). The turbines will be designed to operate automatically and will also be able to be monitored from a control room located in the site substation or controlled remotely from site via telecommunications links.

Image of a typical fixed- frame solar photovoltaic plant

E4.2 Mt Moobi Solar Photovoltaic (PV) Farm

A Solar Photovoltaic (PV) plant will be constructed and installed along the flat cleared section of Mount Moobi Plateau located in the south-eastern portion of Mountain Station. The Mt Moobi Solar PV farm will cover an area of approximately 210,000 m^2 or 21 hectares, dependent on the final layout.

The Mt Moobi Solar PV farm will be composed of photo-voltaic solar cells which will be regrouped in solar modules. Solar modules will be mounted on supporting structures which may be fixed or mobile depending on final design parameters. Solar modules generate a DC current which is generated at low voltage of few hundred volts. The DC output of the solar module is converted to 50Hz AC current via a power inverter in each individual module, which would be mounted on the supporting frame structures connected to in-situ footings poured on site. Four different types of frame structures have been considered in this environmental assessment report to improve overall exposure and reduce costs. Final design of the solar PV plant shall subsequent to approval from the Minister.

Fixed structures allow for longer cells or rows, whereas power tracker structures are designed to maximise power output efficiency through single or dual axes tracking. Frames would be prefabricated off site and transported to the site for installation. The total peak output of the solar farm would be between 3-10MW (gross or rated capacity) depending on the final configuration and area of the plant. Future capacity for up to 30MW is also available within the sites. The Mt Moobi Solar PV farm size and configuration will depend on the type of supporting structure selected.

E4.3 Mini hydro Plant (Closed-loop)

A mini-hydro plant (Closed loop) is proposed to provide a power generation source that can supplement local electricity peak output periods, store surplus renewable energy during off peak periods, high electricity pricing and help balance power output quality from intermittent generation sources such as wind and solar used in the project.

The topography of the proposed site is well suited for this application. Water will be sourced from the site runoff or trucked in and used to fill the header tanks for later discharge through the hydro turbines.

During discharge (under gravity) the water in the header tanks drives a series of smaller mini hydro turbine units located within the closed loop system. Electricity for reverse pumping of water to header storage tanks shall be sourced from excess energy generators from wind and/or solar plants.

Electrical works include a single substation in the order of 100 MVA located close to the site access on Mountain Station. About 21 kilometres of 33kV cable will be laid for underground reticulation within both sites.

E4.4 Transmission line connection to the Grid

Overhead transmission lines will be used for external connection to the grid. There are two main options for connection to the grid a 66kV and a 132kV with final selection based mainly on final park capacity. Variations to these options have also been included. The 66kV connection from the site substation to the new Scone STS consists of approximately 13km of external overhead transmission line (Connection 1 in the diagram below). The 132kV connection would be to the existing Muswellbrook STS, consisting of 42km of overhead line (Connection 3 in the diagram below). An option also exists for connection to

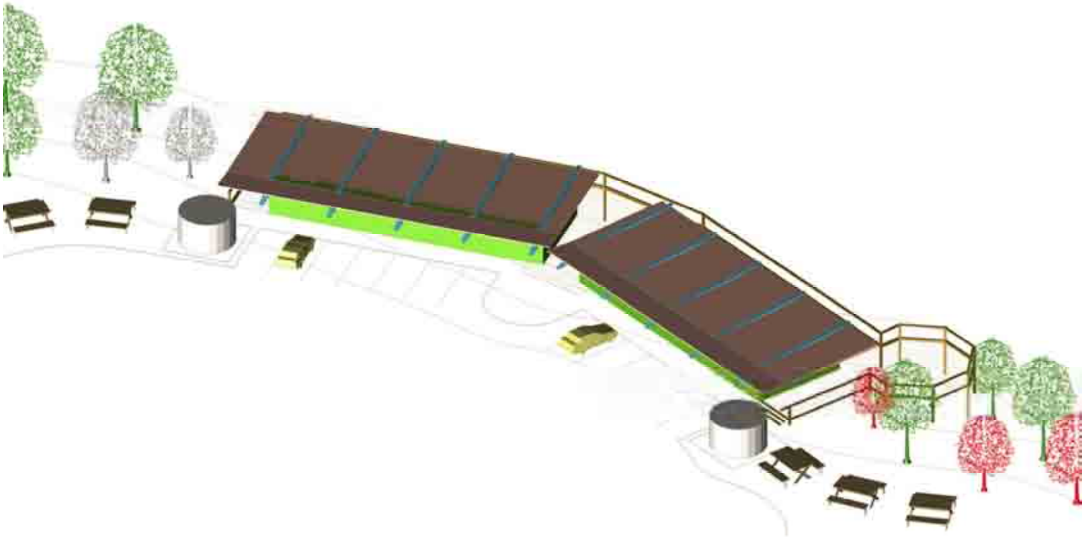
Dartbrook Mine along the same route.

In addition about 9km of 33kV overhead line would be used to connect Middlebrook Station to the site substation. Most of the new line will replace existing pole infrastructure along existing road routes that have been selected to bypass built-up areas and residential zones.

E4.5 Ancillary facilities

Ancillary works include a the installation of a Maintenance shed, a Managers residence, a Visitor's and Education Centre which will be used by visitors, educational institutions and for displaying information regarding the Kyoto Energy Park and local heritage.

The Kyoto Energy Park is designed to be operated automatically and remotely, however permanent staff will be located on site for environmental management and control facilities, safety and general maintenance.



3D Visualisation of the Proposed Visitor's and Education Centre Mt Moobi Plateau, Scone

E5.0 Development Phases and Timelines

The overall development phases for the Kyoto Energy Park can be broadly categorised into

- planning and approval;
- final design, preparation of contracts and tendering;
- construction; and
- commissioning and operation.

Other requirements prior to operation of the project include a Connection Agreement with Energy Australia for connection to the electricity grid and a Power Purchase Agreement (PPA) between the generator (Kyoto Energy Park Scone) and an energy purchaser (eg electricity retailer).

The construction stage of the project will continue for an estimated 20 months duration including construction of all components such as site establishment and preparation, civil works, access tracks, turbine footings and underground cabling, erection of turbine structures, installation of a Solar Photovoltaic (PV) Plant, site substation, construction of the mini hydro plant, a Maintenance shed, Manager's residence, a Visitors and Education Centre and transmission line connection to the grid. The actual duration may vary, depending upon the detail of the final contracts, scheduling of activities and any delays that may be encountered due to factors such as unfavourable weather conditions or supply of equipment or materials.

The overall generating life of the initial Kyoto Energy Park equipment would be approximately 30 years from the commencement of operations. This timeframe is based on the typical collective design life of the generator components. During operations the Kyoto Energy Park would be staffed by up to 10-15 staff at any given period with additional resources used during regular maintenance periods and servicing. At the end of the design life of the Kyoto Energy Park components, refurbishment of the equipment is proposed.

Table 3.2 - Kyoto Energy Park - Construction Timeline

Kyoto Energy Park Construction Program	Mth1	Mth2	Mth3	Mth4	Mth5	Mth6	Mth7	Mth8	Mth9	Mth10	Mth11	Mth12	Mth13	Mth14	Mth15	Mth16	Mth17	Mth18	Mth19	Mth20
Mountain Station																				
Site Establishment	■																			
Upgrade access tracks and hardstands		■	■																	
Establish batching plant		■																		
Internal underground cabling			■	■	■							■								
Turbine concrete foundation				■	■	■	■													
Construct substation/switchyard/control							■	■					■	■						
External connection to the Grid*									■	■	■	■	■		■					
Erect WTGs								■	■	■	■	■								
Construct Mini Hydro Plant											■	■	■	■	■					
Commission Wind Turbines															■		■	■		
Construct Maintenance building															■					
Construct Manager's residence															■	■				
Construct Visitor's Education Centre																	■	■		
Install Mt Moobi Solar Plant (5MW)													■	■	■	■	■	■		
Commission Solar Plant																			■	
Project operation (Wind + Hydro)																			■	
Project operation (Solar)																				■
Middlebrook Station																				
Upgrade access tracks and hardstands				■	■															
Internal underground cabling					■	■														
Turbine concrete foundation							■	■												
Erect WTGs													■	■	■					
33kV to Site Substation											■	■	■							
Commission Wind Turbines																			■	

** Includes timeframe for 132kV connection Option 2 (Vemtec 2008)*

E5.1 Construction Activities

Construction facilities will be set up on site at Mountain Station for the duration of construction phase. On-site construction facilities would include a mobile concrete batching plant, site offices and a laydown area. The laydown area would be located adjacent to the site offices and used for temporary storage of large wind turbine parts prior to erection along ridgeline locations. Road base material would be sourced locally and transported to the site for use in access tracks and crane hardstand areas. Sand, cement and gravel used for concrete production shall be sourced locally and transported to site.

On-site construction activities would occur between 7am to 7pm Monday to Friday and 7am to 1pm Saturday, excluding Sundays and public holidays. On some occasions, some cranage activities will occur outside these working times and possibly on Sundays and public holidays. This is due to the cranage sequence for the lifting of the last sections of the tower, nacelle and blade assembly of the wind turbines. The wind speed must be low and once the sequence of lifting commencing of the four components, it should not be interrupted.

Deliveries would generally occur in bulk loads minimising truck movements to and from the site. Transportation of materials shall occur during associated construction activities to minimise stockpiling on site. Heavy haulage of wind turbine components would occur during NSW Police and RTA approved times. The Traffic and Transportation Assessment identified feasible transportation routes for delivery to site. Final transportation routes for oversize and over mass components would be subject to a permit from the RTA and NSW Police prior to delivery to site.

E6.0 Statutory Planning and Consultation

Planning Approval is being sought pursuant to Part 3A of the Environmental Planning & Assessment Act 1979 for the construction and operation of the Kyoto Energy Park. The Consent Authority for the Kyoto Energy Park project is the NSW Minister for Planning.

Pamada Pty Ltd (the proponent) lodged a Project Application on 29 November 2005 and 14 December 2006 to cover all components of the proposed project. The Department advised on 13 March 2006 and 30 January 2007 that the proposal is declared to be a project that part 3A of the EP&A Act 1979 applies.

The Director-General of the NSW Department of Planning has specified the matters to be dealt with by the Environment Assessment. Director Generals Requirements (DGRs) were issued by the Department of Planning on 1 May 2007.

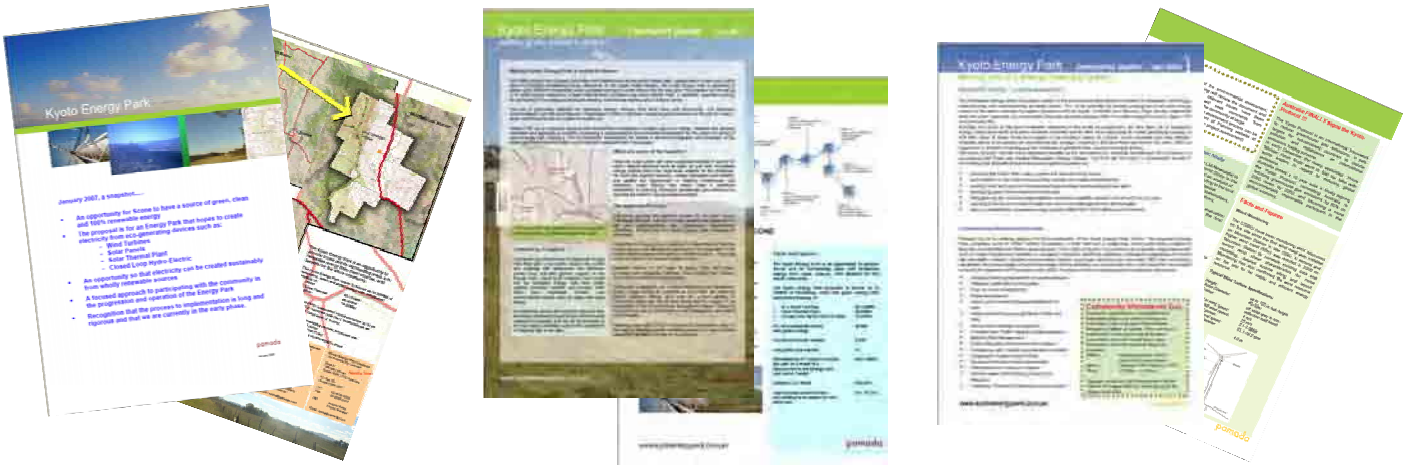
This environmental assessment report has been prepared to address the DGRs for the project and other relevant matters of the project. Pamada are seeking approval or consent for construction and operation of the Kyoto Energy Park.

Other approvals and licences required for the Kyoto Energy Park include a consent for works within and/or over the road reserve under Section 138 of the Roads Act 1993.

The objectives of all EPI's relevant to the subject sites and project are all consistent with the proposal.

E7.0 Community Participation

Community participation is an important consideration for the project in firstly providing accurate and up to date information to the local community, local organisations and business groups, and secondly in gaining non-biased feedback on project parameters.



Examples of Community Information distributed to Local Community and Stakeholders

Public consultation began in 2005 with the rezoning of the subject sites to allow for renewable energy generators to be considered for development. In December 2006 formal planning and environmental assessment of the sites commenced and Pamada prepared a Community Consultation Plan as a management framework for engaging community awareness, providing information and addressing concerns. A summary of the Plan is provided in Appendix N.

Community consultation included:

- Community Information Newsletters;
- formal letters to individual residents;
- presentations to key business groups and to the Local Aboriginal Land Council;
- on site Indigenous archaeological surveys with Aboriginal stakeholders;
- the Kyoto Energy Park website;
- a Community Information Day;
- face-to face meetings;
- phone conversations and interviews;
- Direct email communication; and
- extensive public relations initiatives though media, advertising, direct mail, letterbox drops, and on-display information at Upper Hunter Shire Council.

Meeting nearby Resident on-site

Numerous face to face one on one meetings with neighbouring residents occurred on their neighbouring land. Further numerous communiqués between neighbouring landowners and the proponent occurred by email. Very many highly detailed questions of the proposal were asked which, to the extent of knowledge available, all were provided directly to the residents.

Such meetings occurred during the whole process, from the earliest stages in the assessment, when very little information was finalised from the assessment, right up until late December 2008, when representatives contacted three of the neighbours most pressing for information. Inspections occurred on their properties and information contained in this report was discussed.

Other information was presented through informal presentations, briefings to council, meetings and government consultation.

Kyoto Energy Park Website www.kyotoenergypark.com.au

Pamada Scone Office off Kelly Street, Scone

A Pamada site office was set up in the main street of Scone from 2006 to answer questions from local residents and facilitate meetings. The site was used by Pamada for local appointments with the Community Liaison Officer on a part time basis (Approximately 2-3 days per week).

Extensive media coverage has occurred throughout the project lifetime to date. The bulk of media coverage was undertaken by the local newspaper, the Scone Advocate. Other articles have also appeared in the Newcastle Herald and the Sydney Morning Herald with specific discussion generated on ABC Radio programs (Muswellbrook and Newcastle) and NBN TV news.

The newspaper articles have generally maintained a neutral position and have been informative. Articles have outlined both positive and negative impacts of the proposed development. At a regional level there has been a greater focus on the potential of the development in combating global warming.

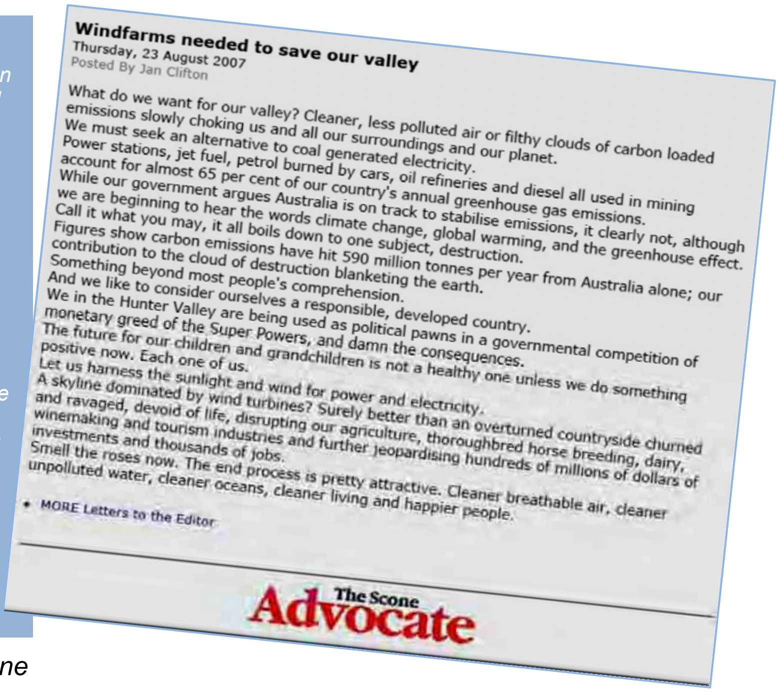
In the ‘Letters to the Editor’ section of the Scone Advocate, letters were received both in support and against the proposed energy park.

- Topics in support, covered matters such as desire to have renewable energy, ‘what’s the problem, they are a beautiful thing’, and desire to slow down the progression of coal mines in the area.
- Topics against, covered matters such as visual intrusion, loss of property values, bird strike, noise, bushfire risk and the concept that the landowner would receive an unfair benefit from the energy park.

No windfarms in Scone

Going through recent issues of The Advocate missed on a trip to Spain I was unpleasantly surprised to read of a proposed installation of wind farms on hills near Scone.
Parts of Spain we drove through are awash with wind farms. Blighted by them would be a better description.
These windfarms may be a triumph of industrial design, and in promotional pictures and videos they do have a certain individual elegance.
But, up close, they are gigantic, up to 150 metres high; as tall as a football field is long plus 50 per cent.
In groups or rows they completely overwhelm and visually annihilate the landscape for kilometres around.
Nobody who is financially or politically disinterested in wind farms but who lives close enough to see or hear them finds them attractive, quite the opposite.
Scone district does however have some of the most attractive country in NSW, heritage grade landscape I suggest.
We don’t need the visual pollution of heavily government (ie taxpayer) subsidised wind farms. Please put them in some else’s backyard.

By Dr Mj Hunter
The Scone Advocate 28 June 2007


Windfarms needed to save our valley
Thursday, 23 August 2007
Posted By Jan Clifton

What do we want for our valley? Cleaner, less polluted air or filthy clouds of carbon loaded emissions slowly choking us and all our surroundings and our planet.
We must seek an alternative to coal generated electricity.
Power stations, jet fuel, petrol burned by cars, oil refineries and diesel all used in mining account for almost 65 per cent of our country's annual greenhouse gas emissions.
While our government argues Australia is on track to stabilise emissions, it clearly not, although we are beginning to hear the words climate change, global warming, and the greenhouse effect.
Call it what you may, it all boils down to one subject, destruction.
Figures show carbon emissions have hit 590 million tonnes per year from Australia alone; our contribution to the cloud of destruction blanketing the earth.
Something beyond most people's comprehension.
And we like to consider ourselves a responsible, developed country.
We in the Hunter Valley are being used as political pawns in a governmental competition of monetary greed of the Super Powers, and damn the consequences.
The future for our children and grandchildren is not a healthy one unless we do something positive now. Each one of us.
Let us harness the sunlight and wind for power and electricity.
A skyline dominated by wind turbines? Surely better than an overturned countryside churned and ravaged, devoid of life, disrupting our agriculture, thoroughbred horse breeding, dairy, winemaking and tourism industries and further jeopardising hundreds of millions of dollars of investments and thousands of jobs.
Smell the roses now. The end process is pretty attractive. Cleaner breathable air, cleaner unpolluted water, cleaner oceans, cleaner living and happier people.

- MORE Letters to the Editor

The Scone Advocate

Examples of Resident Letters as seen in the Scone Advocate and published on the web.

A Community Information Day was held in Scone on the16th February 2008. Pamada engaged an independent consultant (Key Insights Pty Ltd) to advertise, organise, facilitate and record the day which was attended by an estimated 200 local people. 56 feedback forms were collected or mailed to Key Insights providing community feedback on the Day. Core project consultants for the project were in attendance displaying key information, answering specific questions and assessing further local issues relevant to the studies.


Community Information Day held at the Scone Equine Centre

In general the views of the local community have ranged from strong opposition to strong support. Those most strongly opposed to the project have expressed their acceptance of renewable energy technologies but are concerned over local impacts such as noise, visual and devaluation of land values. Those in support of the proposal were generally committed to “green energy” and the association with Scone as a green town.

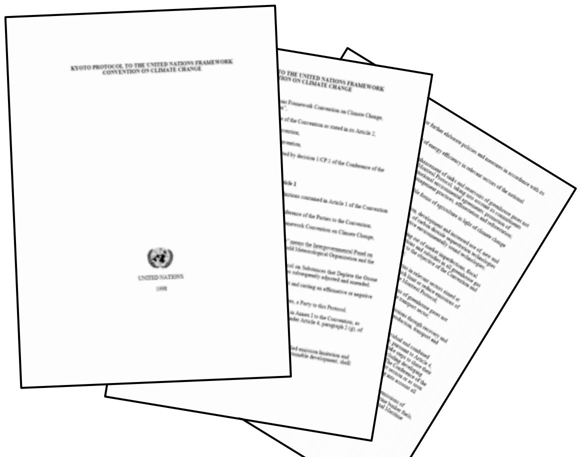
It should be noted that a small group of local residents have repeated notified other groups, the media and through letter box drops inaccurate information not originating from the proponent, and not representative of the real proposal.

E8.0 Strategic Justification

The final generation capacity of the Kyoto Energy Park will be in the order of 90-140 MW of rated (gross) capacity. Final design capacity shall be based on final selection of wind turbine generator (2-3 MW) and size of the Mt Moobi Solar PV farm (3-10 MW). The maximum generation capacity of the Kyoto Energy Park shall be split between wind turbines (92%), solar photovoltaic (7%) and closed loop mini-hydro (1%).

E8.1 Greenhouse Gas (GHG) Emissions

Over a third of Australia's total GHG emissions are from the electricity supply industry. The Electricity Industry is currently dominated by fossil fuel based energy production of coal (black and brown) and gas with renewable energy production represented mainly through hydro schemes, such as the Snowy Mountains Hydro Scheme in NSW.



The Kyoto Protocol was adopted in Kyoto, Japan, in 1997 and ratified by Australia in 2007

The Kyoto Energy Park is being developed as a direct response to long term climate consequences of fossil fuel based electrical generation practices. The Kyoto Energy Park will generate electricity from the latest wind, solar photovoltaic and hydro technology providing a renewable energy source, which will assist and comply with the federal government's most recently announced Mandatory Renewable Energy Target (MRET) of 20% of total electricity by renewable resources by the year 2020.

The state of NSW currently has a generation capacity deficit and imports large amounts of peak electricity mainly during peak periods from interstate (Victoria and Queensland) which increases overall costs, transmission losses for supply and overall Greenhouse Gas Emissions.

Growth in demand for electricity in NSW, and specifically the Hunter Valley over the next 15 years is expected to increase with consumers increasing reliance on electricity.

The electricity generated by the Kyoto Energy Park would supply in the order of 62,000 households per year, based on an average household electricity consumption of 5,000 kWh per year. Wind and solar components are expected to save 286,000 tonnes of GHG emissions annually or approximately 9.5 million tonnes over the life of the Energy Park components, assisting mitigation of greenhouse gas emissions from stationary energy sources.

Conventional coal fired generation uses large quantities of water mainly for cooling purposes. The Kyoto Energy Park would have negligible water requirements. Using data from the coal fired power stations, it is possible to calculate the quantity of water used in the process of creating electricity from the burning of coal for an equivalent generation capacity to that of the Kyoto Energy Park. The saving in water annually is in the order of 700million litres of potable water, or the equivalent of some 12 Olympic sized swimming pools of clean water daily.

The mini-hydro plant is a closed system which when charged will require minor top up allocations during maintenance.

When implemented in accordance with the commitments identified in this document, the Kyoto Energy Park does not compromise environmental values at the locality, including ecological, heritage, soils and water quality. It does not place undue stress on local resources with the exception of traffic regimes which would be managed and controlled in a safe and efficient manner.

E8.2 Social and Economic Impacts

Scone has a population of 5,080 people and is fully contained within the Upper Hunter Shire Council, which was formed in 2004 with the amalgamation of the shires of Scone, Merriwa and Murrurundi. The socio-economic profile of Scone and the Upper Hunter reveals a strong labour market, with low unemployment and high workforce participation.

The most significant economic component of the project will be during the manufacturing and construction phase. The total expected capital expenditure for the project is between 140 and 190 million dollars. Final expenditure will depend on the final generator capacity of the park. It is estimated that 60% of total expenditure would be captured domestically.

Total direct Australian job years during construction of the wind farm component are estimated between 329 and 466. An additional 1351 to 1911 Australian job years would be created in relation to multiplier effects associated with increased economic activity in the region during construction of the park. Further local jobs would be sourced for buildings and facilities construction.

The regional workforce and industry is well placed to provide input into various aspects associated with the project, including local employment, transitional employment for trade skills, supply and fabrication of construction materials and industrial services. Much of the material used in construction will be sourced from (including road base, concrete materials), and from the Newcastle Hunter region (steel, prefabricated components, haulage).

View from the Mt Moobi escarpment looking east to Scone

The creation of on-going employment for the Kyoto Energy Park is in the order or 10 to 15 fulltime equivalent jobs. Additional workers to the area will positively impact on local businesses, through an increase in customers and clients. The addition of a tourism component in the form of the Visitor Education Centre would provide further economic benefit to the Upper Hunter region and the local area of Scone.

The development is located on predominantly cleared grazing land and is able to operate compatibly with the existing activities on site. The park would provide additional income to the landowner of the property on which the wind farm will be located.

There appears to be overall positive support from the general community for the project. The project complies with the requirements for inter-generational equity (i.e. the rights of future generations). Those in opposition to the project are generally located in close proximity to the sites and have expressed concerns mainly in relation to noise, visual impacts and land devaluation potential. These impacts are considered to be manageable and outweighed by the positive environmental benefits of the project.

The proposed Kyoto Energy Park development has the potential to improve the environmental quality of the wider Upper Hunter region with minimal and manageable adverse environmental impacts to the site and local area. It is anticipated that the development will not generate any emissions or greenhouse gases during operation, will contribute to state and national greenhouse gas and climate change policy targets, promote the generation and use of renewable energy, and create an opportunity to educate tourists and visitors about renewable energy and the environment.

E8.3 Surrounding land-use and development

The Kyoto Energy Park site was identified by the former NSW Sustainable Energy and Development Authority (SEDA) in 1995 and since 2000 has been monitoring wind conditions on Mountain Station confirming the locations suitability for wind generation.

Scone is primarily a large service town for the surrounding rural areas and is known as the Horse Capital of Australia due to the significant equine industry and the considerable amount of prestigious horse studs in the area. Other surrounding dominant land uses include grazing, agricultural crops, and coal mining which is rapidly expanding in the area.

Rural properties and homesteads are scattered around the Mountain and Middlebrook Station sites mainly to the east towards the Scone urban centre. No residencies are located within 1 km of the wind turbine generators proposed for both sites. The closest residency is approximately 1.1 kilometres to the east of the nearest turbine on Mountain Station.

The closest rural residential development is the Clifton Hills Estate which is a 15 lot rural residential subdivision located north-west of the Mountain Station site. One residence has been constructed within the Estate and noise impacts were found to be within acceptable limits.

Some rural residential subdivisions are located at considerable distance east of both sites in the vicinity of Scone town centre. There are currently no future residential developments proposed close to the site. There is some potential for development of surrounding lots however this is mostly limited to rural lot subdivisions.

In general, local community feeling seeks to keep Scone a clean and green place, without mines, yet many in the region work in the mining and mining support industries, recognising the importance of coal to the health and growth of the region, state and national economies. Although recognising the importance to the communities, there is strong and broad based concern regarding any further mining activities to the extent of the community paying for advertising space on roadside posters.

E8.4 Potential Devaluation of Property

Bob Dupont Land Valuations Pty Ltd were engaged by Key Insights Pty Ltd to undertake a review of the potential for land devaluation in the surrounding properties specifically from wind turbine generators. This is addressed in Key Insights' report (see Appendix K).

The background assessment was based on existing market evidence in both Australia and internationally, information of the Kyoto development, an inspection of the sites and local area, knowledge of land values in the Scone region and the impact developments of this nature have on land values.

The land surrounding the proposed Kyoto Energy Park is dominated by agricultural land, prominent horse studs, scattered rural homesteads, lifestyle blocks, and some rural residential subdivisional developments. Research shows that there is a general consensus that wind farm developments have no impact on the agricultural viability of land. The report concluded that given the prominence of the wind farm component on top of ridge lines, there may be an initial reduction in value to immediately adjacent residencies, however this reduction is more a consequence of the perception of negative effect rather than actual outcomes. Duponts reported that once developments of this nature are in place, after a period of time (generally 1 to 2 years) the effect generally reduces to zero.




E9.0 Existing Environment

The Scone area is known as the Horse Capital of Australia, hosting some of the most prestigious equestrian events in Australia and home to some of the most prestigious horse studs. The Hunter Valley is also a world famous wine producing region mainly in the south which supports a booming tourism sector that has world class restaurants and golf courses all within an hours drive of the Kyoto Energy Park proposal.

The region is well serviced with education facilities. There are seven high schools in the region – and three TAFE colleges. There is also a hospital located in the Scone centre.

The proposed development is located on an inland rural location that has been extensively cleared and has a predominantly pastoral land use. The development does not preclude the existing land use and it is anticipated that the landowners of the property will continue to graze sheep and cattle on the property.

Rainfall is about 600 mm per year. Mean annual temperatures vary from between 10.0 and 24.1degrees Celsius. The site has high average wind speeds that are predominantly from the south-east or west. The site has a sufficient wind energy resource to support the development.

Sheep grazing along Middlebrook Road, Middlebrook Station Scone

E9.1 Air Quality

Impacts to air quality would be primarily limited to the construction stages of the Kyoto Energy Park development. Areas exposed on the site would be minimal and can be managed to reduce soil loss and mitigate dust control. Exposed works areas would be limited to access roads, turbine excavations, material stockpiles, minor earthworks and regrading areas. Dust mitigation measures and soil management practices will be adopted on site. Accordingly the Construction Environmental Management Plan (CEMP) for the project will incorporate controls to keep dust emissions to a minimum.

E9.2 Existing Land Uses

Existing land uses on the Mountain and Middlebrook Station properties include grazing of sheep and cattle, private aviation, and existing tourism activities. An existing Trig station (Myall Trig) is located on Mt Moobi in close proximity to the proposed wind turbines and solar PV farm. The NSW Department of Lands were contacted and responded verbally that no objection to the proposal was made. The "Myall" Trig will remain unaffected by the project however the Department requested that the Trig station is protected during construction works and that final layout details of all structures be submitted to the Department for concurrence prior to construction.

The existing land uses will be continued and can coexist with the elements of the Kyoto Energy Park project. The existing tourism activities include trips to Mountain Station and Mt Moobi lookout. A Visitors and Education Centre will be constructed on Mt Moobi to allow for exiting and future visitors to the site on an intermittent basis. Some possible disruption to grazing activities on Mountain Station may occur during the construction stage of the project.

E10.0 Flora and Fauna Issues

The Kyoto Energy Park is proposed to be situated on two sites Middlebrook and Mountain Stations. A Flora and Fauna Impact Assessment was undertaken by Conacher Environmental Group between April 2007 and August 2008. A Specialist Bird Impact Assessment was also completed by Conacher Environmental Group in accordance with requirements from the Director General and Auswind Guidelines – Wind Farms and Birds: interim Standards for Risk Assessment. The proposal was referred to the Department of Environment, Water, Heritage and the Arts in accordance with the Environmental Planning and Assessment Act (1979). The department deemed the proposal to not be a controlled action on 18 March 2008.

The main impacts of the development relate to site disturbance during construction and, once operational, to potential for blade strike by birds and bats from wind turbines.

E10.1 Flora

Middlebrook Station has sparse scattered tree cover and is adjacent to the Towarri National Park to the north and partly to the western border. Middlebrook Station is part of the Glen Range, and has a relatively flat single ridgeline which runs approximately north-south. Terrain slopes around the main ridge can be described as complex in all other directions, as there are steep slopes present, particularly to the east and west. The ground cover is medium tree cover to 6-8m. The valleys surrounding the ridgeline are mainly open grassland, with occasional scattered trees to 8m.

Mountain Station site is predominantly cleared open grass land with occasional shrubs and scattered trees. The remnant vegetation is significantly disturbed and significantly reduced due to occupation and previous clearing. The tree cover is denser on the sloped areas of some ridgelines and the main escarpment. One threatened flora population (Cymbidium canaliculatum), was observed at the Mountain Station site. The proposal will not require the removal of any individuals from this population or impact upon this population. One Endangered Ecological Community (White Box - Yellow Box - Blakely’s Red Gum Woodland), was observed within the subject sites. The proposal is likely to remove a maximum of 5.9ha (3.6 ha Middlebrook Station, 2.3 ha Mountain Station) or 0.9% of the community within the sites. Selective removal of vegetation would be required for upgrading of the vehicle access tracks and construction of the wind turbines envelopes and components. The project design and implementation will aim to avoid clearing of native trees whether dead or alive.

There are no areas mapped as vegetation corridors present within the subject site. There are regional and sub-regional corridor areas to the east of the site within the ridgelands and rangelands associated with the Glenbawn Dam catchment. These areas are at considerable distance from the site and have no association or connectivity with the sites.

No areas within the site have been identified as key habitats within the DECC mapping

E10.2 Fauna

Seven threatened fauna species, the Glossy Black-Cockatoo, Grey-crowned Babbler, Spectacled Warbler, Grey-headed Flying-fox, Yellow-bellied Sheathtail-bat, Eastern Bentwing-bat and Eastern Cave Bat, were observed within the subject site. A 7-part test completed for the proposal in accordance with the Threatened Species Conservation Act (1995) and Section 5A of the Environmental Planning and Assessment Act (1979) concluded that the proposed development was not likely to have a significant

impact upon threatened species, endangered populations or endangered ecological communities and a Species Impact Statement should not be required for the proposal.

No Koalas were observed during fauna surveys and there was no evidence of previous Koala habitation within the subject site.

E10.3 Bird and Bats

One threatened fauna species, the Grey-headed Flying-fox, was observed on a single occasion within the subject site. The subject site is not likely to be in the regular flight path of any locally occurring colony or camp of Grey-headed flying-foxes. Any collisions are likely to be isolated individuals and extremely rare. The construction of the turbines is likely to pose some level of risk to smaller bat species (particularly the White-striped Freetail-bat and Yellow-bellied Sheathtail-bat) however the risk posed by the turbines and subsequent population effects are low given the low expected incidence of collision and large amounts of suitable habitat available within the local area including Towarri National Park.

A specialist bird survey was carried out as part of the Bird Impact Assessment completed for the site in accordance with Auswind's Wind Farms and Birds: Interim Standards for Risk Assessment (Auswind 2005). Specialist Bird Surveys were carried out in April, May, June, August December 2007 and February 2008.

Given that the rotors are situated on the ridgeline in exposed areas the impacts are potentially limited to high flying, soaring birds. Two 'Species of Concern' were identified during the assessment that exhibit behaviour that puts them at risk of collision with operating wind turbines. These species were the Wedge-tailed Eagle and the Nankeen Kestrel. Further monitoring of these species will be included in an Adaptive Management Plan implemented prior to commencement of operations of the development. Monitoring of other bird and bat species will also be undertaken during operation of the Kyoto Energy Park.

Glen Range, Middlebrook Station, Scone

E10.4 Vegetation Management

Removal of vegetation will be kept to a minimal. The Kyoto Energy Park will require the selective removal of a small proportion of vegetation for upgrading of access tracks, crane hardstand areas and site works. Vegetation loss would be offset by firstly protection of the existing remnants during construction and secondly replanting and restoration of significant remnants of the EEC during the operational stages of the project.

Other measures will also be adopted during the construction period to minimise the construction footprint of the site, protect existing vegetation surrounding works areas, limiting vehicle access close to protected vegetation and channels and erosion and sedimentation controls.

E11.0 Heritage

E11.1 Indigenous Heritage Issues

The Aboriginal heritage issues have been assessed for the Kyoto Energy Park sites with the findings presented in Appendix H – Myall Coast Archaeological Services Pty Ltd (September 2007) and summarised in Section 9 of this report.

The Aboriginal heritage investigation involved intensive consultation with the aboriginal stakeholders identified during initial stages of the investigation. Stages of the investigation included research and consultation with stakeholders, predictive planning of heritage items, a presentation of the project by Pamada to the stakeholders, a preliminary site inspection, a detailed survey with Aboriginal stakeholders, and final consultation with stakeholders. The assessment level of sensitivity was based on landscape, known artefact distribution and predictive modelling and discussion with aboriginal stakeholders. The assessment report indicates that the probable use of the area was based on the views and connectivity it provided.

No artefacts of places of aboriginal significance were identified during the investigation on both sites. Areas which were likely to contain evidence of habitation were not identified. Aboriginal stakeholders advised that no impact to known artefacts or aboriginal cultural heritage would occur as a result of the Kyoto Energy Park proposal.

Myall Coast Archaeological recommended that Pamada enters into a negotiated agreement with the registered Aboriginal communities prior to construction regarding Aboriginal Cultural heritage and enhancement of Aboriginal Cultural value in the area.

E11.1 European Heritage Issues

The European heritage issues have been assessed for the Kyoto Energy Park sites with the findings presented in Appendix I – Myall Coast Archaeological Services Pty Ltd (September 2007) and summarised in Section 9 of this report.

The subject sites (Middlebrook and Mountain Station) are of approximately 2000 hectares each, and are currently owned by a single landowner. There are some farm buildings located on the properties, none of which have any local, state or federal heritage significance or are located on any heritage registers. The subject sites are neither adjacent to nor likely to affect any known heritage items.

Background research, a site inspection, and discussion with the local government and the Local Historical Society did not reveal any likely heritage items that may be impacted upon by the Kyoto Energy Park proposal within the vicinity of the sites.

Middlebrook Station is adjacent to and overlooks the Castle Rock formation (located approximately 1.3 km from the closest turbine on Middlebrook Station). However there will not be any physical affect to Castle Rock from the development. The proposal will not cause overshadowing, loss of sunlight or pollution issues on any heritage item.

The heritage investigation areas considered potential impacts arising from all components of the development, including the transmission lines. The proposed line transmission infrastructure was assessed to determine firstly if any heritage items existed along any of the proposed line route options and potential impacts associated with the location of the transmission proposed infrastructure and if transmission construction works could potentially damage the item.

Myall Coast Archaeological Services initially investigated and surveyed four (4) possible line route options for connection of the Kyoto Energy Park to the electricity grid. There are currently two (2) preferred options for connection to the grid (with variations). These are referred to as Option 2 (66kV Scone connection) and Option 4 (132kV Muswellbrook connection). The Option 4 route includes a possible connection at Dartbrook Mine based on final design and capacity issues.

Looking west from Liverpool Street, Scone

Option 2 for transmission line is proposed to pass within the vicinity of one (1) item of local heritage significance (listed on the Scone Local Environmental Plan 1986). This item is referred to as the "petrified stump" on Moobi Road. The petrified stump is a geological item that is close to the road pavement and existing 11kV transmission line infrastructure. The petrified stump is protected by a cage structure as it is located close to the road edge. Proposed works include replacing the existing pole and line infrastructure with a new 66kV line structure. Any damage to this item is unlikely however measures would be adopted during construction to ensure this does not occur. It is recommended that the closest pole near the petrified stump be placed the maximum distance possible.

Option 4 includes a connection to the existing Muswellbrook substation, located just North of Muswellbrook township. This route will require the replacement of existing 11kV distribution line with a new 132 kV pole configuration. The route is at sufficient distance from any known heritage items to ensure there is no impact.

E12.0 Noise Issues

The noise issues associated with the construction and operation of the Kyoto Energy Park have been assessed and documented in Appendix D and are summarised in Section 10. The primary noise assessment was completed by Wilkinson Murray Pty Ltd using the criteria adopted within the South Australian "Wind Farm Environmental Noise Guidelines" (February 2003) and NSW Industrial Noise Policy (INP). The draft Australian Standard (EV16) has also been considered in the report by Wilkinson Murray.

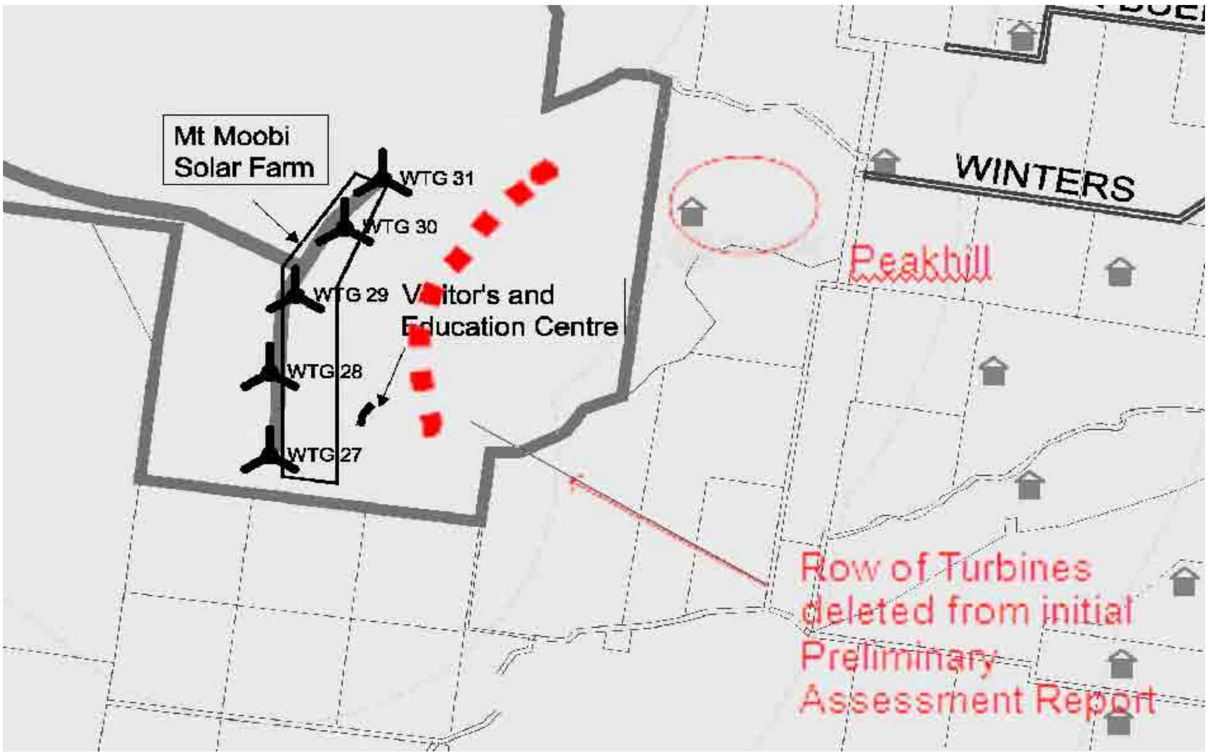
Background noise monitoring was undertaken at sensitive residential receiver locations adjacent tot the Mountain and Middlebrook Station sites on two separate occasions in April/May and in Sept/Oct 2007. Ten (10) different locations were used in the background monitoring period. Background loggers were used at the two closest residencies for both monitoring periods. The closest residence to the wind turbines on Mountain Station is the 'Peakhill' residence (this is a non-landowner residence) at approximately 1.2km away from the nearest wind turbine. The closest residence to wind turbines on Middlebrook Station is the 'Middlebrook Station' residence (this residence is owned by the landowner to the development) at approximately 0.9km away from the nearest wind turbine.

Modelling of the turbine noise was undertaken to determine the likely noise that could be experienced at residences at various distances from the Kyoto Energy Park . The assessment modelled the 'worst case scenario' choice of turbine, the Suzlon Energy A/S S88-2.1 MW, V3 turbines which have a maximum Sound Power Level (SPL) of 104.3dBA. If an alternate turbine is chosen noise levels will not be higher than an SPL of 104.3 dB(A).

Noise levels were predicted to exceed acceptable criteria at the Peakhill residence due to the operation of some of the wind turbines on Mt Moobi (being wind turbines 27,28,29,30,31). Sector management of some or all of these turbines would occur to reduce noise levels during operation under offending wind conditions. Sector Management procedures would be included in the Operational Environmental Management Plan (OEMP) for the Kyoto Energy Park.

The noise assessment concluded that the contribution of the ancillary components (mini hydro plant, Solar PV Plant and site substation) resulted in insignificant increases in noise levels at all closest receivers under adverse weather conditions. Additional shielding of the site substation towards the Clifton Hills Estate was recommended as a precaution. A 4m high grassed earth bund wall will be constructed around the north-eastern edge of the site substation.

Overall, the noise impacts associated with the project are considered to be within acceptable criteria as set out by Government.



Example of Mitigation of Noise Impacts

Van den Berg is concerned about the potential for modulation in turbulent noise levels from the blades which can occur if the wind speed across the blades at the top of the swept path is sufficiently different to the wind speed at the bottom. This is more likely to occur also at night where the atmosphere can be more stable with a steeper wind speed gradient above the ground. Modulation can be exacerbated if two turbines experience this modulation and are in phase when perceived from a particular residence.

The potential for modulation to occur on site is related to the atmospheric stability of the area which was found to fall within the neutral to slightly stable range, such that some slight degree of modulation may occur. The likelihood of modulation would be reviewed during operations to understand whether controlling of wind turbines is required to eliminate modulation under certain stable atmospheric conditions.

E13.0 Visual Assessment

E13.1 Visual Issues

The Kyoto Energy Park consists of elements that will harness wind, solar and water storage as sources of clean energy. While all of these elements and associated facilities such as buildings and a transmission line have a visual effect by far the biggest visual effect and potential impact will be created by the wind farm elements of the project.

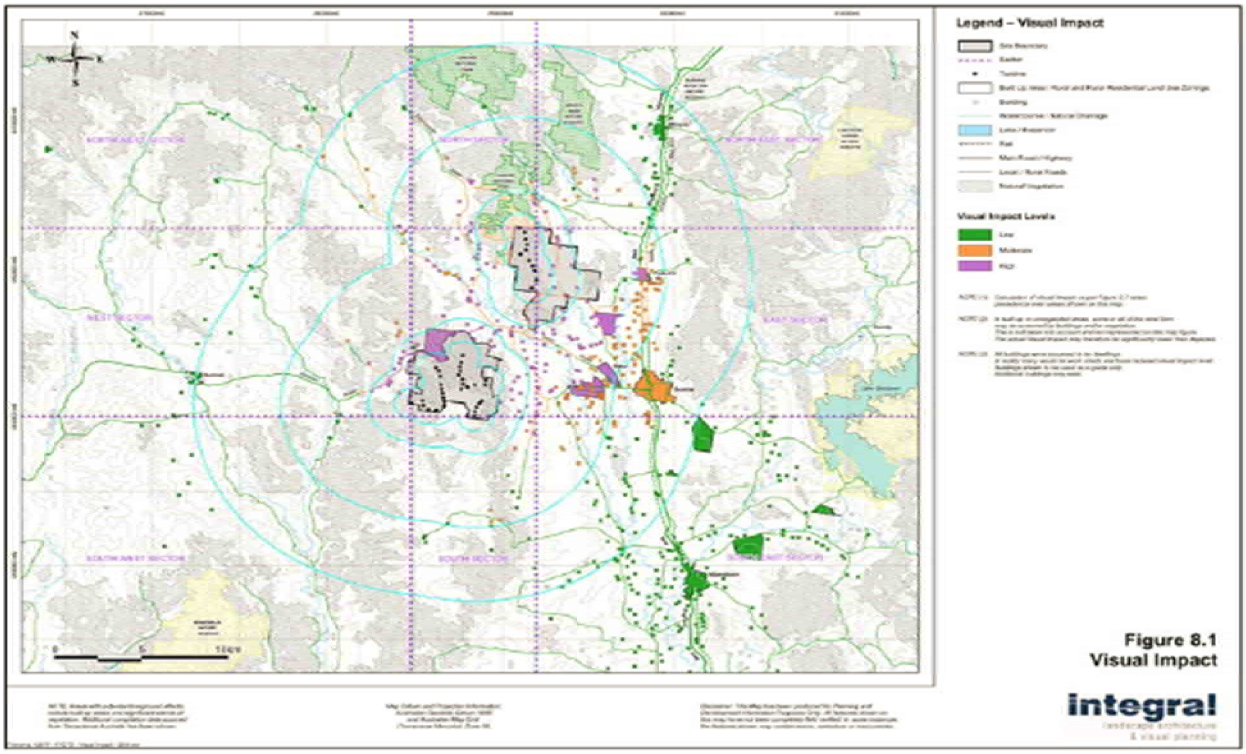
A comprehensive visual impact assessment has been undertaken by Integral Visual Planning (Appendix B) and summarised in Section 11 of this report. The Visual Impact Assessment incorporates elements of landscape character, visual effect and landscape sensitivity impact analysis, and identification of the visual catchment and photomontage preparation.

Wind turbines are large structures that are generally located in exposed and elevated positions. As such they can be visible over a large area and thereby a visual impact assessment is a key element of the wind farm assessment. The wind farm elements of the project were considered in terms of the landscape interactions created by them and the visual effects and impacts resulting on surrounding visual receptors.

In terms of visual interactions with the existing landscape, Mountain Station is more typical and common of rural landscapes within the Australian context with distinctive qualities created by major rock outcropping when viewed in certain local contexts. Middlebrook has high landscape integrity and has recognised distinctive landscape qualities, especially as they relate to Castle Rock. To reduce the visual impact the original layout was modified including the removal of one turbine closest to Castle Rock formation just west of Middlebrook Station.

The visual impacts of the wind farm elements on various view locations were the greatest on near by rural residences directly adjacent to both Middlebrook and Mountain Station. Most of the homesteads are concentrated along rural roads feeding off the main arterial connector being that of Bunnan Road from Scone. High visual impact areas are restricted to rural residential areas most notably in the Thompson’s Creek Road (directly west of Middlebrook Station), Middlebrook Road (directly east of Middlebrook Station) and Upper Dartbrook Road (directly west of Middlebrook Station). A Visual Impact Map using GIS data was developed to identify areas of high impact requiring further attention and potential treatments.

Visual impact was found to be lower for rural residencies located to the east of Mountain Station where there is a much broader valley and the scale of visual settings is much greater. Also the visual orientation of households is less likely to be towards the topographic feature that is Mountain Station, however there will be exceptions. To reduce visual impact and clutter four turbines on the original proposed layout were removed from Mt Moobi Plateau, Mountain Station. The revised or current layout comprises a total of 42 turbines on the two sites.



Kyoto Energy Park Visual Impact Map (Integral 2008)

The photomontage below suggests the view (close up and enlarged for the purpose of this report) from a typical property near Thompson's Road, north west of the Middlebrook Station site.

It is very important to understand that this image on this page does not represent the actual perceived size of the landscape and the turbines if viewed by the reader of this report. Please refer to the Visual Assessment report in the Appendix for strict viewing instructions to ensure a correct visual impact assessment of the photo-montages.

It is intended to carry out planting design workshops and in the case of the few highly impacted residences to eliminate views to the Kyoto Energy Park or to visually integrate the wind farm by providing foreground visual frames and or filters of foreground vegetation. In high visual impact areas it is intended to carry out 'compensatory landscape' works as needed to integrate or screen wind farm elements, re-orientate views and or create new visual focuses within foregrounds. Potentially high impacted areas are represented in the following map below (extracted from the Integral Visual Impact Assessment)

Wind turbines would be off-white to soft-grey in colour to improve visual integration. Onsite developments and intelligent interpretation of the various components of the Kyoto Energy Park the project as a whole within the constraints noted above has the potential to be appropriately integrated to achieve the much needed clean energy outcomes for the location.

It is understood that the visual perception of wind farms can be positive because of their visual strength and environmental values in terms of clean energy. However in this visual study, a high visual sensitivity for residences, urban and rural has been assumed. On this basis the visual impacts of the Kyoto Energy Park is mainly experienced by adjoining residents that to varying degrees are impacted by the view of wind turbines.

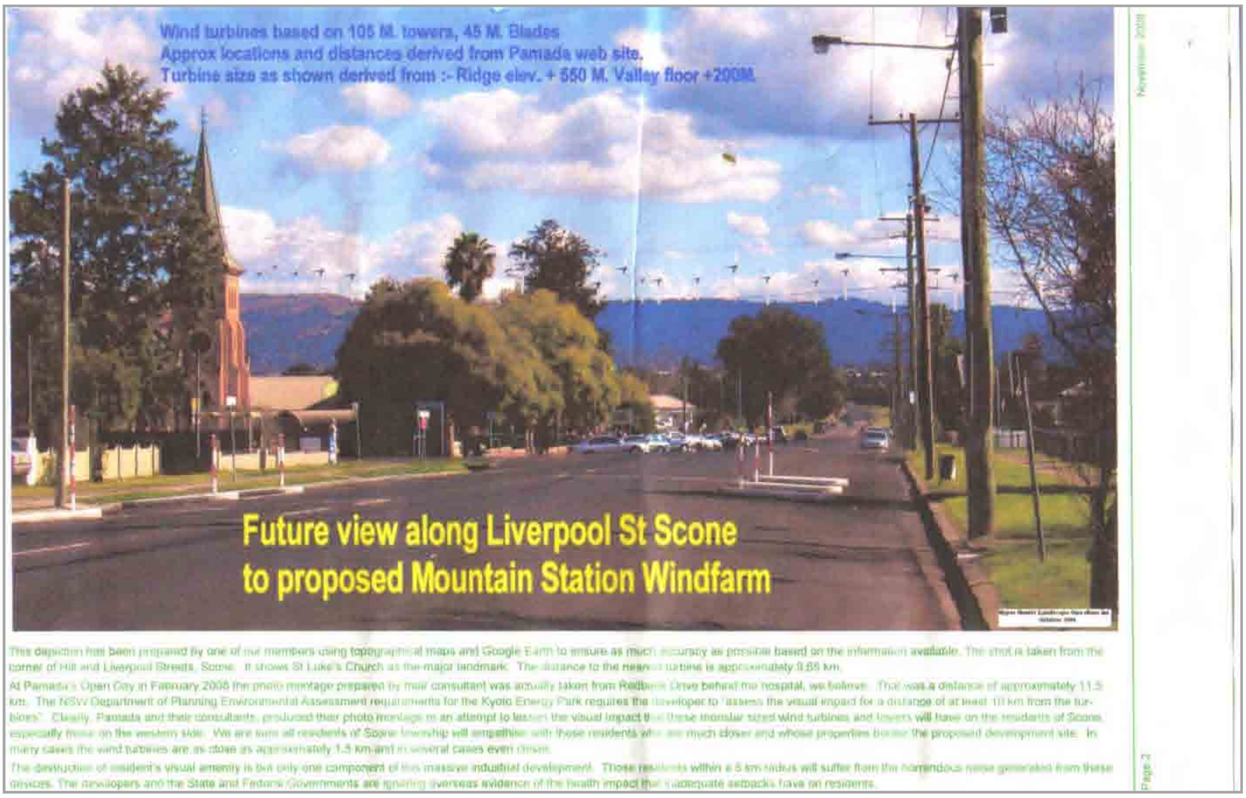
The visual impact of the other generator components and ancillary works is minor when compared to that of the wind turbines and a range of mitigation measures have been incorporated to mitigate their impact.

By mitigating the visual impacts of the wind farm components of the Kyoto Energy Park on affected local receptors, the environmental benefit of the development can be realised.

The visual impact on Scone town is generally moderate reflecting moderate visual effects and sensitivities at this distance. The impacts on the more distant towns of Aberdeen and Muswellbrook will be low.

The visual impact on the highway and railway (which dissect the town of Scone) is generally low and is likely to be a visual feature in an ever changing view as seen from these travel corridors.

It is also important to note that photomontages that have been circulating in the community have not been produced by the proponent or any team member and are a misrepresentation of the impact of the turbines on the town.



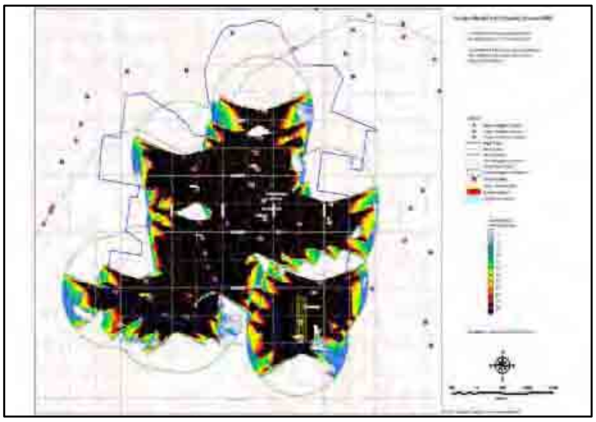
Local Resident Newsletter – November 2008

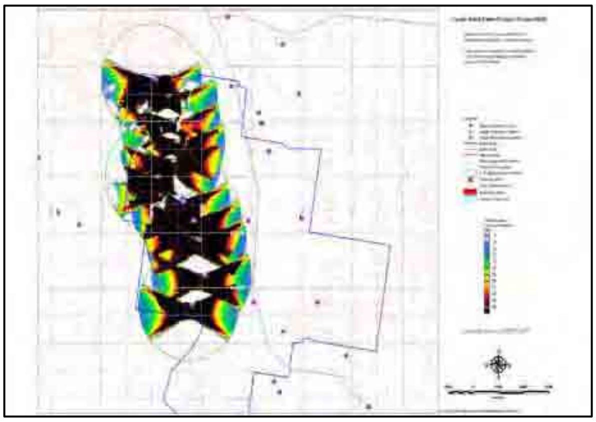
E13.2 Shadow Flicker

A full assessment of the potential for Shadow flicker occurrences was undertaken by Garrad Hassan Pty Ltd, consultants specialising in wind turbine design and modelling. Shadow Flicker from wind turbines can occur when the sun is low in the sky and moving shadows are cast by the rotating blades on an area around them. When viewed from a stationary position this can appear as a flicker.

The Shadow Flicker assessment was undertaken for both Middlebrook and Mountain Station sites (Appendix G) and summarised in Section 11 of this report. Shadow flicker calculated in this manner overestimates the number of annual hours of shadow flicker experienced at a specified location. The assessment predicts the cumulative annual hours of shadow flicker at nearby residencies with the maximum limit of 30 hours per year based on industry guidelines.

The assessment concludes that no nearby houses have modelled shadow flicker of greater than 30 hours per annum and therefore shadow flicker is not expected to be a constraint to the project.





Modelled Shadow Flicker at Mountain and Middlebrook Station's Scone

E13.3 Turbine Blade Glint

Blade glint refers to the potential for the movement of the blades to catch the light and produce a reflection or glint which may be seen from surrounding areas or passing vehicles. Blade Glint was assessed by Garrad Hassan and is attached as Appendix G and summarised in Section 11 of this report.

The paint used on modern blades and tower of the wind turbines helps to significantly reduce any occurrence of glinting and associated impacts. Blades would be finished with a matt surface treatment of low reflectivity to ensure that glint is minimised.

E14.0 Aviation Issues

The Scone local airport is located approximately 5.5 to 6.0 km from the closest proposed wind turbines on Mountain and Middlebrook Station, respectively.

The height of wind turbine structures is 150m above ground level (i.e. greater than 110 metres) and therefore the Civil Aviation Safety Authority (CASA) were contacted and supplied with details of the project including 47 wind turbines (original layout) proposed for both sites. CASA advised that some of the turbines were encroaching the Obstacle Limitations Surface (OLS) for Scone airport. Airservices Australia were also contacted and advised that some of the turbines were infringing flight procedures for the Scone airport defined as the 29RNAV, NDB and CAT C circling procedures.

The revised 42 turbine layout rectified some of these encroachments, with the exception of wind turbines 36, 37, 38, 39, 40, 41 and 42 on Middlebrook Station which are still infringing Airservices Australia flight procedures. The balance of the wind turbines on Middlebrook Station i.e. 32, 33, 34 and 35 are not infringing any of the flight procedures or OLS surfaces. The final turbine layout for Middlebrook Station will depend on discussions between Pamada and Airservices Australia after a more detailed evaluation of the traffic routes and aircraft procedures for Scone airport.

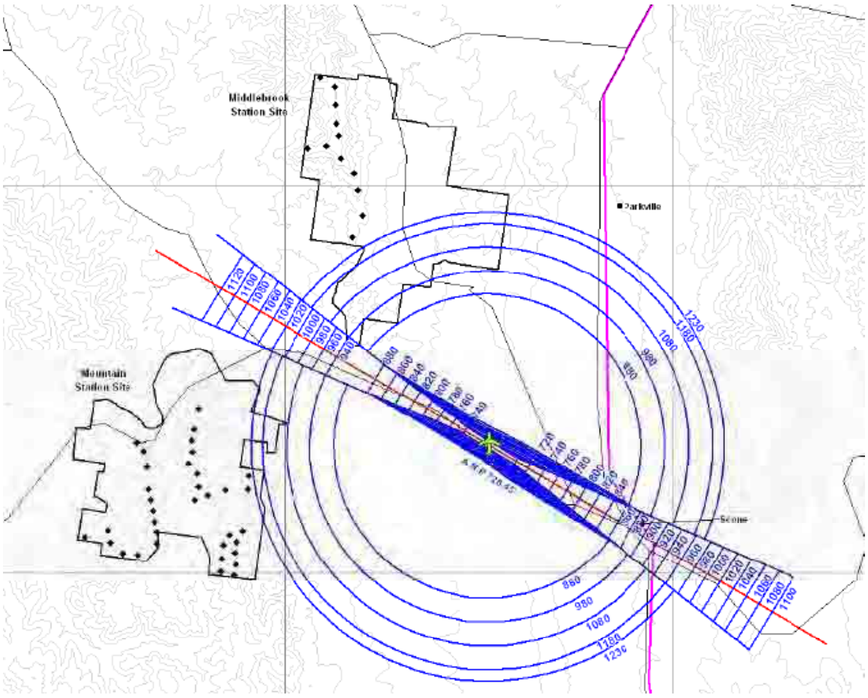
All wind turbines proposed for Mountain Station are outside the limits defined by the OLS and all flight procedures.

The Upper Hunter Shire Council (which owns and operates Scone airport) were contacted in relation to impact of the Kyoto Energy Park wind turbines on Scone airport and local operators. The Councils technical staff advised that the structures need to be located in accordance with Airservices Australia and CASA requirements.

The main commercial operators from Scone airport were also contacted and provided with details of the proposed project and structures. No obstacles were identified in discussions with commercial operators.

The Department of Defence were contacted and advised that the Kyoto Energy Park proposal was outside areas used by the closest RAAF base at Williamtown and that there were no impacts on communication or radar installations.

Final details of wind turbine locations, transmission lines and other structures and their heights will be provided to CASA, Air Services Australia, the Upper Hunter Shire Council and the Royal Australian Airforce RAAF (Williamtown RAAF base and also the RAAF Aeronautical Information Service (AIS) in Victoria) for inclusion in their ‘obstacle’ databases.



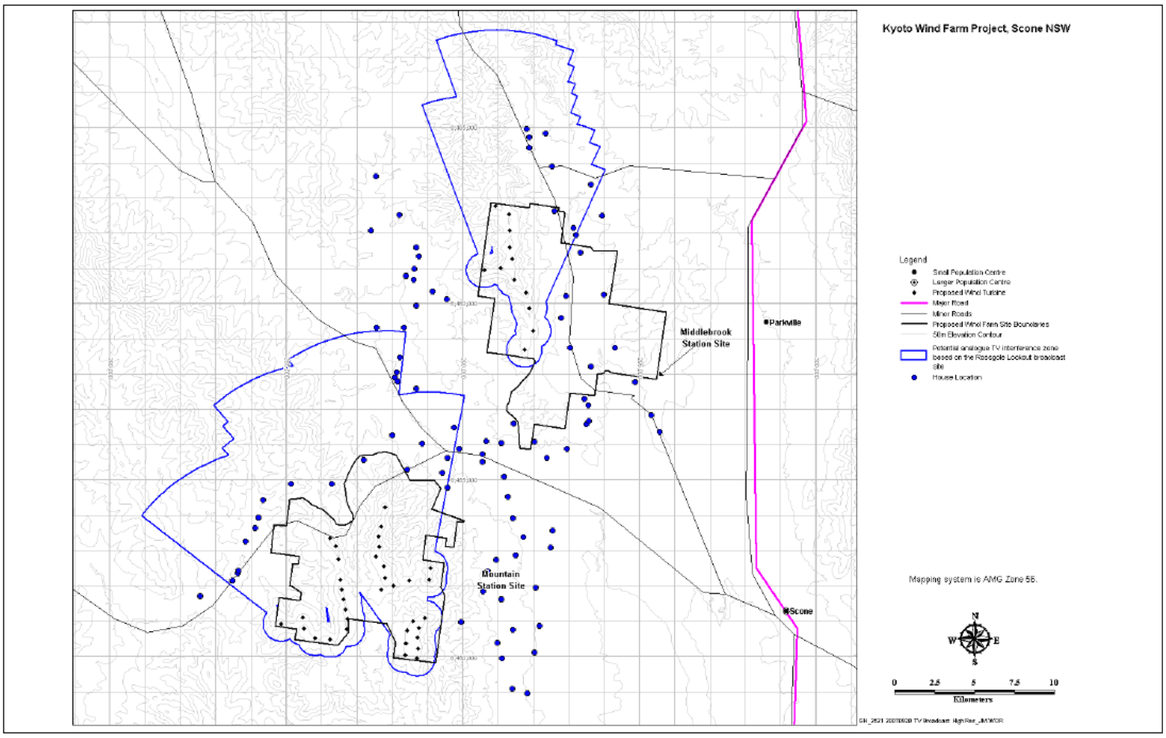
Obstacle Limitations Surface (OLS) for Scone Airport

E15.0 Electromagnetic Interference (EMI)

The potential for Electromagnetic Interference (EMI) associated with the operation of the Kyoto Energy Park has been assessed by Garrad Hassan (Appendix F) and is documented in Section 13. Computer modelling and consultation with telecommunications companies within a 50km radius have not raised any concerns regarding potential interference. The potential for the project to interfere with microwave signals, defence and aircraft navigation signals, radio communications and mobile telephones is unlikely.

As part of the wider community consultation process, essential and emergency service organisations will be contacted, to minimise risks of conflict of the development with radio communications.

The nearest television broadcast tower is at the Rossgale Lookout approximately 8.5 km to the south of Mountain Station. An assessment of the potential for interference of television signals has indicated that some residences to the north of the two sites may be affected and these areas have been identified on a map (shown below). TV interference from turbines once observed can be easily rectified. Various options involving modifications to receiving equipment are available to address potential problems which may be encountered and it is proposed that Pamada will assess any cases of television interference and rectify the problems shown to be associated during operation of the Energy Park.



Potential TV Interference zones identified from the Rossgale Lookout

E16.0 Coal and Gas Resource Sterilization

Mountain Station was identified as having no foreseeable coal resource exploration potential based on high depth of coal seams, likely intrusions and limitations from the overlying topography. The site does contain coal seams which may include gas extraction potential in the future.

Middlebrook Station was identified as having black coal reserves that potentially could be considered for long term reserves, however resource extraction in the next 15 years is unlikely based on the geological complexity of the strata in the area. The Middlebrook site has low potential for gas exploration.

While both sites are in areas defined as having reserves of black coal, extraction potential would be low due to deep and complex reserves. Other constraints to extraction of coal resources under the two sites would include overlying topography, high cost of extraction, social and environmental considerations such as noise, dust, traffic, groundwater impacts and mine subsidence with development of this resource in close proximity to the Scone township.

There are currently no mineral leases or mineral claims applied to the sites or in the proposed area.

Three (3) exploration license holders were identified over the two sites. Current license holders were contacted and confirmed that they had no objection to the Kyoto Energy Park proposal in relation to impacts on the licenses.

There is currently a gravel quarry operation leasing two land portions at Middlebrook Station. The operation is a dry screening operation on an alluvial clayey gravel deposit located west of the main ridgeline. The quarry operations will remain unaffected by the proposal. Road base to be used in the upgrading of access tracks could potentially be sourced from this quarry. There are no identifiable gravel resources present within the Mountain Station site.

The design of generator foundations to consider future mine subsidence measures would not be warranted considering the limitations to the resource under the sites, depths and complexity of strata, timeframes for future extraction should it be considered and economically feasibility of designing foundations for unforeseeable events.

E17.0 Hydrology and Groundwater

The project will require water during the construction stage for activities such as dust control, concrete batching, amenities, washing and cleaning. Depending on weather conditions during construction it may be necessary to import water for the purpose of controlling dust on access tracks or at sites where earthworks are being undertaken and for stabilisation and/or re-establishing vegetation at disturbed areas. Once operational the project will require only a small amount of water and may be able to obtain much of the requirement from roof drainage on site. The mini hydro plant is a closed loop system that requires minimal recharge of water during operations. Any additional water for the system will be sourced from water trucked into site.

An assessment of the potential effects of the proposal on surface water hydrology and groundwater is discussed in Section 15 of this report. The Kyoto Energy Park site is located in an area on ridgelines and exposed hilltops, meaning that it is distant from permanent water courses or ephemeral creeks. The ridgelines are dissected by various second and third order drainage lines.

Groundwater aquifer systems are located along main creeks on the river flats at considerable distance from the proposed structures and works areas. The construction and operations will not impact upon any groundwater systems of resources. No groundwater dependent ecosystems were detected on site. Water for dust control will be sourced from existing dams located on Middlebrook Station or will be trucked to site.

The erosion and sedimentation controls will be adopted during construction periods to protect soils and existing natural drainage of the site. All chemicals and petroleum products used during the construction stages will be properly managed to prevent contamination of soils. A Spillage Control Plan will be implemented during construction and operations to manage chemical spills and reduce risk of occurrences. A Sedimentation and Erosion Control Plan will also be prepared as part of the Environmental Management Plan to prevent soil loss and contamination of natural drainage lines.

E18.0 Geology

The Kyoto Energy Park proposal is situated on two main landholdings known as Mountain and Middlebrook Stations, west of Scone. The sites comprise the Carboniferous and Devonian sediments which include coal bearing Singleton measures, shale and sandstone formations and overlying tertiary deposits of basalt intrusions on much of the higher ground on both sites.

A site inspection and desktop geological analysis was undertaken by HDB which suggest that site conditions are suitable to support large wind turbine structures. Turbine footings would be either gravity or reinforced concrete anchored into bedrock. Final design parameters for foundations would be subject to a detailed geotechnical investigation.

Coal Mine operating just outside Muswellbrook in the Upper Hunter

E18.1 Soils

The differing soil types that occur on site range in erosion potential from low, to very high. The project OEMP will include a Sedimentation and Erosion Control sub management plan that has appropriate erosion and sediment controls for site works. With effective management it is anticipated that the project can be implemented without exacerbating existing areas of erosion. A range of Erosion and Sedimentation measures will be implemented in the CEMP and OEMP.

E19.0 Traffic and Transport Issues

The Traffic and Transport Issues related to the construction and operation of the Kyoto Energy Park have been assessed and documented in Appendix J and are summarised in Section 17. The construction stage of the project involves the transportation of a considerable quantity of components and materials to site, including large wind turbine components, heavy plant and erection equipment, mobile concrete batching plant, building and construction materials, and prefabricated components.

Unloading a Wind Turbine Generator at Port

Road transport is considered the preferred method for transport. Some of the technological components would be sourced from overseas and trucked from port to the site. Construction activities will include use of oversize and overmass vehicles that will require special permits and approval from the RTA prior to transportation of these components.

The preferred port of entry is the Newcastle Port which has the capacity for large heavy components, is logistically feasible and is the most suitable and safe point of access. Experienced haulage contractors associated with the Hunter mines were consulted during investigation into transport. Existing heavy vehicle haulage routes were identified from Newcastle to the Kyoto Energy Park site for transportation of large wind turbine components similar to size of components used in the local coal mines. Final routes for transportation of components would need to be approved by the RTA.

Approximately 8,500 one way truck movements and some 4,800 one way car movements will be involved in the construction stage. Construction vehicle movements will be spread over about 20 months but it is anticipated that some minor disruption to local traffic may occur at times. A Traffic Management Plan (TMP) will be developed and implemented during the construction stage of the project. Some minor road works identified in Traffic and Transport Assessment may require a consent under Section 138 of the Roads Act (1993) from the Upper Hunter Shire Council prior to use.

Once on-site, the existing access tracks will be used wherever possible and these will require minor works to upgrade them. Some new sections of access tracks will be required to access individual turbines, site substation, Visitor's and Education Centre and other facilities buildings. These will be designed in accordance with the erosion and sedimentation requirements for the project and will, as far as possible, avoid the clearing of trees.

E20.0 Bushfire Risk

Both sites are contained within land defined as bush fire prone land under the Planning for Bushfire Protection 2006. A Bushfire Protection Assessment was completed by Conacher Travers Pty Ltd for all site components and facilities (Appendix C) and summarised in Section 18 of this report. The report looks at the potential for bushfire risk on buildings within the site in relation to surrounding topography, slope and vegetation. The Managers residence and Visitors and Education Centre have a medium level of bushfire risk and appropriate design management controls have been adopted to these facilities.

The potential for fire ignition from construction and operational activities has also been assessed as is considered a low risk. Wind turbine generators proposed would comply with Australian design safety standards and have a high level fault protection systems built in to each generator. Wind turbine generators (nacelles) are fully enclosed and regularly maintained. Nacelle generators can automatically shut down during extreme conditions and are designed to full level of lightning protection. Construction and operational bushfire risk would be effectively managed through a Bushfire Risk Management Plan developed in consultation with the Scone Rural Fire Service (RFS) and include emergency procedures.

E21.0 Transmission line connection to the Grid

Two preferred options for electrical connection of the Energy Park to the grid include a:

1. 66kV connection to the new Scone substation and;
2. 132kV connection to the existing Dartbrook Mine or Muswellbrook substation.

The final generation capacity of the Kyoto Energy Park will be in the order of 90 to 140MW based mainly on final wind turbine selection (2-3MW), and solar PV capacity (3-10MW). The final connection option would be selected at final design stage of the project subject to final capacity.

Photographs showing existing timber poles (left) and proposed replacement concrete poles (right) (Energy Australia 2007)

Environmental considerations have been made based on a ‘highest impact scenario’, to allow for environmental factors to be considered in design. No significant environmental constraints were identified with the preferred connection options. The two preferred options involve variations to bypass town subdivisions and the central township in general. The line routes predominantly follow road reserves, existing transmission easements and along existing lines but also allow for more direct routes through private and public land reserves (private easements). No discussion with private landholders has been undertaken in this assessment. Final line route selection will include discussions with potential private landholders to utilise easements as identified in this report.

Environmental mitigation measures will be formulated in a Construction Management Plan which will include environmental management and mitigation procedures for electrical and line construction works.

E22.0 Safety and Environmental Risk

A review of potential safety issues associated with the construction and operation of the Kyoto Energy Park is documented in Section 20 of this report.

Health and safety management would be a significant factor during construction and operation of the Kyoto Energy Park. Construction risks were identified as the most potentially hazardous mainly during unloading, transportation, and erection of wind turbine components. This is mainly due to the size and weight of the wind turbine components, and the heights required for erection. Specialist contractors would be engaged to undertake these works during the construction phase. Controls would be incorporated in the Construction and Operational Environmental Management Plans for the Kyoto Energy Park to ensure safe conduct of the activities arising from the project.

Crane crews putting together a Turbine Rotor Assembly

Activities associated with the operations stage of the project are by comparison less risky. Wind turbines have a very low incidence of blade failures and are unlikely to present a safety risk. These stringent regulation and compliance requirements are designed to ensure the safety of site staff and the community.

E22.1 Residual Environmental Risk

The few identified residual risks relate to seven (7) turbines on Middlebrook Station encroaching into airspace, bird strike (mainly from two predator birds) and bushfire risk. The first involves possible reconsideration of turbine locations and would be undertaken in accordance with the Civil Aviation Authority (CASA). The second involves detailed monitoring, management and initiation of preventative management systems. Thirdly new wind turbine generators have a high level of quality and safety standards and electrical fault protection to prevent ignition issues. Newer turbine models are independently monitored and controlled and can shut down if operating temperatures or conditions pose a risk to systems. Turbines are fully earthed to prevent risk and damage to electrical systems from lightning strikes. The potential to generate bushfires is considered low. As the analysis indicates, the mitigation / control techniques available, have the effect of reducing the potential hazards and risks, to a very few aspects of the proposal which will require further investigation.

E22.2 Statement of Commitments

The detailed Statement of Commitments for the Kyoto Energy Park is provided in Section 20 of this Environmental Assessment report. The Statement of Commitments is a product of the analysis of the personal safety and environmental risks that were identified in the project assessment. The identified mitigation measures include some further discussion and negotiation in relation to the aviation, the final route for the grid connection and some minor other issues. All commitments will be rigorously and faithfully followed up, reposted on and closed out in the appropriate time.

E23.0 Cumulative Impact

The wind turbines will be visible over a wide area. Close views of the wind farm will emphasise the size of the structures, but the more distant view points will have a reduced visual impact. At distance, the wind farm may be visible but will not dominate the broader landscape.

Mitigation measures incorporated for the construction and operation will ensure that the wind farm will not exceed acceptable noise limits, disrupt local traffic, cause further erosion and siltation, increase air pollutants or Green House Gases, degrade the ecology of the region, result in long term property devaluation, or cause surface or ground water pollution. In terms of power generation, wind farms are regarded as one of the most benign generation types.

E24.0 Summary and Alternatives Considered

All energy generation in Australia is covered with some form of Government support, that underlines the principal that us, as citizens do not chose to pay the true total cost of generation of electricity through our tariff pricing. Coal-fired power stations and the largest electricity users are some of the largest supported through pricing and support mechanisms, and indeed in the Federal Government White Paper policy launch on 15 th December 2008, provided major concessions to aluminium and intensive energy industries such as coal fired power stations. Thus, as with other energy generation enterprises, renewable energy production is currently supported by a number of government schemes to foster the development of renewable energy projects and reduce Australia's greenhouse gas emissions.

The Federal Government's Mandated Renewable Energy Target (MRET) aims to achieve 9,500 GWh of new renewable energy by 2010. The Federal Minister for the Environment has recently announced that the National MRET's target would increase from 9,500 GWh to 45,000 GWh by 2020 It is anticipated that this increase will be legislated in 2009.

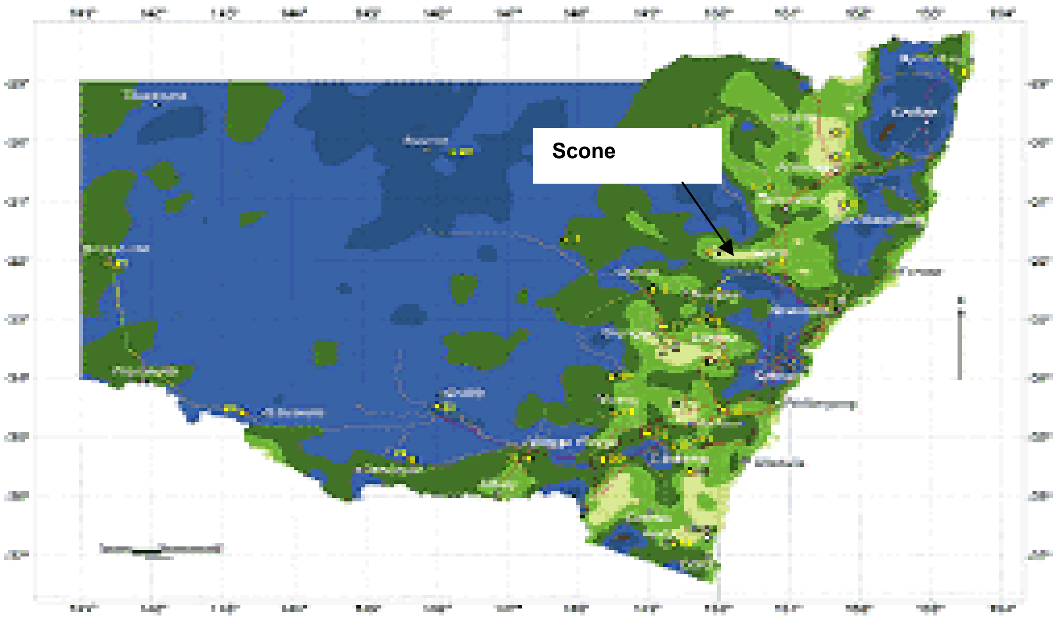
The alternative to renewable energy, is more coal-fired power stations. Whilst nuclear may be suggested as an alternative to coal, the pragmatic reality is that should there be a decision today to generate electricity from nuclear technology it will be 15-20 years for the necessary technological, political, safety, environmental and physical hurdles before a working nuclear power plant could be met.

The application for Planning Approval under Part 3A of the NSW Environment Planning and Assessment Act for the Kyoto Energy Park in Scone should be supported.

The Kyoto Energy Park site (Mountain Station) was selected by the former NSW Sustainable Energy Development Authority (SEDA) in 1998 as a viable wind energy resource, based on wind monitoring undertaken on site by the CSIRO since 2000. From these wind monitoring results the NSW Wind Atlas was produced which identifies the site and Scone in general as a viable wind energy resource. Scone is a good site due to the hills and ridges of the Great Dividing Range interacting with the calmer background winds that blow from west to east across the vast NSW inland.

- **The assessed impacts of the project are well documented and in the circumstances acceptable.**
- **The benefits of the project to the community, local and further a-field are significant.**
- **The perceived adverse impacts, particularly of visual impact and loss of property values are not significant nor sufficient to justify non-approval.**

The Minister for Planning, as Consent Authority is urged to consider this report, as part of the Project Application and grant Planning Approval to the Kyoto Energy Park, and support, not just the Hunter's energy industry, but the creation of electricity from green, clean and renewable sources.



NSW Wind Energy Atlas showing wind speed gradients

a last word from the farmer….

…..He recalls his forebears, of the nineteenth and twentieth centuries that used the Southern Cross Windmill to move water for the stock, and now can see the reality for the twenty-first century farmer who can use the modern windmill and modern mirror to feed the community around his home with clean renewable energy ….

And today, he fears not just the climate, the soils, the water of his chosen place, but also global markets, harsh economic times all that impede his ability to efficiently carry out the trade, the landuse for which he and his forebears have toiled and the culture they have created…the traditions of the Aussie bush life

And, not only does climate change impact on his soils, the air, the water, but too the flora and fauna that has coexisted for hundreds of years. Now another species itself is being endangered, that creature …. that of the farmer himself, unless he can innovate and find new means to sustain ably harvest his patch.

Repeating the Main Points

The Kyoto Energy Park is a genuine attempt to bring to the world, Australia, the Hunter and all its people, a path towards a clean and sustainable future.

The Kyoto Energy Park seeks to create electricity, fed into the national grid, using the completely renewable and non-impacting natural resources of wind, solar energy and gravity. By integrating the numerous technologies, the project seeks to optimise the specific characteristics of the location and make for a genuinely sustainable enterprise.

The key elements of the park are:

- **3-10MW Solar Photo Voltaic Array;**
- **42 Wind Turbines;**
- **1 MW Closed-Loop Hydro Plant; and**
- **Visitor and Education Centre**

The main benefits are:

- The natural wind and solar resources are strong and combined with elevational change, the natural attributes of the site are excellent for an integrated Energy Park;
- Demand for electricity is close by and will make the use of the electricity generated from the Kyoto Energy Park highly efficient, producing enough **green power** for approximately **62 000 households**;
- The creation of the Kyoto Energy Park provides short term and long term **employment** and creates a **new tourism** destination for the Upper Hunter;
- The **Moobi Foundation**, an initiative of the Kyoto Energy Park shall **invest into the community** of the Upper Hunter through a Not-For-Profit structure (using community leaders);
- The Kyoto Energy Park is proposed to create clean and renewable electricity and create a transition to **less reliance on the burning of coal** as the main form of creation of electricity; and
- Creation of an enterprise that may continue without the time constraint of the resource that is harvested (such as coal) running out…. Wind and sun shall continue

The main impacts are:

- The placing onto the landscape of the 42 wind turbines, creating for some, an unacceptable visual intrusion and with others a positive visual beacon of commitment to making and keeping the Upper Hunter a clean green place, without coal mines and the ecological destruction that coal mining brings;
- The overall footprint (i.e. developable area) utilized by the Kyoto Energy Park components and facilities is in the order of 0.5 % of the sites' area. Overall damage and disturbance of the landform is extremely minimal. Upon completion of the life of the generator components (solar, wind, hydro) new technology can be easily installed to replace outdated technology or fully decommissioned, without any land degradation;
- The opportunity to **remove the equivalent of 90 000 cars** off the roads in terms of greenhouse gas abatement (which includes approximately **9.5 million tonnes of CO_2 gases** over the initial life of the proposed technology);
- The opportunity to create electricity with negligible use of water, leaving the water in the landscape not loosing it in the cooling towers of a coal powered power station - the **saving** of approximately **700 million litres of potable water annually** – or the equivalent of about **12 Olympic pools daily!**;
- Clean and renewable energy production free from other air pollutants such as coal dust, heavy metal compounds, carbon monoxide, sulfur and nitrogen oxides;
- Large scale significant **investment into rural Australia**;
- **Short and Long term jobs, reinforcing the Hunter as a region of high skills in the generation of Electricity**

The main matters consistently raised by the community relate to:

- **Intrusion into their visual reference and the potential loss of property values;**
- **Support for the concept of renewable energy, but not in the Hunter;**
- **Bird strike and Bushfire risk; and**
- **Noise Concerns.**

Kyoto Energy Park Scone is wholly an Australian Enterprise. The Management is 100% Australian.

The funding of this proposal and report is 100% Australian.

An Australian Project

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Kyoto energypark

1. Introduction

1.0 INTRODUCTION

Pamada Pty Ltd (the proponent) and HDB Town Planning and Design have prepared this Environmental Assessment for the proposed Kyoto Energy Park Scone facility and ancillary works for consideration pursuant to the provisions of Part 3A of the Environmental Planning and Assessment Act 1979 (as amended). Under NSW Planning legislation, an Environmental Assessment Report is required to support a Development Application for the project. Specific requirements for the scope and content of the Environmental Assessment have been prescribed by the Director-General of the Department of Planning.

The Director-General's requirements (see Table 1.1) also includes reference to relevant guidelines for the preparation of an Environmental Assessment. This Report addresses the Director-General's Requirements and provides:

- a description of the existing environment;
- a description of the proposed project;
- an assessment of its potential environmental impacts and the measures to mitigate those impacts;
- justification for the project;
- and the consultation undertaken or proposed to be undertaken for the project.

1.1 Background

The NSW Sustainable Energy and Development Authority (SEDA), identified the site in 1995 as one of eleven sites in NSW highly suitable for the generation of electricity from wind (SEDA is now part of the NSW Department of Energy Utilities and Sustainability DEUS). A Wind Monitoring Tower was installed on the southern site (Mountain Station) in 1999 and has been logging wind conditions for over 9 years, confirming the locations suitability for wind generation.

In 2004 EHN (Oceania) Pty Ltd initially commenced discussions with the landowner to seek approval for a 'wind farm' on the Mountain Station site. No formal agreements were reached with the landowner and discussions fell through. Pamada Pty Ltd were approached by the landowner to initiate planning feasibilities and investigations into the potential power yields for the site.

In 2005, the Upper Hunter Shire Council, with support from the NSW Department of Planning, amended the Scone Local Environmental Plan (Amendment No. 64 Scone LEP 1986) to allow consideration of eco-generating devices in the LGA and on the subject sites. Also in 2005, the Upper Hunter Shire Council approved the proposal to install an additional Wind Monitoring tower on the Mountain Station site. A second wind mast was installed on Mountain Station in October 2006 and has been recording data since November 2006.

Pamada Pty Ltd submitted a project application to the Department of Planning in December 2006 for works comprising the Kyoto Energy Park at Scone. The original application was accompanied by a Preliminary Assessment Report (dated 5 December 2006). The report essentially described a Renewable Energy Park Facility with solar, wind and hydro generating technologies.

The original application was amended based on a legal planning technicality and resubmitted to the Department in February 2007 accompanied by an amended Preliminary Assessment Report (Amendment C-dated 13 February 2007). The amended project application comprising the current application describes works as follows:

- Construction and Operation of wind turbines and associated infrastructure (including transmission lines, substation and grid connection) comprising of up to 47 turbines ranging from 2MW-4.5MW on two properties Middlebrook and Mountain Stations, Scone;
- A proposed solar thermal device (panels/array) of approximately 1 square kilometre;
- A small closed loop hydro-electric plant;
- Managers residence; and
- Construction and operation of a Visitor and Education Centre and associated facilities

The Preliminary Assessment Report identified solar thermal devices under consideration. This included a variety of solar technologies such as solar - parabolic trough, solar dish and solar central receiver

(Power Towers). In a letter submitted to the DoP (dated 14 August 2007) Pamada advised that following further investigation, solar thermal options were not considered as a feasible option for the site based on environmental requirements, plant size and current technological deficiencies for small to medium sized applications (currently for solar thermal plants with < 30MW total capacity). Solar photovoltaic technology was identified as suitable for the site based on site conditions, to supply peak demand and balance electrical output from the Park.

Scone has a population of 5,080 people and falls within the Upper Hunter Shire Council (UHSC), which was formed in 2004 from the amalgamation of the Councils of Scone, Merriwa and Murrurundi. Over the past ten years the rate of development of the coal industry has seen an increase in the number of mines, an increase in the size of the mines, the re-opening of mines that were previously closed, and mines that were underground now proposing to be open-cut. The region has changed dramatically as a result, and the Upper Hunter landscape now shows the social, economic and physical impacts (positive and negative) of the increase in coal mining activity in the area.

1.2 Overview of the Proposal

The proposed Kyoto Energy Park will be located on two separate properties referred to as Mountain Station and Middlebrook Station situated west of the Scone town.

The proposed Kyoto Energy Park will produce electricity from completely renewable generator technologies for supply to the electricity grid and eventual use by network customers. The Kyoto Energy Park will be able to produce approximately 137 mega watts (MW) of electrical energy from the combined output of wind turbine generators, a solar photovoltaic plant and a closed loop mini-hydro plant. A general description of the proposed facilities is listed below:

- Installation of wind turbine generators at specific points along the dominant ridgelines situated at Mountain Station (31 turbines) and Middlebrook Station (11 turbines), for a total of 42 wind turbine generators. Wind turbines would be a maximum height of 105m to the nacelle (i.e. hub height) plus blade length equating to a maximum height above ground level of 150m (i.e. from ground level to the tip of the blade);
- A solar photovoltaic (PV) plant generating electricity using solar cells on a commercial scale;
- A Closed-loop mini hydro electric plant utilising steep slopes for electricity generation during peak demand periods or for balancing intermittent power output;
- Electrical connections between wind turbines using underground cables;
- A site substation and adjacent control room complex for management and control of electricity generation on site;
- A managers residence for accommodation of Park Manager;
- A Maintenance Shed for on-site storage and maintenance of mainly wind turbine parts.
- A Visitor’s and Education Centre to be used on a part time basis for public display, educational, conference and tourist facilities;
- Access roads to generator sites, and minor upgrades to site access at Mountain Station

A full description of the proposed development is provided in this report along with a description of all Construction, Operation and Decommissioning activities including anticipated timelines for each development phase.

A variety of wind turbine models have been considered as discussed in detail. The specific wind turbine selection would be carried out through a competitive tender process after development approval has been received.

The solar PV plant will be composed of photo-voltaic solar modules, supporting structures or frames, low voltage reticulation system, metering cubicles and safety protection systems. Options for solar frame design have been included in this report.

Where possible, the analysis contained within this Environmental Assessment is based on the highest impact caused by any of the wind, solar and hydro layouts. The proponent expects that the final built form shall be smaller in overall design and impact than what is assessed in this report. The detailed investigations of each layout is contained in the specialist reports attached in the Appendices (see Volume 2).

The project description is based on the current renewable technology for wind, solar and mini hydro applications. In particular, any site layouts are based on the current proposal which may change to a minor degree due to unexpected issues arising in relation to ongoing biodiversity assessment; archaeological assessment; geology; wind regime; wind turbine availability; and transmission connection design issues.

The total anticipated lifecycle of the generator equipment proposed for the Kyoto Energy Park is approximately 25-30 years. This includes a design life of 25-30 years for main wind turbine components and 25 years for solar photovoltaic modules (all of which can be replaced). The components of the Mini hydro plant are modular and fully replaceable once they have achieved their service life.

At the end of the project life of generator components options exist to replace old components with updated technology or fully decommission the Park, associated electrical infrastructure, site substation and facilities, and removed from site. Most of the components are recyclable or fully reusable.

1.3 Objectives of the Environmental Assessment

This Environmental Assessment has been prepared following consideration of the following key project factors:

- Planning framework which considers Commonwealth, State and local statutory planning considerations, renewable energy targets and mechanisms, policies and guidelines for project development and control;
- Specific requirements provided by the Director-General (DG requirements) of the DOP and consultation with key government departments, the Upper Hunter Shire Council and general requirements from other regulatory stakeholders;
- Consultation with key Community groups, local residents and local business organisations, including feedback from the Community Information Day.
- Studies undertaken by independent consultants and feedback from this work.

Specialist environmental consultants were engaged from an early stage of the project to undertake investigation into technical, environmental and social aspects of the project. Final reports have been prepared by individual consultants and included in the Appendices to this report.

The main body of this document summarises key outcomes and findings of these specialist assessments with the aim of clearly stating the potential impacts and any recommendations. The purpose of this report is to satisfy the accepted criteria for an Environmental Assessment that it be clearly understood by the general public while providing supporting studies for those that require more detail.

Specific key environmental issues are addressed in the relevant sections of this assessment as outlined below in Table 1.0

Table 1.0 – Description of report sections

Section	Description	Objective
Section 1.0	**Introduction**	Provides a general project introduction, background and overview of key project parameters for assessment.
Section 2.0	**Project Description**	Describes the main generator technologies, components and ancillary facilities.
Section 3.0	**Project Development Phases**	Outlines the stages of the project from anticipated approval though to construction, operation and decommissioning including likely timeframes for each phase.
Section 4.0	**Statutory Planning and Consultation**	Outlines the statutory planning context including local, regional, state and commonwealth planning and consultation with government stakeholders.
Section 5.0	**Community Participation**	Discusses the project community strategy and outcomes. Local community and stakeholders were engaged at an early stage of the project to encourage participation and feedback.
Section 6.0	**Strategic Justification**	Analyses the demand for electricity and particularly renewable energy technology including justification of the project based on supply and demand factors, socio-economic and environmental benefits and constraints.
Section 7.0	**Existing Environment**	Describes the existing local environment and surrounding landuse and development in the region and locality.
Section 8.0	**Biodiversity, Flora and Fauna**	Summarises key project outcomes of the Ecological Site Assessment, EPBC referral and Bird and Bat Assessment.
Section 9.0	**Heritage**	Summarises impacts of proposed project on Indigenous and European heritage in the area.
Section 10.0	**Noise Impact**	Summarises key project outcomes and noise issues associated with operations and construction activities.
Section 11.0	**Visual Impact**	Summarises visual impacts analysis and treatments to reduce visual effect particularly from wind turbine structures.
Section 12.0	**Aviation Issues**	Summarises aviation issues with the local Scone airport and other commercial and local operators in the vicinity of the project.
Section 13.0	**Electromagnetic Interference (EMI)**	EMI relates to potential interference with telecommunications signals from operating wind turbines within a 50km radius of the sites.

Section	Description	Objective
Section 14.0	**Mineral Resource Sterilisation**	Summarises existing coal and gas resources in the area and underlying the two properties, mineral licenses and potential for sterilisation of these mineral resources for future mining potential.
Section 15.0	**Hydrology**	Summarises any impacts on natural surface drainage (i.e. streams, creeks) and groundwater systems (i.e. aquifers) from the proposed project.
Section 16.0	**Geology and Soils**	Classifies the underlying geological formations and soil derivatives on the two sites and outlines sedimentation and erosion controls measures to be implemented.
Section 17.0	**Transportation of Energy Park Components**	Summarises transportation and traffic logistics, traffic safety and haulage routes from port of entry to the site.
Section 18.0	**Bushfire Risk**	Summarises the potential risk for bushfire ignition from generator components and design considerations for protection from bushfire hazard.
Section 19.0	**Assessment of Transmission Line Connection to the Grid**	Quantifies issues associated with electrical connection of the Kyoto Energy Park to the local electricity grid network, corresponding environmental and community issues and possible options for line routes based on final design considerations.
Section 20.0	**Safety and Risk**	Identifies specific hazards and safety aspects of the project and assesses these risks for possible mitigation and ongoing management.
Section 21.0	**Summary and Justification**	This section summarises the key project attributes and possible alternatives to the proposal including a ‘do nothing’ approach.
Section 22.0	**References**	Summary of References used in the assessment.

1.4 Key Planning Requirements

1.4.1 Director General's Requirements

The following table (Table 1.1), outlines the Director Generals Requirements for the Environmental Assessment. These requirements have been addressed in this document. The right-hand column indicates the section/s of this document where responses to the Director General's Requirements are contained within this report.

Table 1.1 – Director General's Environmental Assessment Requirements

Requirement	Description of requirement	Relevant Section in Environmental Assessment
General Requirements	• The Environmental Assessment must be prepared to a high technical and scientific standard and must include:	Noted
	• an executive summary and glossary;	Executive Summary
	• a description of the proposal, including construction, operation and	1.2, 2.0
	• a timeline which clearly identifies the proposed commencement of construction and operation of the project components,	3.4, 3.5
	• their envisaged lifespan and arrangements for decommissioning and staging;	3.3
	• Assessment against the Department's draft *NSW Wind Energy Draft Environmental Impact Assessment Guidelines 2002*;	Included throughout report.
	• An assessment of the environmental impacts of the project, with particular focus on the key assessment requirements specified below;	Included throughout report.
	• Justification of undertaking the project with consideration of the benefits and impacts of the proposal;	6.0 - Strategic Justification 21.0 - Summary and Justification
	• A draft Statement of Commitments detailing measures for environmental mitigation, management and monitoring for the project; and	20.6.3
	• Certification by the author of the Environmental Assessment that the information contained in the Assessment is neither false or misleading.	Preliminaries
Key Assessment Requirements	The Environmental Assessment must include assessment of the following key issues:	
Strategic Justification	• **Strategic Justification (all project components)** – the Environmental Assessment 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.	6.0 - Strategic Justification 19.2.3
	• It must also 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.	6.4
	• The Environmental Assessment must include strategic planning consideration of the project and an analysis of the suitability of the proposed site with respect to potential land use conflicts particularly subdivision potential with existing and future	6.7, 19.4.9

Requirement	Description of requirement	Relevant Section in Environmental Assessment
	surrounding land uses.	
	• With regards to the transmission line, the Environmental Assessment must clearly identify the proposed route	19.8 Figure 19.2
	• and clearly describe the ownership, land use and zoning provisions for the land along the route.	19.4.9 Figure 19.9,19.10
Noise Impacts	• **Noise Impacts (all project components)** – the Environmental Assessment must include a comprehensive assessment of the predicted noise impacts resulting from the construction and operation of the proposal.	Appendix D 10.3
	• The assessment must include consideration of noise impacts of the project, with a particular focus on scenarios under which meteorological conditions characteristics of the locality may exacerbate impacts (such as the van den Berg effect for wind turbines) at sensitive receivers. The probability of such occurrences must be quantified.	10.3,10.4 Van Den Burg 10.3.6
	• If any noise agreements with residents are proposed for areas which noise criteria cannot be met, sufficient information must be provided to enable a clear understanding of what has been agreed and what criteria have been used to frame any such agreements.	10.4
	• The noise assessment must be undertaken must be undertaken accordance with: → Wind Turbines – The South Australian Environment Protection Authority's Wind Farms – Environmental Noise Guidelines, 2003; → Remaining Structures – In accordance with the NSW EPA Industrial Noise Policy, January 2000;	10.1
	• → Construction noise – undertaken in accordance with Chapter 171 of the Environmental Noise Control Manual (EPA, 2004) for noise impacts associated with the proposal, particularly along the main access routes to the site;	Appendix D 10.1
	• The Environmental Assessment must clearly outline the noise mitigation, monitoring and management measures the Proponent intends to apply 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 implemented.	10.4 20.5, 20.6
Heritage Impacts	• **Heritage Impacts (all components including transmission line)** – the Environmental Assessment must identify indigenous and non-indigenous cultural, archaeological and built heritage issues/items, the potential impacts activities associated with the project will have on these proposed mitigation measures.	Appendix H – Indigenous Appendix I - European 9.1,9.3
	• The Environmental Assessment must include an Archaeological Assessment, Methodology and Research Design for any proposed archaeological monitoring, in consultation with the NSW Heritage Office, Aboriginal Community and DEC in accordance with the Department of Environment and Conservation's draft *Guidelines for Aboriginal Heritage Impact Assessments and Community Consultation*.	9.2.3, 9.2.4
Visual Amenity Impacts	• **Visual Amenity Impacts (all components)** – the Environmental Assessment must fully describe all project components, locations and dimensions including wind turbines, solar thermal/array, visitor centre, transmission lines, substations etc.	Appendix B, B(i), B(ii) 11.1.3

Requirement	Description of requirement	Relevant Section in Environmental Assessment
	A photographic assessment clearly demonstrating the potential visual amenity impacts of the proposal must be provided	Photomontages Appendix B(ii)
	along with clear description of visual amenity mitigation and management measures that the Proponent intends to apply to the project.	11.10, 20.6.3
	An assessment of the feasibility, effectiveness and reliability of proposed measures and any residual impacts after these measures have been implemented must be included in this regard with a 'zone of visual influence map' provided covering the towns of Scone and Aberdeen.	ZVI – 11.3
	The Environmental Assessment must specifically address the following matters with respect to individual project components:	-
	→ Solar Thermal/Solar Voltaic Array – the Environmental Assessment should provide an analysis of reflectivity on surrounding residents;	11.8,11.9
	→ Visitor Centre – the Environmental Assessment must identify that the height, scale and lighting of the building responds and contributes to its context and that the design has an appropriate scale of built form (including roof form and building height);	11.1.3 Figure 17.1, 17.1(i)
	→ Transmission Line/Grid Connection – the Environmental Assessment must describe the proposed corridors, likely route alignments and location of energy storage devices, proximity to other infrastructure and urban and rural residential development;	19.0, 6.75,6.7.6 Figures19.2,19.3, 19.4,19.5,19.9, 19.10.
	→ Wind Turbines – the Environmental Assessment must assess the visual impact of the proposal on this landscape (including existing and approved dwellings) for a distance of at least 10 kilometres for the turbines, taking into consideration the impact of shadow "flicker" and blade "glint"	11.7, 11.10 Shadow Flicker11.8 Blade Glint 11.9
	• The visual impact assessment should be prepared with regard to the Australian Wind Energy Association and Australian Council of National Trust's Wind Farms and Landscape Values: Stage 1 Final Report – Identifying Issues, March 2005, Appendix B: Wind Farms and Landscape Values: Final Issues Paper.	11.1.4
Flora and Fauna	• **Flora and Fauna (all components)** – the Environmental Assessment must include a flora and fauna impact assessment identifying and considering any critical habitats, threatened species, populations or ecological communities listed under both State and Commonwealth legislation recorded on the site, along the transmission line route or the surrounding area.	Appendix A(i),A(ii), A(iii), A(iv). Section 8.0 Section 19.4.1
	• The Environmental Assessment must also detail measures to avoid or mitigate impacts associated with the siting and construction of any access roads and other infrastructure.	Section 8.0
	• Additional it must address:	
	→ the impact of the proposal on birds and bats from strikes and alteration to movement patters resulting from the turbines and transmission lines. An outline of an adaptive management program must be included;	8.5 8.12.2
	→ vegetation clearing during construction and maintenance, including details on the location, composition and quantity and likelihood of disturbance to the White Box Yellow Box Blakely's Red Gum Woodland (Endangered Ecological Community);	8.2,8.4
	→ identification of any regional corridors; and	8.7

Requirement	Description of requirement	Relevant Section in Environmental Assessment
	→ an assessment of any potential impacts associated with the proposal on the Towarri National Park	8.8
	and the Hunter-Central Rivers Catchment Action Plan;	8.9,8.10
	The flora and fauna assessment must be prepared in accordance with the Department's of Environment and Conservation and Primary Industries' draft *Guidelines for Threatened Species Assessment, Auswind's Wind Farms and Birds: Interim Standards for Risk Assessment*, July 2005 and have regard to the Commonwealth Department of Environment and Heritage's *Cumulative Risk for Threatened and Migratory Species*, March 2006.	8.1
Water Quantity and Quality Impacts	• **Water Quantity and Quality Impacts** – the Environmental Assessment must include an assessment of the water quantity and quality impacts of the proposal (including on stream and drainage lines),	15.1 15.2
	with particular reference to the water needs of the project, the proposed source of water,	2.5.7
	and the implementation of water saving measures (including use of treated effluent or rainwater)	2.5.7
Bushfire Risk	• **Bushfire Risk** – the site is identified as bush fire prone land and the Environmental Assessment must meet requirements of *Planning for Bush Fire Protection 2006* by complying with standards regarding setbacks,	Appendix C 3.1/3.2
	• provision of water supply, access, supply of services,	18.4.2
	• fuel management and evacuation planning in consultation with the NSW Rural Fire Service and Upper Hunter Council.	18.4.2,18.5
Infrastructure and Services	• **Infrastructure and Services** – the Environmental Assessment must assess the potential impact of the proposal on telecommunications, aircraft and electric and magnetic fields.	Appendix F Section 13.0
	• In reference to aircraft, the assessment must consider any impacts on the operation of Scone Airport and private landing fields and any restrictions on aerial spraying and emergency landing capabilities arising from the project	Appendix E Section 12.0
	• in addition to the Civil Aviation Safety Authority's draft advisory circular AC 139-18(0) Obstacle Making and Lighting of Wind Farms, December 2005.	12.2
	• Consideration of electric and magnetic fields must address potential impacts and the means of minimizing such impacts.	13.6
	• A demonstration of compliance with 'prudent avoidance principles' should be provided, and consideration given to the ARPANSA draft Radiation Protection Standards for exposure limits to Electric and Magnetic Fields (or more recent update).	19.4.8,19.7.3
Geotechnical and Resource Issues	• **Geotechnical and Resource Issues** – the Environmental Assessment must consider the presence of mineral/gas and gravel resources and the potential impact the project may have with respect to mining/extraction potential and land sterilization.	Section 14.0
General Environmental Risk Analysis	• **General Environmental Risk Analysis** – notwithstanding the above key assessment requirements, the Environmental Assessment must include an environmental risk analysis to identify potential environmental impacts associated with the	20.2

Requirement	Description of requirement	Relevant Section in Environmental Assessment
	project (construction and operation),	
	• proposed mitigation measures	20.4
	• and potentially significant residual environmental impacts after the application of proposed mitigation measures.	20.5
	• 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 Environmental Assessment.	20.6
Consultation Requirements	You must undertake an appropriate and justified level of consultation wit the following parties during preparation of the Environmental Assessment:	-
	• Department of Environment and Conservation;	Appendix A and D 4.6
	• Road and Traffic Authority;	Appendix J 4.6, 17.3
	• Department of Primary Industries (Mineral, Fisheries and Agriculture);	4.6
	• Department of Natural Resources;	4.6, 14.5
	• Hunter-Central Rivers Catchment Management Authority;	Appendix A 4.6,8.9
	• Upper Hunter Council;	Appendix N Section 5.0
	• Energy Australia/Trans Grid;	Appendix L 4.6,19.1.1,19.1.2
	• NSW Rural Fire Service;	Appendix C 4.6,18.4.2,18.5
	• Civil Aviation Safety Authority (CASA);	Appendix E 4.6, 12.2
	• Woonarua Local Aboriginal Land Council; and	Appendix H 4.6,9.1
	• The local community.	Appendix N Section 5.0 19.3,21.4,21.8
	The Environmental Assessment must clearly describe the consultation process and indicate the issues raised by stakeholders during consultation and how these matters have been addressed.	Appendix N and Appendix K–Attachment A 5.1, 5.4,5.5
+Deemed refusal period	Under clause 8E(2) of the *Environmental Planning and Assessment Regulations 2000*, the application deemed refusal period is 60 days from the end of the Proponent's environmental assessment period for the project.	Noted

1.4.2 Requirements from Other Authorities

In addition to the comprehensive list of requirements from the Director General of the Department of Planning, a number of other authorities emphasised a number of issues of particular interest to them as follows: (These issues have been included as considerations in the required Environmental Assessment process.)

Table 1.2 – Requirements from other authorities.

Requirement	Description of requirement	Relevant Section in Environmental Assessment
NSW Department of Environment and Climate Change	Noise impacts on the surrounding community	Appendix D Section 10.0
	Impacts on threatened flora and fauna, populations or endangered ecological communities	Appendix A, A(i),A(ii), A(iii), A(iv) Section 8.0
	Impacts on Aboriginal cultural heritage	Appendix H 9.1
NSW Department of Natural Resources	Groundwater Interception	15.2
	Riparian Protection	Section 15.0 16.4
Upper Hunter Catchment Management Authority	Native Vegetation	Appendix A 8.2,8.7,8.9,8.10
	Biodiversity impacts	Section 8.0
Upper Hunter Shire Council	Community involvement	Appendix N Section 5.0
	Visual assessment	Appendix B Section 11.0
	Acoustic issues	Appendix D Section 10.0
	Flora and fauna including regional corridors	8.2,8.3,8.7
	Transport and erosion and sedimentation controls	Appendix J Section 17.0,16.0
	Electro-magnetic interference and mitigation	Appendix F Section 13.0
	Geotechnical	Section 16.0
	Flicker assessment	Appendix G 11.8
	Archaeological – Aboriginal and European	Appendix H,I Section 9.0
	Aviation	Appendix E Section 12.0
	Grid Upgrade	Appendix L Section 19.0
	Bushfire	Appendix C Section 18.0
	Climate Change	6.1,6.4
	Geological resources	Section 14.0
	Impact on property values	Appendix K 6.7.7
	Education and community access	Appendix N Section 5.0 19.3,21.4,21.8

1.5 Project Team

This Project Application is made by Pamada Pty Limited (the Proponent), an Australian property advisory and boutique development company based in Sydney, on behalf of Kyoto Energy Park Scone Pty Ltd, (the developer). The principle activities of the Proponent are as an advisor in the property industry, with a key focus on community development and projects which seek to achieve a renewable and sustainable world.

Pamada has a high commitment to the development of projects focusing on reducing impacts of a carbon climate and reducing overall lifecycle environmental impacts of projects. Other companies which have had input into the preparation of this Environmental Assessment are:

Table 1.3 – Kyoto Scone Project Team

HDB Town Planning & Design	Co-Author Environmental Assessment and response to the Director General's Requirements Strategic Planning/Geotechnical
Pamada	Co-Author Environmental Assessment and response to the Director General's Requirements
BBC Planners	Statutory Planning
Conacher Environmental Group	Ecological Assessment
Conacher Environmental Group	EPBC Referral
Conacher Environmental Group	Bushfire Risk and Management
Garrad Hassan	Wind Speed Assessment and Layout Optimisation
Garrad Hassan	Blade Flicker and Glint
Garrad Hassan	Electro Magnetic Interference
Garrad Hassan	Aviation
Key Insights Pty Ltd	Socio-Economic Study
Key Insights Pty Ltd	Community Information Day Report
Myall Coast Archaeological Services	Indigenous Heritage
Myall Coast Archaeological Services	European Heritage
Wilkinson Murray	Acoustic
Integral	Visual and Landscape Planning
Bob Dupont Pty Ltd	Property Research
Senergy Econnect	Electrical Grid Connection/Innovative Integrated Design
Vemtec Utility Infrastructure Services	Transmission Line Route Study
Snowy Mountains Energy Corporation	Mineral Resources/Closed loop hydro

1.6 Location of the proposed Kyoto Energy Park

The proposal is located on two private landholdings Mountain Station and Middlebrook Station which are two landholdings located west and north-west of Scone town centre respectively. Scone is a rural township located on the New England Highway in the Upper Hunter Valley of New South Wales approximately 150 kilometres north-west of Newcastle. The proposed sites are owned by a single landholder and completely within the Upper Hunter Shire Council Local Government Area (LGA). Middlebrook Station and Mountain Station properties are dissected by Bunnan Road which is an arterial rural road linking Scone to the Bunnan township located to the west.

Both Mountain and Middlebrook Station are characterised by undulating to hilly terrain, with broken, generally north-south oriented ridgelines. There are no major watercourses present on the subject sites. Several small or intermittent watercourses drain the site to nearby secondary creeks and streams. There is little natural tree cover on site with the larger proportion of the site cleared for pastoral and commercial grazing of sheep and cattle.

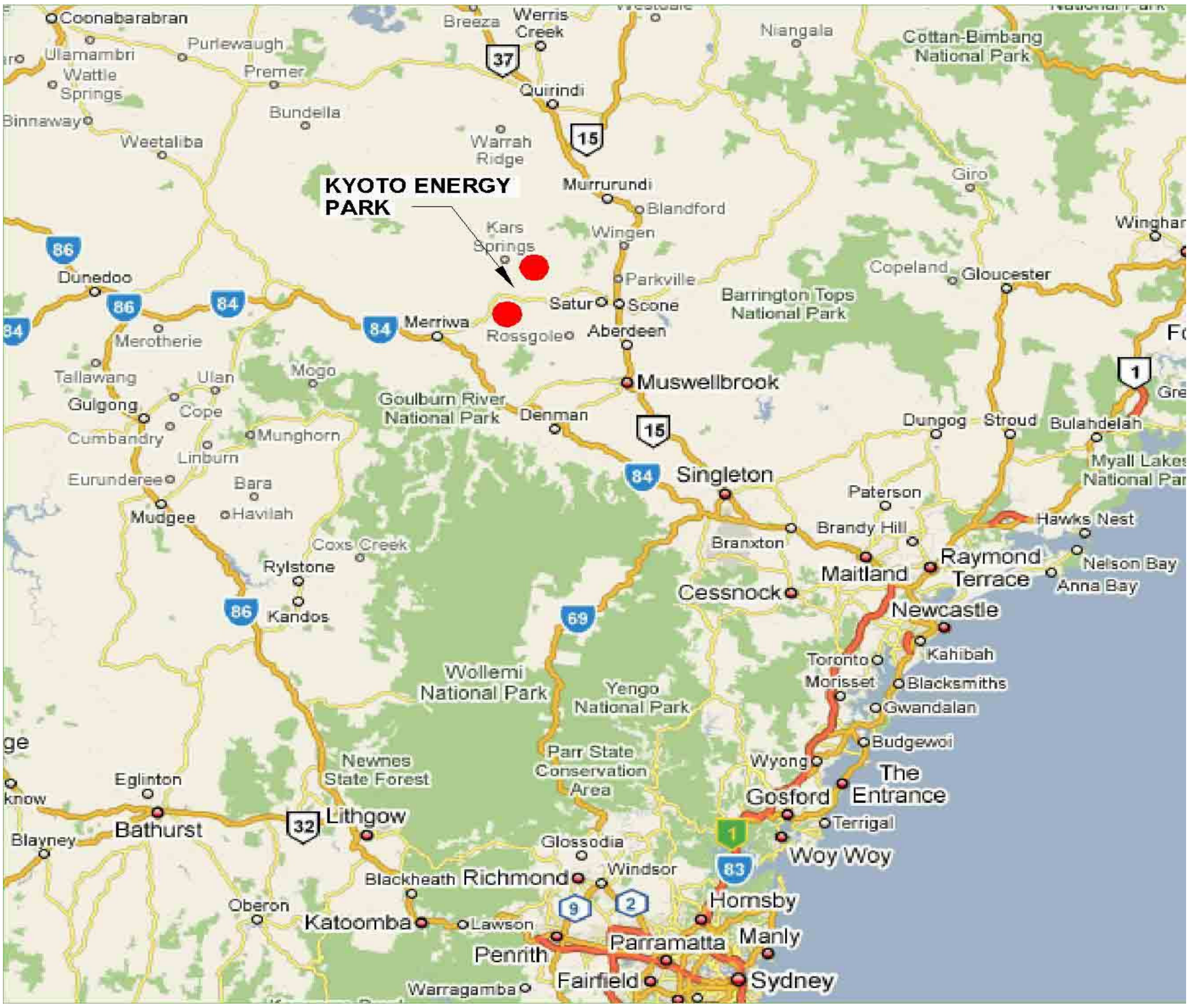


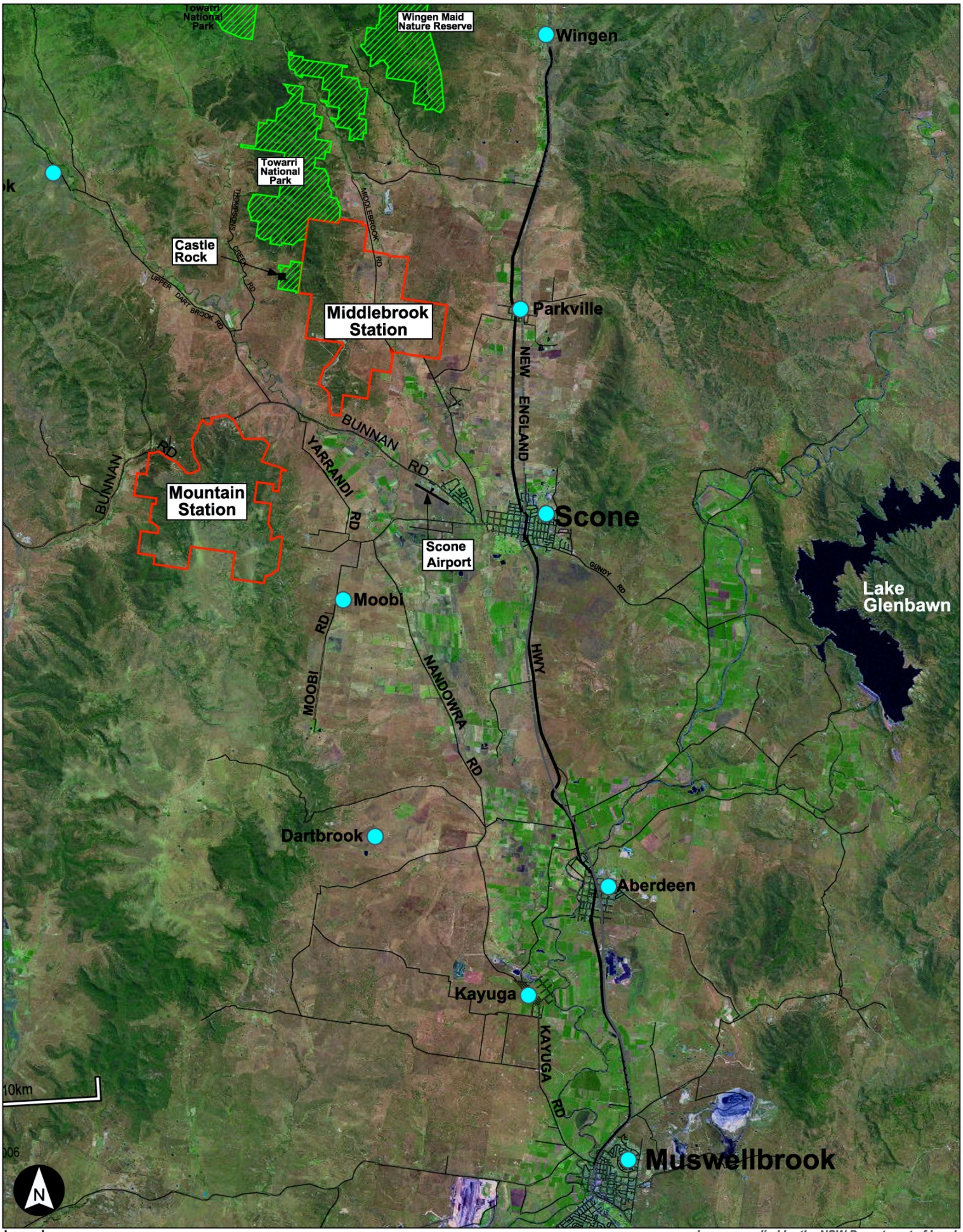
Figure 1.0 Locality Plan (Source: Google Maps)

1.6.1 Middlebrook Station

The Middlebrook Station property is located approximately 8 to 13 kilometres north-west of the Scone town centre (Refer to Figure 1.1 below). This site is part of the Glen Range (part of the Great Dividing Range), and has a relatively flat single ridgeline which runs approximately north-south. Middlebrook Station has an elevation of between 580m and 620m. Middlebrook Station comprises an area of approximately 2032 ha. The energy park components will represent only a small portion of the total area of the site. A ‘Trig’ station is located on the ‘Robertson’s Knob’ towards the southern portion of the site. The Trig station is accessed via a Crown road and is at considerable distance from any proposed works or facilities.

1.6.2 Mountain Station

The Mountain Station Site is located approximately 9 to 14 kilometres west of the Scone town centre (Refer to Figure 1.1 below). This site is an area of escarpments and ridges on the western side of the Hunter Valley. The proposed facilities are to be located on a prominent escarpment called Mount Moobi and on nearby prominent ridgelines that generally aligned in a north-south direction. Mount Moobi has an elevation of between 600m and 640m. A ‘Trig’ station is located on the Mount Moobi escarpment (Refer Section 7.11) . Mountain Station has an area of approximately 1995ha.



Legend:

Image supplied by the NSW Department of Lands

- Major & Minor Rural Town Centres
- Highway/main road
- Minor road
- Watercourse
- Property Boundary
- National Park/Nature Reserve
- Railway

0 5.0 10.0

Kilometres

Kyoto energypark | *Figure 1.1 - Location Plan* | pamada | A4

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1.7 Land Tenure and legal description

Both Middlebrook and Mountain Station sites are located on private freehold tenure owned by a single landowner. Both properties are owned by Middlebrook Scone Pty Ltd (the landowner) and are wholly within the Upper Hunter LGA. The Kyoto Energy Park Company Pty Ltd have entered into a long term lease agreement with the landowner to seek approval for, construct, own and operate the Kyoto Energy Park throughout the life of the facility.

The land parcels that comprise both Mountain Station and Middlebrook Station are listed in Table 1.4 below.

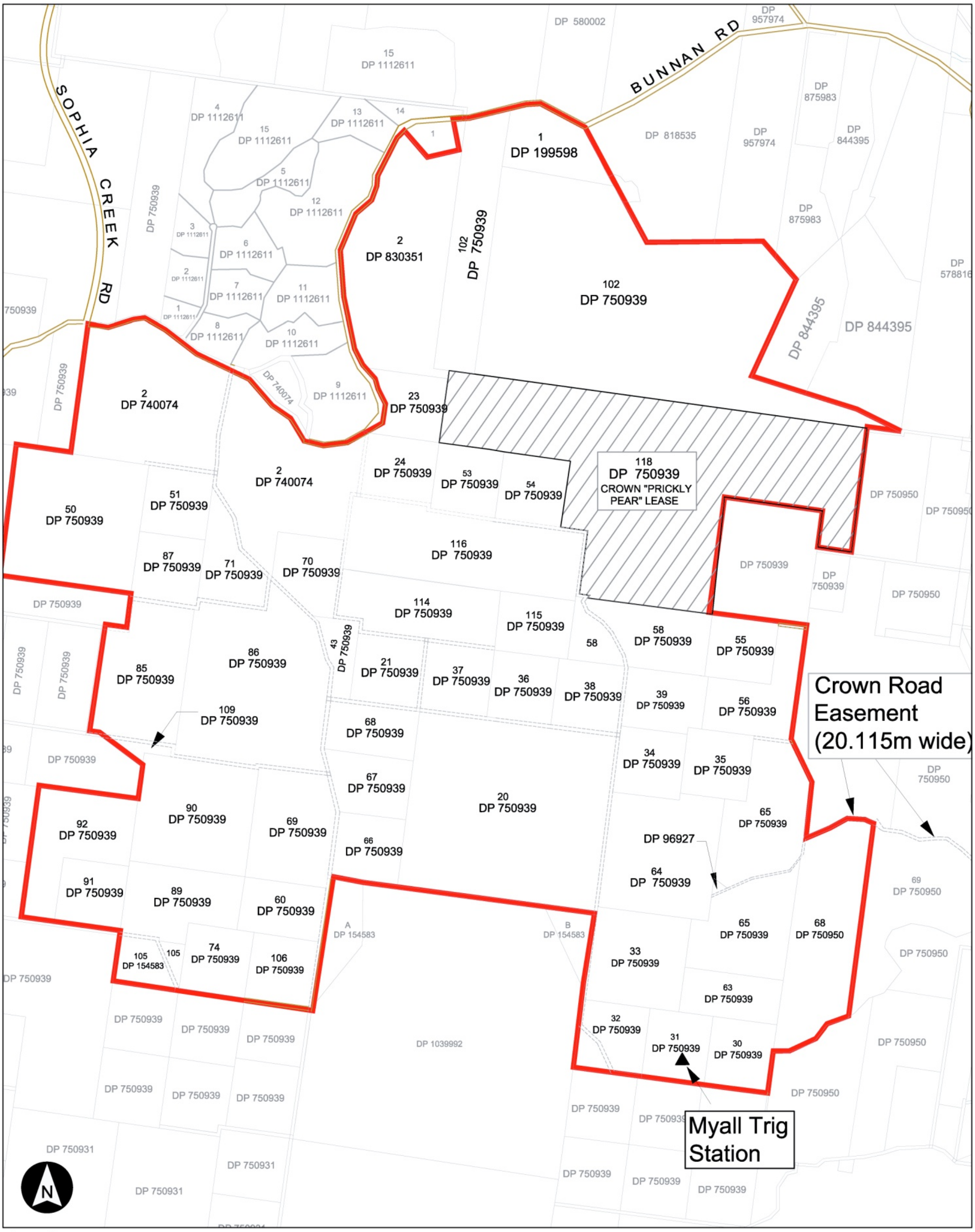
Table 1.4 Land Portions affected by the proposal

Property	Registered Proprietor	Land Description	
Mountain Station	*Middlebrook Scone Pty Ltd*	**DP**	**Lot**
		DP 740074	Lots A and B
		DP 750939	Lots 20, 21, 23, 24, 30 – 39, 43, 50, 51, 53-56, 58, 60, 63,64,65 –71, 74, 85–87,89-92, 102,105,106,109, 114 –116 and 118.
		DP 830351	2
		DP 199598	1
Middlebrook Station	*AAG & SA Henderson* *AAG Henderson*	DP 750941	Lots 17,24,7004 59,60,62-63,65 71-74,76,78,79,87,88 102-109 115-120 126,127,129
		DP 82248	2
		DP 978019	3,4
		DP 1099334	1-3
		DP 1100370	10
		DP 1123467	1,2

These land descriptions for both properties are illustrated in Figure 1.2 and Figure 1.3.

Lot 118 (DP 750939) on Mountain Station is NSW Crown Lands 'prickly pear' lease in favour of Middlebrook Scone Pty Ltd (the lessee). No wind turbines or other structures are located on portion 118. An existing access road shall be upgraded to a 5m width solely for access over this portion.

There are Trigonometric (Trig) Stations located on Mountain Station (Myall) and on Middlebrook Station (Robertson's). The NSW Department of Lands were consulted in relation to potential impacts on these permanent survey marks which is discussed in Section 7.11



Legend:

Property Boundary

National Park/Nature Reserve

Minor road

Crown Land (Paper Roads)

0 0.5 1.5
Kilometres

Kyoto energypark

Figure 1.2 - LandTenure and Legal Information (Mountain Station)

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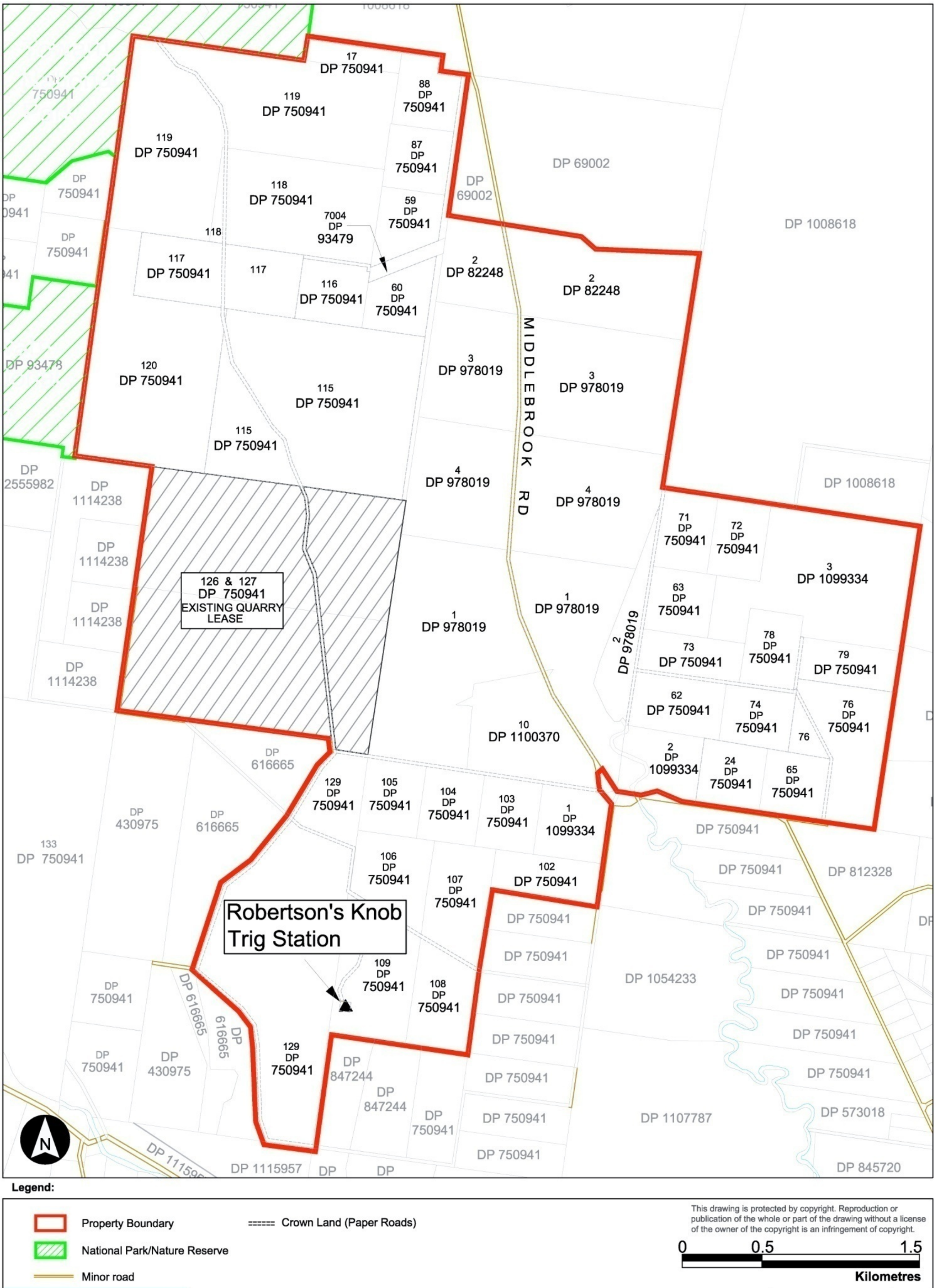

Kyoto energypark

Figure 1.3 - LandTenure and Legal Information (Middlebrook Station)

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Kyoto Energy Park Scone is wholly an Australian Enterprise. The Management is 100% Australian.
The funding of this proposal and report is 100% Australian.
An Australian Project

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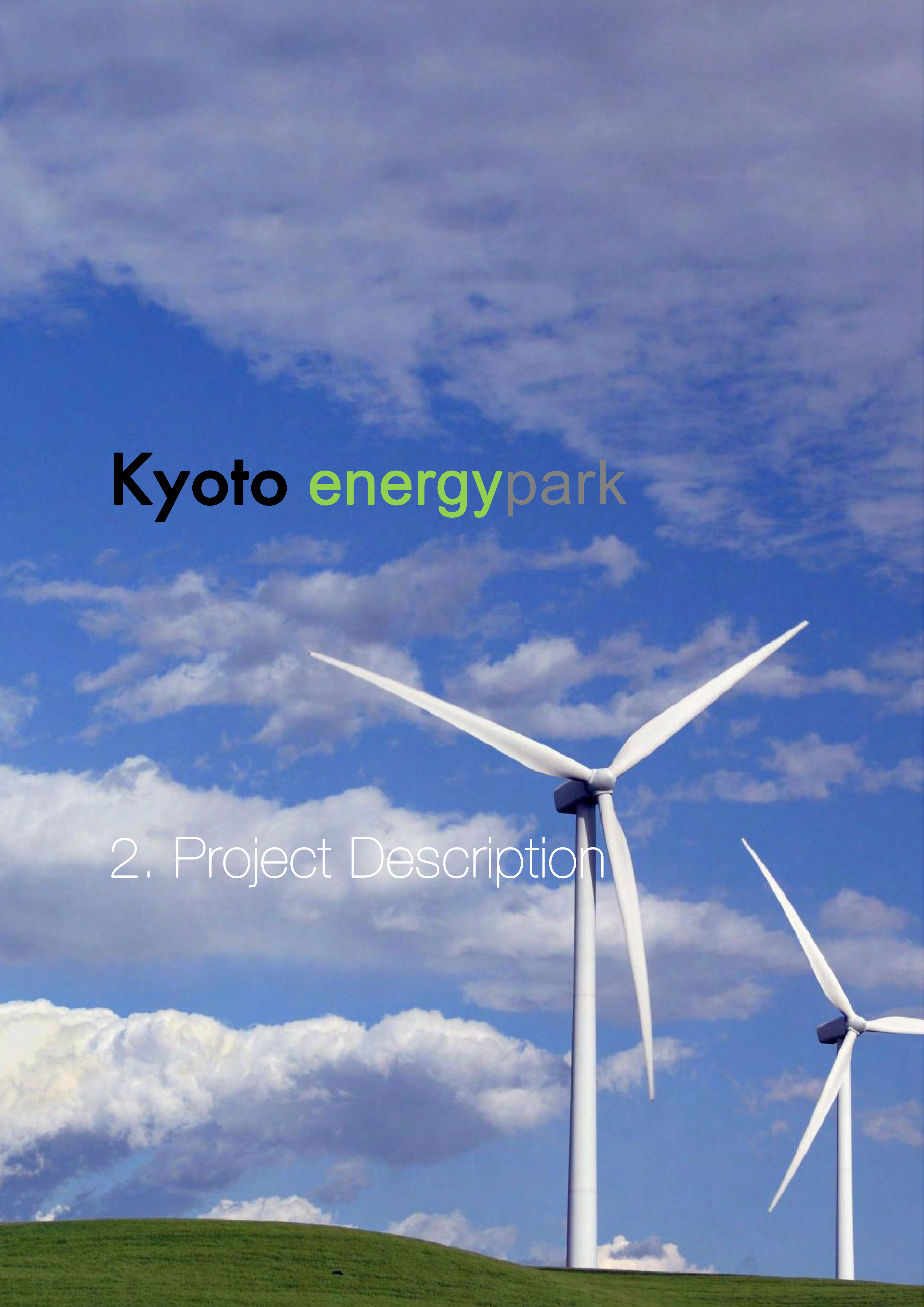


Kyoto energypark

2. Project Description

2.0 PROJECT DESCRIPTION

2.1 Introduction

The proposed development will include renewable energy generator components including Wind Turbine Generators (WTGs), a Solar Photovoltaic Plant (PV Plant), a mini hydro plant (Closed loop) and associated ancillary works. The application also covers work that will be required to connect the Energy Park to the local electricity grid network.

Most of the generator components and ancillary facilities are proposed on Mountain Station.
The application also covers work that will be required to upgrade existing power lines in the Scone area along transmission line routes. The transmission line connection to the grid has been assessed in Section 19.0 of this report.

2.1.1 What is the Project Application seeking approval for?

The project application seeks approval for the construction and installation of the following eco-generating devices and associated facilities. These include the following components:

Mountain Station

- 31 x 2.1-3.0MW Wind Turbine Generators;
- 31 x Kiosk step-up transformers at base of turbines;
- Installation of a 3-10MW Solar Photovoltaic Plant on Mount Moobi (Mt Moobi Solar PV Farm);
- Installation of a 1MW Closed loop Mini Hydro-electric Plant;
- 1 x Site substation, Switchyard and Control room;
- Construction of internal access tracks and hardstand areas;
- A Maintenance shed;
- A Manager's residence;
- A Visitor's and Education Centre;
- 33kV underground internal reticulation cabling.

Proposed facilities on Mountain Station are illustrated in Figure 2.0.

Middlebrook Station

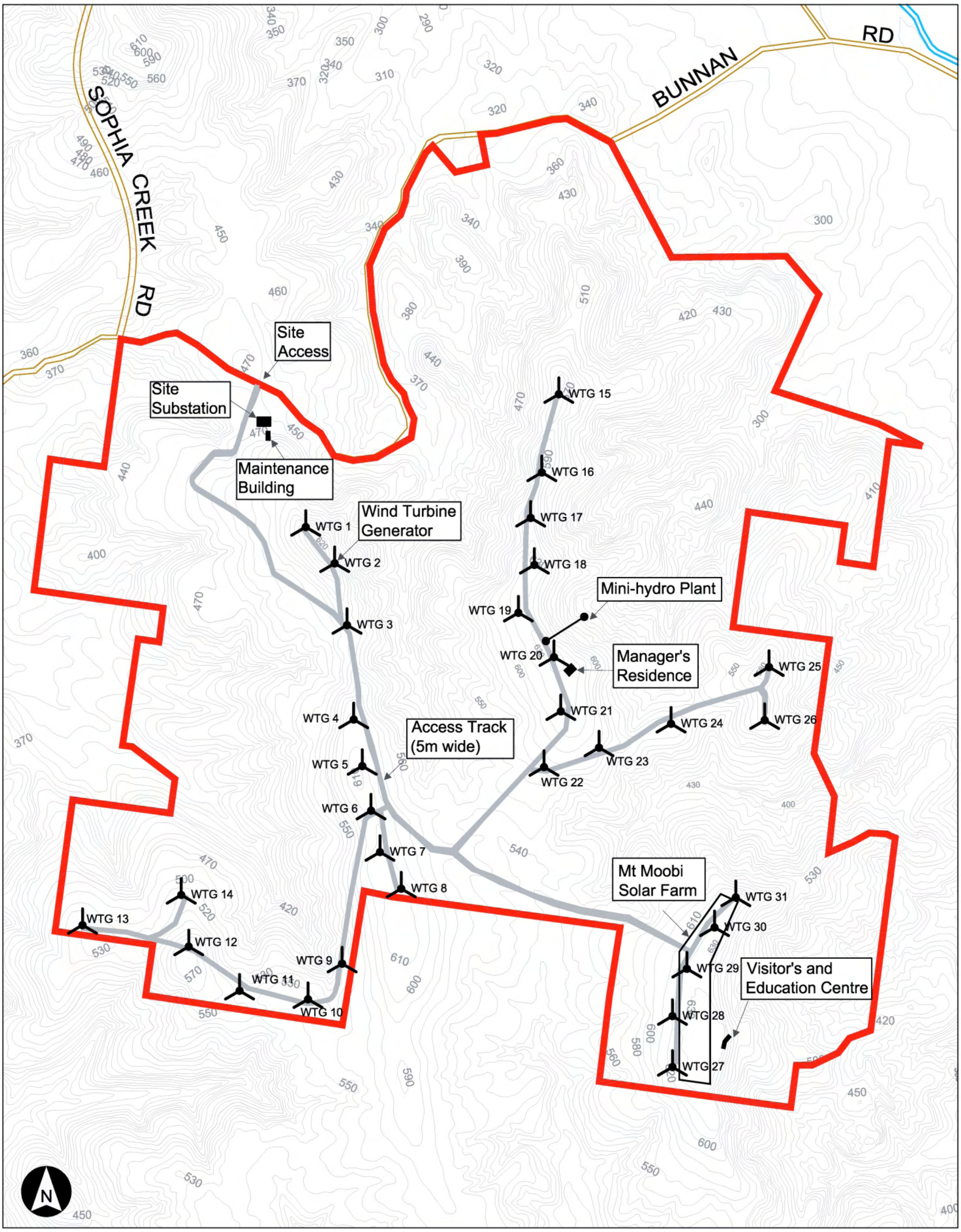
- 11 x 2.1-3.0MW Wind Turbine Generators;
- 11 x Kiosk step-up transformers at base of turbines
- 33kV underground cable network

Proposed facilities on Middlebrook Station are illustrated in Figure 2.1.

Transmission line Connection to the Grid

- Either a 66kV(Option 2) or 132 kV(Option 4) overhead transmission line to connection point to grid network;
- Construction of overhead 33kV transmission line for connection of Middlebrook Station turbines to Mountain station site substation;
- Construction of overhead communications lines for connection of Middlebrook Station turbines to Mountain station site substation.

Some temporary facilities will be required during the construction stage of the Kyoto Energy Park including a concrete batching plant, site offices and laydown area.



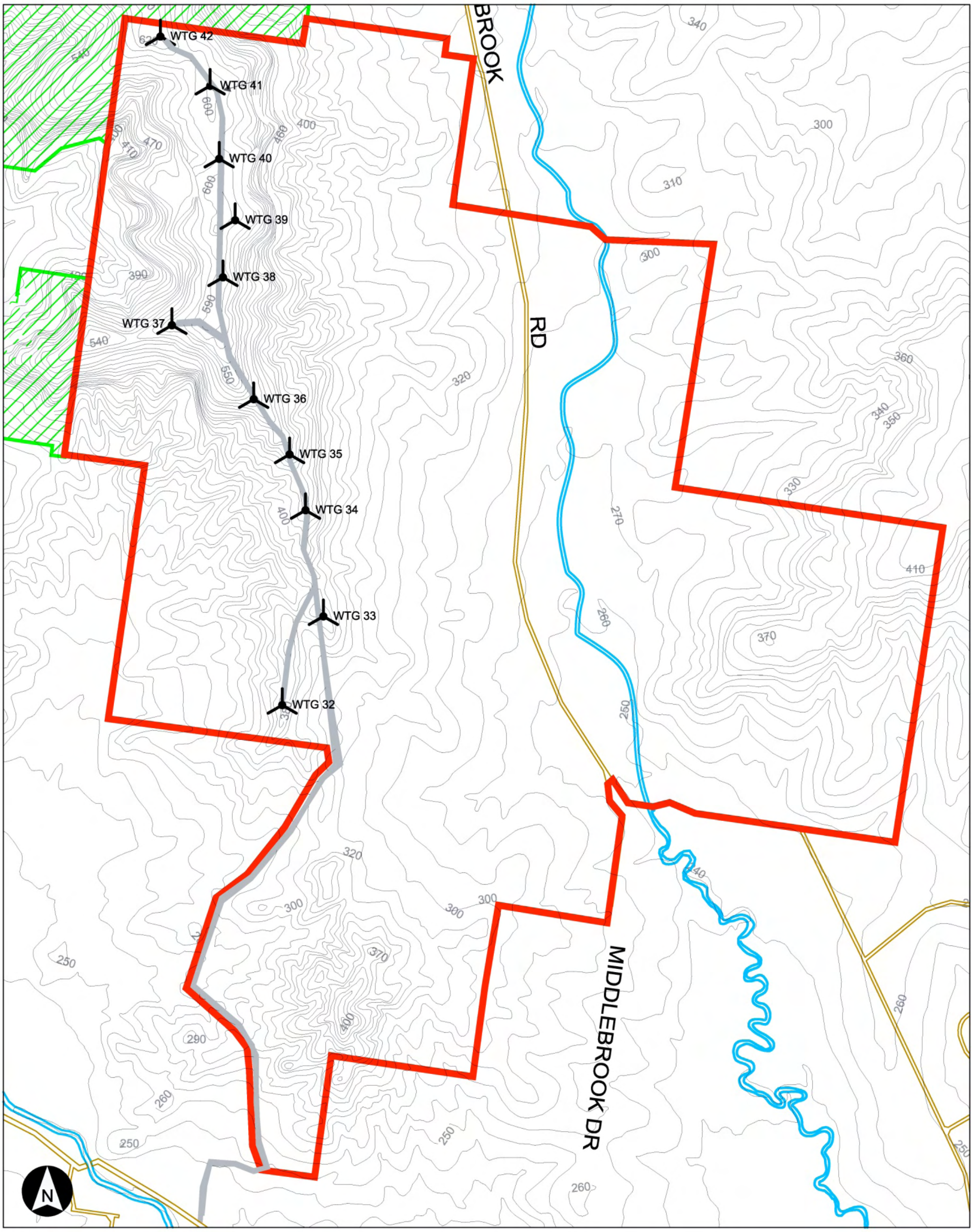
Legend:

Property Boundary	Natural Contour (10m Interval)
National Park/Nature Reserve	Natural Drainage
Minor road	

0 0.5 1.5 Kilometres

Kyoto energypark | *Figure 2.0 - Proposed facilities (Mountain Station)* | pamada | A4

File path : Z:\01 Pamada\60 Kyoto\04 Design\EA Report\Figures\Proposed facilities



Legend:

Property Boundary

National Park/Nature Reserve

Minor road

450 Natural Contour (10m Interval)

Natural Drainage

0 0.5 1.5

Kilometres

Kyoto energypark *Figure 2.1 - Proposed facilities (Middlebrook Station)* pamada A4

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2.1.2 Capacity of the Kyoto Energy Park

The anticipated final capacity of the Kyoto Energy Park is shown in Table 2.0.

Table 2.0 Kyoto Energy Park Rated Capacity

Component	Minimum Capacity (MW)	Maximum Capacity (MW)	Max Generation Capacity (MW/hr) p.a.
Wind Turbine Generators	89 (96%)	126 (92%)	320,000
Solar Photovoltaic Plant	3 (3%)	10 (7%)	26,300
Closed-loop hydro plant	1 (1%)	1 (0.7%)	8,300
Estimated Total	**93 (100%)**	**137 (100%)**	**354,600**

Upon completion of all stages of the project the Kyoto Energy Park will generate approximately 137MW of electricity combined from wind generation, (92-96%), solar (3-7%) and a Closed loop mini-hydro system (0.7-1%), which will be fed by transmission lines into the local electricity grid. The background into each technology, evaluation and feasibility is discussed below. The design of each component of the Kyoto Energy Park has taken into consideration all of the proposed eco-generation technologies currently available and suitable for the location. It should be noted that for the purposes of evaluation of the potential for adverse environmental impacts, the worst case scenarios have been modelled in this report.

Final design of the plant technology, configuration and capacity will be evaluated at the time of procurement of system components. A description of the various technologies suitable for the site is provided in Section 2.2 below.

2.2. Generator Components

2.2.1 Wind Turbine Generators

Introduction

The first large wind turbines were designed and manufactured by the Danish, basically to improve energy utilisation for agricultural activities and farmers. In the 1970s the Danish government introduced government policies to promote research and development of wind turbines following two oil shortage crises that occurred. In the early 1980s California introduced tax incentives for wind energy development which resulted in thousands of smaller sized turbines being installed, mainly imported from Denmark. The original Danish turbines were 55kW, with a hub-height of about 18 metres and rotor diameter of 15 metres. The turbines were designed with a 20 year life and many are still in operation today.

In the 1990's the first megawatt machines (i.e. gross capacity of more than 1 MW) were introduced. In the last 10 years, with much research, development and implementation around the world, energy created from wind turbines has become an extremely effective and efficient form of generation in the right places. Large modern turbines are typically installed with a capacity of 1.5MW to 3MW each, with some off-shore installations using generators of up to 5MW in rated capacity. Typical modern inland turbines vary in height between 50m and 105m (this is the hub height or height above ground level to the top of the nacelle). The Nacelle is the generator housing which is seated on top of the tower. A typical wind turbine generator is shown in Figure 2.2

All typical modern turbines have three blades, with the blades varying between 40m and 50m in length. Current designs are allowing for taller towers and greater blade lengths. Often a small transformer or switchboard is located adjacent to the base of the tower. It is possible for agricultural uses to co-exist right up to the tower base and is common in most circumstances. The bigger machines offer greater rotor area which equates to greater energy production per machine, more efficient generators, reduced construction costs for foundations cabling and erection, and associated maintenance requirements. Larger machines with slower uniformly spinning rotors at greater turbine spacings are also considered more pleasing to the eye and reduce potential bird and bat strike impacts in areas with large numbers of avifauna. (Ecogeneration May/June 2008).

With rapid annual global growth in the wind industry and technology improvements, manufacturers are continually developing new equipment. In general this has meant a trend to larger wind turbines but it has also yielded improved designs from an engineering and environmental perspective. The preparation of this environmental assessment has included consideration of the potential for variations in environmental impact related to differing designs and has sought to provide an assessment that will be representative of the development that would be installed if consent is obtained.

The electricity generated by the wind farm is supplied to the electricity grid network for use by the network customers. The Kyoto Energy Park will include a fully operational 'wind farm' as a component of the project. The wind farm component of the park will be able to produce about 89-126 million watts (MW) of electrical energy capacity from the combined output of about 42 wind turbines. Each turbine could have a generation capacity of about 2 to 3 megawatts. Turbines will be mounted on towers up to 103m in height (hub-height up to 105m) and have the general form as shown in Figure 2.2. The turbines are large structures and the top of the blade sweep for each turbine will have an overall height of up to 150 metres above ground level (150m agl). The turbines have automatic controls that enable them to face into the wind and to vary their speed of operation with wind speed.

A full description of wind turbine components is discussed below.

Wind Turbine description

A Wind Turbine Generator is made up of five main components, that being the footing, tower, nacelle and rotor assembly. A step-up transformer is also located at the base of the tower for configuration of the voltage prior to transmission to the site substation.

Foundation

The design of the turbine foundation or footing is dependant on the geological strength of the bedrock foundation around each turbine. Footings under consideration in the Kyoto Energy Park wind turbines include a gravity footing and a reinforced concrete anchored design dependant on the geological strength around each turbine base.

The gravity footing is used in areas where there is insufficient strength in the bedrock to anchor the turbine. The reinforced footing generally consists of a reinforced concrete structure with post tensioned rock anchors into stable rock material.

Sizes for turbine foundations will therefore be determined based on final design considerations of footing type (gravity, reinforced anchored, combination), and bedrock strength. Turbine footings would be in the order of 5-6 metres in diameter and 3-5 metres deep, dependent on the above variables in final design. Turbine footings are completely buried beneath the existing ground surface level and are therefore not visible to the eye. Upon decommissioning footings would remain buried beneath the ground level surface. A full description of turbine footing construction is provided in Section 3.1.6

Tower

The purpose of the tower is to support the nacelle and rotor assembly which are the moving components of the wind turbine. The tower tubes are prefabricated and delivered to site in tubular steel sections where they are erected on site. Each section is bolted together and to the concrete foundation to form a total height of either 78 metres (80 hub-height) or 103 metres (105m hub-height).

Nacelle

The nacelle is the housing at the top of the tower which contains the internal components including the drive-train, gearbox, generator, brakes, pumps and control equipment. The nacelle is mounted on a large bearing allowing it to rotate around the top of the tower. The control equipment ensures safe and optimum operating efficiency is maintained by the turbine. Control equipment also directs the rotor blades into dominant wind speeds and control blade pitch which minimizes blade noises. The nacelle housing is acoustically insulated to reduce noise emissions from mechanical components.

Rotor Assembly

The rotor refers to the configuration of the three blades, hub and nose cone mounted on the turbine nacelle. Air is caught by the blades causing the rotor to spin, and thus driving the generator. Each blade consists of two blade shells, bonded to a supporting beam. The rotor would rotate in a clockwise direction at a speed of between 7-19 revolutions per minute depending on the machine used (refer Table 2.1)

Step-up Voltage Transformer

The generator located in the nacelle converts the rotational energy of the rotor to electricity which is passed through a step-up transformer located at the base of the tower. The generator operates at 50/60Hz and 690V. The electricity is fed into the transformer which 'steps up' the voltage to either 22,000V or 33,000V for reticulation to the site substation. By increasing the voltage the transmission losses from the cables are reduced.

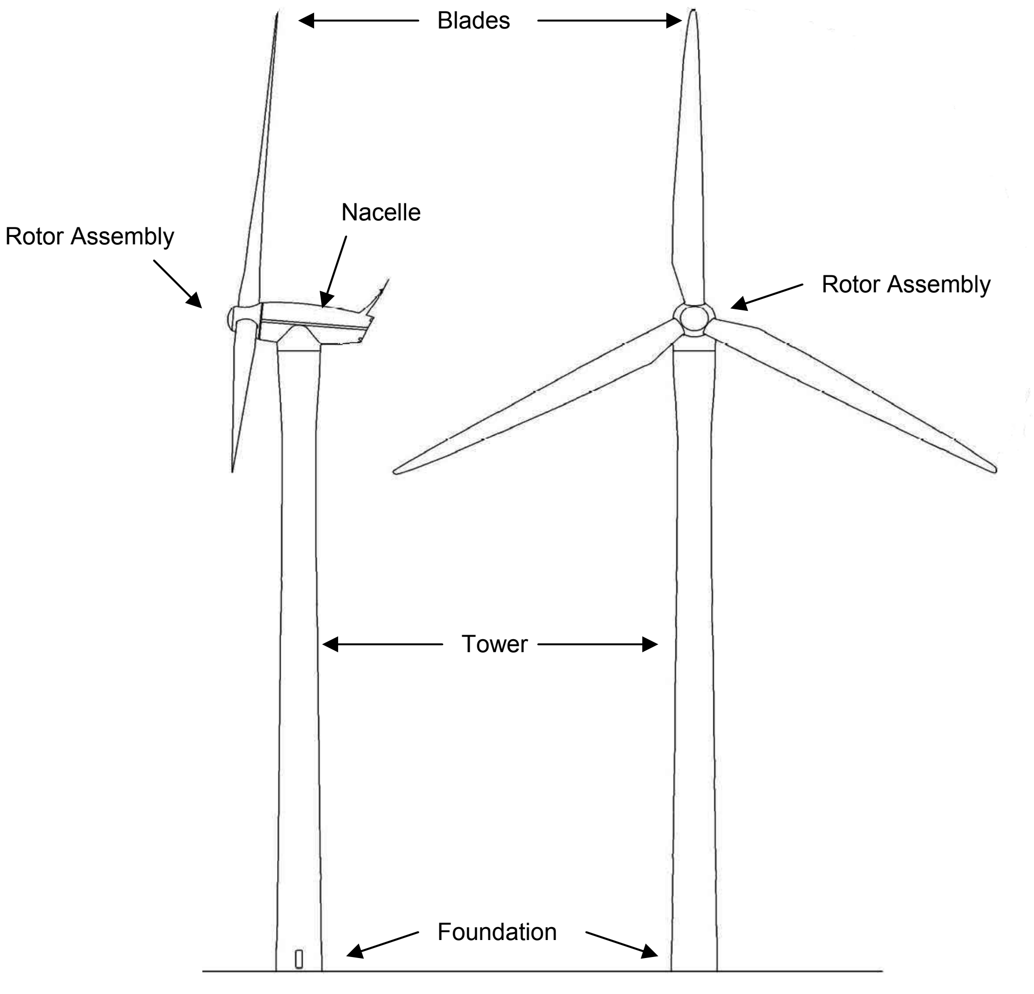


Figure 2.2 –Wind Turbine components

Wind Turbine independent control

The computer housed in each turbine nacelle controls the tip angle or pitch of the blades. The tip angle of the blade would be constantly regulated so that the blades are always pitched at the angle which optimises power production and noise reduction for current wind conditions. The internal computer also controls the stopping and starting of the rotor. Breaking is achieved by full feathering of the blades (i.e. angling the blades perpendicular to the wind direction). A parking brake located in the nacelle would then be automatically activated. The rotor begins to spin at the 'cut-in' wind speed, until it reaches the optimum wind speed for energy generation. Braking (or pitching of the blades) of the rotor to reduce rotor speed occurs at 'cut-out' speed, when wind speeds would be too high for the safe operation of the turbine.

2.2.2 Selection of Wind Turbine

Each wind turbine would be a three bladed type of the “up-wind” design. That is blades are facing up into the wind and in front of the tower. The wind turbine would have a diameter of 88 to 92.5 metres and a hub height (centre of the nacelle) of up to 105 metres, with the blade tip at its apex up to 150 metres above ground level. Blades would be of various material configuration but mostly are constructed of fibreglass attached to a steel hub, and would include lightning rods for the entire length of the blade in each model. Each wind turbine would have a rated power capacity of between 2.1MW to 3.0 MW, depending on turbine selection.

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. It is likely that variable speed machines would be used in the Kyoto Energy Park, with a rotational speed in the range of 7 to 19 revolutions per minute (rpm) depending on wind conditions.

Wind farms are a highly capital-intensive business, with a high proportion of the long term costs of a wind farm being related to its construction and financing. Likewise, revenues are directly linked to energy production, which is basically fixed by the turbine selection and capacity factor for the site. For this reason, to keep generation costs down and to ensure the projects financial viability, it is essential that the appropriate wind turbine is selected for a site, and that a competitive approach is used between manufacturers to minimise the capital costs of the project. At this stage, the specific wind turbine model and manufacturer have not been selected for this project. Various international wind turbine manufacturers have products available that are ideally suited for the low to medium wind speed conditions present at the site. These wind turbine suppliers include Vestas (Denmark),RE Power (Germany), Suzlon Energy (India) and GE Wind (US).

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. Also of consideration in the final turbine selection is the availability of turbines on the market and current supply of generators to the Australasian market.

Another factor influencing turbine selection is contractual considerations of project delivery. Some turbine manufacturers currently also project manage wind farm projects within Australia (Suzlon, Vestas) for design, construct and delivery arrangements which are referred to as ‘turnkey delivery’ of projects. Benefits are obtained in contracting an overall delivery of the project by turbine suppliers experienced in design, construction and installation of turbines.

The final selection of the wind turbine generator model and capacity shall be determined during final design stages of the project. The type of turbine used will depend upon the availability of the turbine model at the time of procurement. Accordingly, the final turbine selection can only be carried out under a competitive tendering process once this development application has been determined and the final approval conditions are known.

Four wind turbine models have been considered in this report as outlined in Table 2.1.

2.2.3 Wind turbine 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 around 3 – 5 metres per second (11 – 18 km per hour) and gradually increase in production to their maximum capacity, usually at around 12 – 15 metres per second (44 – 54 km 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 again to a suitable level. Various operating constraints can be programmed into the control system to prevent operation under certain conditions.

2.2.4 Environmental considerations of turbine selection

As discussed in the previous section the final turbine selection will consider turbine supply, contractual arrangements, commercial considerations and environmental criteria. Wind turbine design is constantly being researched and developed increasing turbine power efficiencies, power quality, reducing overall weights and improvements in structure design, blade development and aerodynamics.

Table 2.1 Wind Turbine Models under Consideration

Turbine component	Turbine Manufacturer			
	Suzlon*	RePower	Vestas**	GE Wind
Turbine Model/Capacity	S88 (2.1MW)	MM92 (2.0MW)	V90 (3.0MW)	2.5xl (2.5MW)
Hub Height	100m	100m	105m	100m
Blade Diameter	88m	92.5m	90m	100m
Blade Tip Height	144m	146.25m	150m	150m
Rotor Swept Area	6082m^2	6720m^2	6082m^2	7854 m^2
Blade material type	Fiberglass/Epoxy	GFC shell construction	Fiberglass/Epoxy carbon	Fiberglass/Epoxy carbon
No of Blades	3	3	3	3
Rotational Speed (rpm)	Variable 15.0-17.6 rpm	variable 7.8-15 rpm	variable 8.6-18.4 rpm	variable
Cut-in wind speed (m/s)	4m/s	3.0m/s	4m/s	3.5m/s
Cut-out wind speed (m/s)	25m/s	24.0m/s	25m/s	25m/s
Rated wind speed (m/s)	14m/s	11.2m/s	15m/s	12.5m/s
Rated voltage	690/600V	690/575V	1000V	-
Rated frequency	50/60 Hz	50/60 Hz	50Hz	50/60 Hz
Noise (dBA at 8m/s)	106.3	105	102.0-109.2**	-
Lightning protection	Full	Full	Full	Full

Table 3.2 shows a list of wind turbines currently under consideration for the Kyoto Energy Park , together with key parameters of these turbines. All these turbines have been selected based on the suitability to low to medium wind conditions present on site. Final wind turbine selection would be carried out based on commercial considerations, turbine availability and environmental considerations which have been modelled on a worst case basis within this report.

This Environmental Assessment, and the related specialist studies, is based on the selection of a turbine which is representative of the ‘worst case’ scenario for consideration of environmental impacts (Noise and Visual Impact) associated with each turbine type. The turbines selected are:

Visual Impact Selection
The Vestas V90 3.0MW is one of the largest available wind turbines in the 2-3 MW range. This machine has been modelled in the Visual assessment for photomontages.

Suzlon S88 2.1MW.

This turbine has been cost competitive in Australia producing a high capacity factor due to the increased ratio of rotor diameter (88m to 90m) to generator capacity (2.1MW). The Suzlon s88 is expected to represent the highest impact case from a noise perspective. The current model utilises V3 blades with improvements in aerodynamics and noise reduction.

2.2.5 Wind Monitoring

There are currently two wind-monitoring masts located on Mountain Station that have been used in the evaluation of wind speeds and directions for the two sites. The first wind mast operating on the Mount Moobi escarpment was installed on the site in late 1999 by the Sustainable Energy Development Authority (SEDA), now the Department of Energy Utilities and Sustainability (DEUS). It is a guyed triangular lattice mast of nominal height 45m. The wind data has been recorded using an anemometer

Figure 2.3 - Mounting of the anemometer and wind

and wind vane installed at a height of 45m agl. A Data logger is installed closer to the base of the tower for logging ten minute mean wind speed and direction, standard deviation and maximum wind speeds.

Development consent for the construction of a second wind mast was granted by the Upper Hunter Shire Council on 13 May 2005. Wind Mast 2 includes anemometers installed at heights of 30m, 45m and 65m to record wind speed and direction, standard deviation and maximum speeds at 10 min intervals. The second wind mast was installed on Mountain Station in October 2006 and has been recording data since November 2006.

Remote monitoring of wind data is undertaken by Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO). The CSIRO record data on a monthly basis for preparation of a monthly report for the two masts. The CSIRO also maintain the service and calibrate the monitoring equipment under contractual arrangement with Pamada. It is proposed to continue operation of both masts to allow ongoing performance monitoring and independent verification of the site data during operational periods.

There is currently no wind monitoring on the Middlebrook Station site. It is proposed to install a wind monitoring mast on the Middlebrook site following development approval. An approval for the wind mast is not part of this application.

Note: As of February 2006 Wind Monitoring towers are considered 'exempt' development (SEPP No 4) and therefore do not require development consent if they have minimal environmental impact, less than 110 meters in height and are used for a period of less than 30 months.

2.2.6 Wind Turbine Layouts

The initial wind turbine layout for the two sites was undertaken by wind consultants Garrad Hassan Pacific Pty Ltd. The purpose of the initial assessment was to optimise layout based on wind speed characteristics of the site, and determine the projected energy capture for both sites. To prepare these layouts, Pamada provided Garrad Hassan Pacific Pty Ltd with key site parameters, including:

- general spacing requirements for turbine models;
- site boundaries;
- aerial photographs to determine extent of vegetation on site;
- site photos showing typical vegetation characteristics and distribution;
- topographical information (topography @ 10m contours);
- wind speed data collected on site by CSIRO (since 2000);
- operating parameters of selected representative wind turbines

Garrad Hassan Pacific Pty Ltd (GH) then optimised wind turbine layouts for both sites using a variety of specialised software packages including WaSP and Windfarmer. The wind speed and direction frequency distribution at the site mast at 45m height was derived for the period from January 2000 to September 2006, representing the wind speed and direction data recorded at Wind Mast 1.

Wind flow modelling was carried out to determine the hub height wind speed at the site mast location, as well as variations over the two sites relative to the anemometry mast. The long term energy production of each site was then calculated using the WaSP computational flow model taking account of array losses, topographic effects, availability, electrical transmission efficiency, air density effects, sector management and other potential losses. Energy production was determined for the Suzlon s88 2.1MW and the Vestas V90 3.0MW turbines.

The initial wind speed assessment and layout optimisation study prepared by Garrad Hassan (Nov 2006) indicated significant variability of wind speed across the site, which will help to explain the layouts proposed for each turbine type.

The original wind farm configuration included up to 47 wind turbines (35 at Mountain Station and 12 at Middlebrook Station) for both sites. Following environmental studies which took place in 2007 and early 2008 a final layout turbine configuration was determined. This included:

- Removal of 4 turbines from that initially proposed for the Mount Moobi plateau (Mountain Station) due to noise and optimisation of visual layout; and
- Removal of 1 turbine in close proximity to the Castle Rock plateau (Middlebrook Station) mainly due to visual considerations.

Further wind shear calculations (Garrad Hassan 2007) were performed using the latest collected data from the second wind mast which was installed in Oct 2006 on the Mountain Station site. This data was used to estimate wind speedup factors at the wind mast to be used in determination of wind speed at turbine hub heights of 80 and 105m on both sites.

Wind shear calculations were used to estimate long term mean wind speed averaged over each site at a hub height of 105m above ground level. The following conclusions were made using wind shear information up to and including Jan 2008.

- The long-term speed across all turbine locations at a hub height of 105m for the Mountain Station site is estimated to be 6.5-7.5 m/s.
- The long-term wind speed across all turbine locations at a hub height of 105m for the Middlebrook Station site is estimated to be 6.5-7.5 m/s.

When lengthy periods of wind regime data are not available it is usual to include long-term measurements from a local meteorological station. In this case, due to the long period of wind speed and direction monitoring, the onsite data was considered representative of the long term wind climate for the area. More detailed wind profiling and a turbine micro siting analysis will be performed on both sites following approval of the proposed development.

2.2.7 Wind turbine Micro-siting

Prior to construction the project will undergo a final engineering design phase as discussed in Section 3.4-Development Phases. During this phase a detailed Wind Energy Assessment will be undertaken by a specialist consultant using the preferred turbine model.

Following approval, final turbine locations would need to be micro sited to allow for the following:

- Slight variations in layout for each preferred turbine model (see Section 2.2.4) in accordance with the turbine manufacturers warranty;
- Optimisation of the layout for the selected turbine capacity i.e. 2MW or 3MW (spacing of turbines is mainly a factor of rotor diameter). Sufficient spacing between turbines prevents shielding of wind and reduced power output. Proposed models utilise a rotor diameter in the range of 88 to 100m based mainly on capacity)
- Detailed analysis of localised wind patterns over the land including a site inspection and detailed computer modelling for layout optimisation;
- Variances in geo-technical strength of sub grade material for turbine footings. Turbine footings would be designed during final design stages of the project.

There are many potential reasons for small changes to the preliminary wind turbine layout. These reasons may relate to construction issues, or energy considerations as described above. An allowance for micro-siting of each turbine structure by up to 150 m radius, from existing coordinates, would be required to accommodate final design variables, best practice engineering design and construction considerations as described above.

An allowance for these variations to turbine positions has been considered during all environmental investigations, site inspections and environmental considerations for the two sites. Any variances to turbine locations as a result of modifications to turbine layout would not increase likely impacts to environmental factors in each case. Turbine spacings would not be reduced as a result of micro-siting and therefore visual consistency of turbine clusters would be maintained as originally designed.

2.3 Mt Moobi Solar PV Farm

2.3.1 Preliminary solar plant investigation

During the initial project application stages a number of technologies were investigated for the solar energy component of the project. These included Solar-thermal variations and solar photovoltaic (PV) plants.

Essentially solar thermal electric power plants generate heat by using lenses and reflectors to concentrate the sun's energy. Because the heat can be stored, these plants are unique because they can generate power when it is needed, day or night, rain or shine. The solar thermal variations include parabolic troughs, parabolic dish and heliostat configurations for heating of a fluid or material for later conversion to steam. This steam would then be used to power a conventional steam turbine plant for generation of electricity. Other variations of solar thermal technology were also considered including the Compact Linear Fresnel Reflector (CLFR) system used to preheat water at the Liddell Power Plant.

There are rapid changes in solar technology developing in the field particularly in the area of storage of renewable energy. Hybrid variations can include even more variations for storage of solar energy used for manufacturing of SolarGas and geothermal storage of energy. SolarGas technology is currently being researched at the CSIRO National Solar Energy Centre (NSEC) in Newcastle.

Photovoltaic literally means ‘electricity-from-light’. Currently large-scale solar PV plants have not been as commercially competitive as wind and hydro options in Australia but their emergence is underway with some large scale pilot plants in some of the sun belt regions. One of the current disadvantages with solar photovoltaic plants are the large areas of land required to achieve comparably small outputs of energy. In addition the relatively high cost of solar cells has made PV Plants more expensive to build per MW than conventional solar thermal plants by comparison. This has generally limited the PV market to smaller scale applications such as rooftop PVs and for remote access power supply (RAPS).

A description of the technologies initially investigated at the project application stage is summarised in Table 2.2.

Table 2.2 - Solar Plant technologies investigated in Preliminary Assessment Report

Technology	Solar-receiver	Manufacturer (Example)	Description	Comments	Photograph
Solar-thermal	Solar Parabolic Troughs	Ausra Inc (US)	Consisting of curved mirrors which form troughs that focus the sun's energy on a pipe. A fluid, typically oil, is circulated through the pipe which is used to drive a conventional steam generator to create electricity.	• Environmental considerations • Water consumption for cooling towers • Viable for large scale plants >30MW capacity • More suited to sunbelt regions	
	Solar Parabolic Dish	Solar Systems (Australia)	Systems which consist of a parabolic-shaped concentrator (similar in shape to a satellite dish) that reflects solar radiation onto a receiver mounted at the focal point at the centre. The collected heat is utilised directly by a heat engine (or concentrated high quality photovoltaic cells) mounted on the receiver which generates electricity.	• Concentration of sunlight up to 500 times natural light intensity. • High efficiency photovoltaic cells used for higher gains • Higher cost of frame structure • Cost effective in higher sunbelt regions	
	Solar Central Receivers or	EnviroMission	Consists of a tower surrounded by a large	• Elaborate design with various receiver	

Technology	Solar-receiver	Manufacturer (Example)	Description	Comments	Photograph
Solar-thermal (cont)	"Power Towers"		array of heliostats or mirrors.	technologies mediums • Suitable for larger scale applications >30MW • Requires steam generation technology such as a steam turbine for electricity production	
	Compact Linear Fresnel Reflector (CLFR)	Ausra Inc	The first 35MW commercial plant under construction was at the Liddell Power Station in the Hunter Valley NSW as a pre-heater operating at 270°C using the existing coal plant turbines infrastructure.	• Cost effective technology used in the preheating of water for at Liddell Power Station • Requires conventional downstream steam generation turbine and recovery system	
Solar Hybrid	SolarGas™	CSIRO	SolarGas™ uses solar energy to increase the energy content of coal-seam methane or natural gas by about 26%. Hydrogen gas is generated which can be used in Hydrogen cells.	• Current pilot plant used at the Newcastle CSIRO facility • Requires methane or gas for conversion process.	

Technology	Solar-receiver	Manufacturer (Example)	Description	Comments	Photograph
Solar Hybrid (cont)					
Solar-photovoltaic	Fixed/single axis /dual axes or Concentrated structures	Sunpower Corporation (US) Meca-Solar (Spain)	Solar modules are mounted on either fixed, or tracking frames in an orientation to optimise sunlight over the daylight period.	• Modular system • No downstream infrastructure such as steam turbine generators/cooling towers • Reduced environmental considerations • Low maintenance • Remote monitoring • Generally low production output on commercial scale • High cost of cells	

The overall efficiency of solar thermal plants increases with size. That is, solar thermal plants are generally more adaptable to larger scale plants typically of at least 30MW, in high sun regions similar to that which exists west of the Great Dividing Range. However, given the current limitations to the technology for the size of the plant initially proposed (30-40MW) and other environmental considerations at the time, it was considered that a solar thermal plant in the order of 30-40MW capacity was unsuitable for the site.

A commercial scale solar photovoltaic plant was chosen as an ideal application based on the ability to supply power during peak demand periods. A further consideration was the ability to supplement fluctuations in wind power and efficiencies of grid integration and stability.

A full description of the Solar photovoltaic technology under consideration is provided below.

2.3.2 Solar Photovoltaic Technology and Application

PV systems use silicon cells to convert energy from sunlight into electricity. The DC electricity from PV modules is converted to AC by an electronic inverter(s). Systems can either be stand-alone or grid-connected. In grid-connected systems, the system produces power which is converted and fed into the grid. Silicon shortages on the global market have lead to growing need for thin film modules and concentrator PV systems. The Sliver Cell ™ was developed by the Australian National University (ANU) and uses 20 times less silicon than conventional cells, which significantly reduces the cost of production.

One of the major advantages of photovoltaic when compared to other solar technologies is that they produce electricity directly from sunlight and do not require a thermal conversion process such as a steam turbine. This reduces infrastructure considerations, operational costs and also environmental concerns associated with solar thermal systems. Solar photovoltaic technology was seen as an environmentally acceptable and potentially cost effective technology for the Kyoto Energy Park based on the following considerations:

- low overall environmental impacts associated with infrastructure i.e. no requirements for fluids, steam turbines and cooling towers used for solar thermal conversion systems;
- reduced on-site maintenance costs and on site operational requirements as compared to solar thermal systems;
- ability to remote monitor system performance and ease of maintenance;
- utilisation of the existing 33kV internal HV electrical network for reduced transmission and connection costs;
- utilisation of site substation to reduce electrical infrastructure costs;
- balancing of power output intermittency with combined generator technologies;
- ease of installation of components mainly due to off site prefabrication of solar trackers and modulation of cell panels;
- reduced transportation requirements in comparison to solar thermal systems;
- utilisation of on-site staff and local technical skills for operation and maintenance

Photo-Voltaic plants are very effective energy generators for small quantities of power which is why they have been effective in remote locations all over the world. The transition from small scale and remote application to medium sized applications is emerging in some overseas countries such as Spain, Germany and the US. Solar PV micro-generation is disadvantaged in Australia as the market fails to take into account of the true value and many benefits to the electricity network which arise from the adoption of renewable energy technologies embedded within the electricity grid. Solar PV, like other renewable energy sources, provide environmental benefits through reduced greenhouse gases and atmospheric pollution, and social benefits through industry development and job creation, each with related economic benefit.

The emergence of these systems in Australia will depend largely on Government policies and incentive schemes, feed in tariffs, cost reductions from global developments and improvements in cell efficiency. Very significant global investment is going into solar-voltaic design efficiency, engineering and cost of manufacture. Currently the most efficient photo-voltaic solar cells manufactured in the world have a foreseeable life span of approximately 25 years.

The Solar farm component of the Kyoto Energy Park is designed to be modular in nature. Additional capacity can be added by adding additional solar modules. Solar modules can be supported on frame structures varying from fixed to concentrated. Total overall capacity of the farm will be based upon final system design.

2.3.3 Viability of Commercial Solar PV Plants

Solar photovoltaic plants are generally expensive for large scale electricity generation. This is due to the relatively high cost of solar modules and the required large surface area of solar modules for electricity production. The proposed Mt Moobi Solar PV farm has been designed based on most suitable and viable technology for the site conditions. Large-scale applications (2-30MW) have been developed overseas but have been supported by government programs for implementation and overall higher electricity prices.

As an example in 1991 the German government introduced the Electricity Feed Act, legally regulating the feed-in to the grid of electricity generated from renewable resources. This act required utilities to purchase electricity generated from renewable resources at set rates (feed-in tariffs). The scheme, originally introduced in 1991, was expanded and enhanced in 2000, and has been responsible for the dramatic growth in Germany's renewable energy market and the solar photovoltaic industry in particular. The quantity of electricity fed into the grid from eligible sources has more than doubled, with a seven-fold increase in installed solar photovoltaic (PV) capacity to over 1,500 MW by the end of 2005. By comparison, at the same time Australia had in the order of 7MW of grid-connected solar PV, or less than 0.5% of Germany's capacity.

Australia currently supports renewable energy schemes through overall capital funding allocations for selective projects. Recently some states have introduced solar feed in-tariffs for electricity generated by solar panels however this has been limited to rooftop PVs (non-commercial scale) at this stage.

The Mt Moobi solar PV farm has been designed based on site conditions, peak operating sunlight hours, commercial considerations and a cost effective and viable combination of solar panels and tracking designs. Options for solar design have been included in this report (see Section 2.38). The final solar option is to be decided based on commercial considerations, procurement of cells and frames, cell efficiency, and government funding.

2.3.4 Solar PV Site suitability and location

The Mt Moobi plateau was chosen as an ideal location for the solar photovoltaic plant due to the
- availability of cleared flat land;
- good exposure to annual peak sunlight hours (PSA);
- and potential to absorb upstream infrastructure costs associate with transmission reticulation.

By co-locating this new PV power plant with other renewable generators (wind turbines and mini hydro components) the Kyoto Energy Park infrastructure and the associated interconnection and transmission facilities, will be optimised. As a result, the impact to the immediate environment is minimal and the project completion timeline will be shorter. The PV power plant is expected to serve customers in Scone and surrounding areas.

The area is relatively flat and located on what is part of a disused grassed private airstrip which is used infrequently for accessing the Mountain Station property by private light aircraft. The location of the Mt Moobi Solar PV Farm is illustrated in Figure 2.4 below. There is approximately 15 hectares of flat and an additional 6 hectares of relatively flat land for utilization i.e. Total area of utilization of 15-21 hectares. Minor earthworks may be required on the additional 6 hectares of land to dependent on the final option used for the solar plant.

During the investigation stages other areas within the Middlebrook and Mountain Station sites were identified as suitable for large-scale solar modules, which may be investigated in future stages.

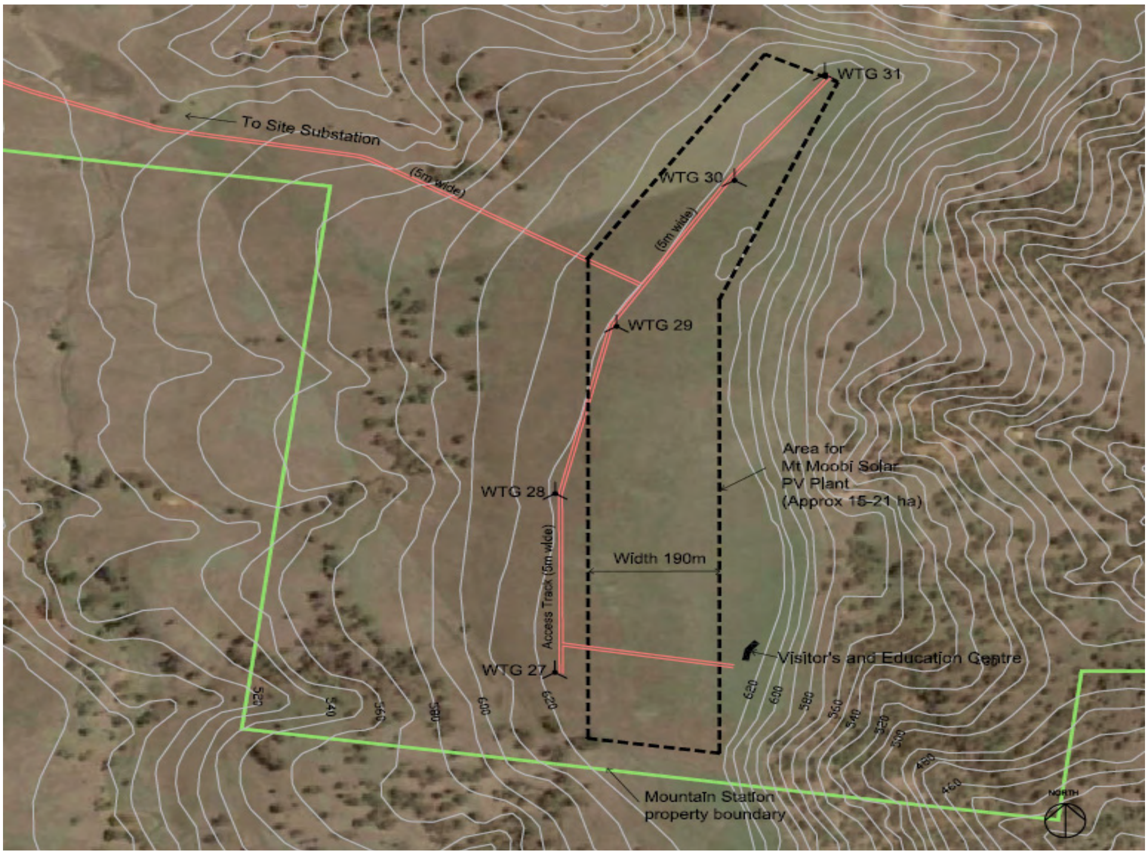


Figure 2.4 Location of Mt Moobi Solar PV Farm

2.3.5 Solar PV Options

Maximum plant capacity and estimates of gross power output have been designed on a maximum solar photovoltaic area of 21 hectares. The size of the Mt Moobi Solar PV Farm and configuration will depend on the type of supporting structure selected. Fixed structures allow for longer cells or rows, whereas power tracker structures are designed to carry between 10-35kW solar modules each.

Four solar options are being considered in the final layout for the solar farm component as shown in Table 2.3.

Table 2.3 Estimated Solar PV Plant Size for Different Structures Types

Description	Solar Photovoltaic Plant Options			
	1. Fixed Structure	2. Single Axis Tracker	3. Concentrator Photovoltaic (CPV)	4. Double Axis Tracker
Expected land use (ha/MW installed)	2	2-3	4-5	2-6
Estimated Plant capacity (MW)*	10	7-10	4-5	3-5
MW per structure	0.1	0.01	0.035	0.01
Number of structures	Up to 100	Up to 1000	Up to 150	Up to 1000
Area covered by solar modules (ha)	8.1	6.5	4	4

**Assuming a total site area for photovoltaic array of 21 hectares (Mt Moobi Plateau)*

2.3.6 Solar PV Design and Electrical Infrastructure

The Mt Moobi Solar PV Farm will be composed of the following electrical infrastructure:

- Up to 1000 Solar modules
- Up to 1000 supporting structures (fixed, single, dual axes or CPV trackers)
- 0.690kV low-voltage reticulation system
- Up to 6 step up 0.690/33kV substations
- 33kV HV reticulation system
- Metering cubicles
- Lightning protection

An indicative single line diagram of the proposed electrical infrastructure is provided in Figure 2.5.

2.3.7 Solar Modules

The solar farm will be composed of photo-voltaic solar cells which will be regrouped in solar modules with an output of a few kW (generally sold in panels of sizes 10W to 140W capacity). Solar modules will be mounted on supporting structures to allow for greater areas of cells for commercial installation. The frames may be fixed or mobile to allow PV racks to follow the Sun's path, increasing efficiency. Solar modules generate a DC current which is generated at low voltage of few hundred volts. Normally, the DC output of the solar module is converted to 50Hz AC current via a power inverter in each individual module, which would be mounted on the supporting structures.

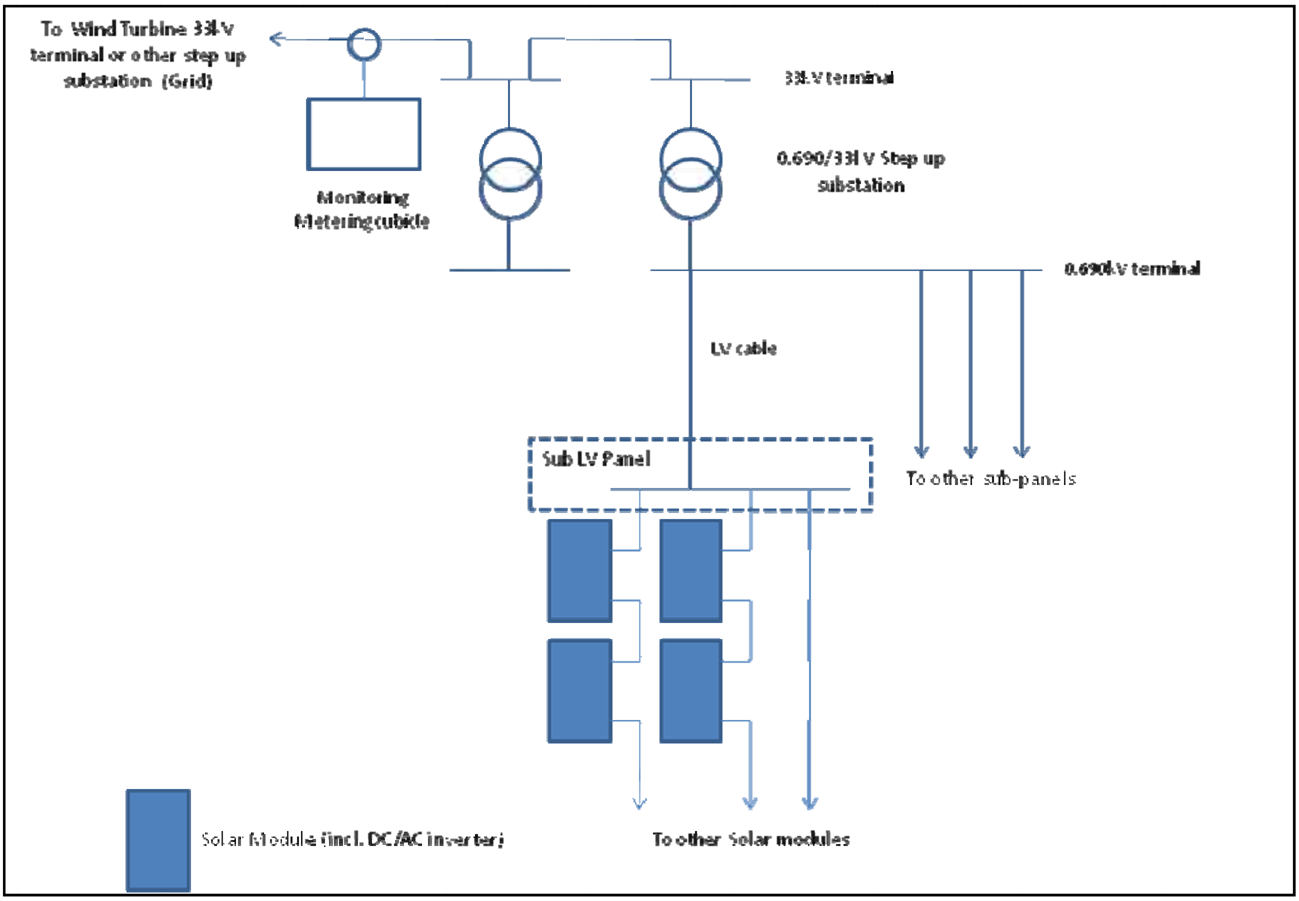


Figure 2.5 Mt Moobi Solar PV Farm Electrical Installation (Econnect 2008)

Solar panels would be sourced from Australian suppliers (eg BP Solar, Origin Energy) or internationally from Europe, China or the US. With the cost of cells a major cost of the project the supply would be based on a commercial decision.

2.3.8 Supporting Structure Options

A number of structure designs remain under consideration including fixed tilt, single or double axis power tracker, or concentrating dish structures as described below.

Option 1- Fixed Tilt / Fixed Orientation Structures

Fixed tilt structures are a simple frame structure made of steel or aluminium. They are designed to position the solar modules in the optimal fixed incident angle for sunlight. Fixed structures are generally configured in rows. The dimensions of the structure would depend on the final design; however, it is expected to be no more than 4 metres high and less than 10 metres wide. Row length will depend on final configuration; however, it is not expected to be greater than 200 metres. Figure 2.6 shows an example of a fixed structure installation. The structure's foundations are made of wire mesh reinforced concrete. The foundations are fixed with earth bolts that have a minimal sealing impact on the ground.

Figure 2.6- Solar PV Fixed Supporting Structure (Example)

Power Tracker Frames (Single or Dual Axis Tracker Structures)

Single or dual axis tracking systems are mobile structures also known as power trackers. They are designed to enhance solar panel energy production when compared to fixed structure design. This is achieved by continuous adjustment of the solar panel inclination to an optimal incident angle for sunlight, dependent on the movement of the sun and meteorological conditions. Power trackers are powered by three phase AC induction motors and controlled by a PLC controller usually connected to a GPS or a meteorology station. Power trackers are fitted with individual DC/AC inverters and their own protective electrical cabinet. The power tracker foundations are made of wire mesh reinforced concrete. Structures are designed to carry solar modules of up to approximately 10-15kW and are able to withstand strong winds of up to 140-170 km per hour depending on the manufacturer and tracker used. In the event of high winds, some structures are programmed to set panels in a horizontal position to minimize wind loading on the structure.

Option 2 - Single-Axis or Horizontal Trackers

Single axis horizontal axis trackers consist of a series of long horizontal tubes supported on bearings mounted upon pylons or frames. The axis of the tube is on a North-South line. Panels are mounted upon the tube, and the tube will rotate on its axis to track the apparent motion of the sun through the day. Since these do not tilt toward the equator they are not especially effective during winter mid day (unless located near the equator), but add a substantial amount of productivity during the spring and summer seasons when the solar path is high in the sky. These devices are therefore less effective at higher latitudes such as Australia. The principal advantage of these systems is the robustness of the supporting structure (for high wind areas), the simplicity of the mechanism and the lower cost of installation.

Since the panels are horizontal, they can be compactly placed on the axle tube without danger of self-shading and are also readily accessible for cleaning. Also a single control and motor could be used to rotate multiple rows of panels. Horizontal axis systems are therefore simple in design and installation, more compact and require minimal foundation construction. They are therefore less costly to install. Overall cell efficiency of these systems is limited in lower latitudes such as Australia with the single axis tracking system, reducing power output efficiency of the overall system.

Tracked arrays substantially improve the amount of power produced by a fixed system by enhancing morning and late afternoon performance. Strong afternoon performance is particularly desirable for grid-tied photovoltaic systems, as production at this time will match the peak demand time for summer season air-conditioning. For residential loads this peak period is normally in the mid to late afternoon. In very hot summer days this peak period can extend to 6 or 7pm in the evening.

Figure 2.7 – Solar PV Single Axis Power Tracker Supporting Structure (Example)

Option 3 - Dual Axis Solar tracker

The dual axes tracker follows the sun's path, using a controller, motor, and drive to rotate the PV array. That gives between 18% and 35% more energy output than rigid systems in which the panels are installed at a fixed angle of inclination. The systems use a galvanised, corrosion-resistant steel frame, and withstand high winds up to 130km/hr (MecaSolar). The construction scales from small to large multi-MW installations.
A typical dual-axis solar tracker system under consideration is shown in Figure 2.8.

Dual axis trackers are ideally mounted on high support structures to avoid contact of the rotating PV array with the ground. Improvements are also made in the cell efficiency by increasing air-flow around the back of the array for cooling of the cells which increases cell performance. The performance of crystalline silicon cell arrays can decline with very high temperatures, where ventilation is limited and the cell temperatures can be 30 to 40 degrees higher than existing air temperature.

Figure 2.8 Solar PV Typical 11kV Dual-axis Tracker (Courtesy of Meca Solar Pty Ltd)

A 7.5 m3 concrete foundation would be required for each tracker foundation based on a 11kW module. Up to 1000 units have been allowed for in the design. Solar trackers are delivered to site on flat bed truck and bolted on to the foundation. Cell panels are delivered to site and fitted to the tracker frames prior to erection onto the tracker base.

Other indirect benefits to using solar trackers include the ease of installation and minimal earthworks requirements for large areas of sloping gradients. Solar trackers also reduce the amount of ground coverage required making it easier for grazing of livestock with minimal disturbance, which maintains the grass cover to a suitable height.

Option 4 Photovoltaic Concentrator (PVC)
Solar photovoltaic concentrator technology (PVC) is different from conventional PV installation. Curved mirrors, grouped to form a dish, are used to concentrate the sun 500 times on an array of closed packed, high efficiency PV cells. The mirror and the PV array are mounted on a power tracker as described. PVC structures are taller than the conventional PV system. Structure height is expected to be in the order of 14 metres. Structures are designed to withstand wind loading of up to 190 km. In the event of wind above 50km per hour the system is designed to horizontally orient the dish to minimize wind loading on the structure.

2.3.9 Other components of the Solar PV plant

Low-Voltage (LV) Reticulation system
A number of solar modules will be connected in series to form solar arrays. Solar arrays will be connected in parallel to sub-distribution LV switchboards (Sub-Panels). These sub-panels will collect the plant output, provide electrical protection of solar arrays, and will be used as a transition point to increase LV cable sizes before connecting to the step-up substations which may be located at a distance of a few hundred meters. LV cables may be installed above or underground, unenclosed or enclosed depending on final design. Sub-panels are relatively modest in size (e.g. 1000 x 1000 x 200mm) and will be mounted either on the solar system

structure or on a small stand alone post.

Figure 2.9 – Example of a Photovoltaic Concentrator Structure (PVC)
(Courtesy of Solar Systems Australia)

Lightning Protection

Lightning protection of the Solar PV System would be in accordance with standard practice for solar structures and electrical systems. Solar tracker units would be earthed with a lightning rod to protect inverters, and component electrical systems. Underground cables would also be earthed as per normal design.

Step-up substations

Groups of sub-panels will be connected to a single step-up substation. The step-up substation will be composed of an LV switchboard, 0.690 / 33kV transformer and 33kV switchgear. All the equipment will be enclosed in an outdoor kiosk. Pad mounted transformer sizes have not yet been selected, but are expected to have a rating between 1.5 and 2.5MVA. Based on a 2.5MVA step-up substation, the footprint will be 3 x 8 x 3 metres (dimensions are inclusive of the concrete slab). At this stage up to 6 step-up substations are expected to be distributed around the proposed site. Final locations will depend on detailed design.

Medium voltage (MV) reticulation system

The step-up substations will be electrically connected together via 33kV underground cables. The solar farm output will be connected to the grid via one or several wind turbine 33kV terminals depending on final design.

Monitoring and metering

Independent monitoring and metering of the solar farm output may be required and will be installed in an outdoor cubicle. The dimensions of this may be expected to be 3 x 10 x 3 metres. Figure 2.10 shows an example of such a cubicle.

Figure 2.10 – PV Farm - Monitoring & Metering Cubicle (Econnect)

2.4 Mini Hydro Plant (Closed-loop)

2.4.1 Introduction

Hydropower is one of the most cost-effective and reliable energy technologies available for clean-electricity generation. Sometimes referred to as 'pumped storage' or 'load balancing' the hydro-plant is used to store surplus electrical energy in water as potential or stored energy. This energy is later released for generation of electricity into the grid during peak demand periods or high electricity pricing. Stored hydropower is different to conventional stream or lake feed micro hydro turbine systems which supply a constant rate of electricity from constant flows.

Conventional 'pumped storage' plants pump water from a lower elevation reservoir to a higher elevation reservoir at times when electricity demand is low, usually at night times. The water is later discharged during high peak demand periods (usually the day) when electricity pricing is highest. Pumped storage plants have also been used in large-scale applications for balancing of power output from conventional generators and reducing the need for installation of expensive peaking plants.

A major advantage of larger pumped storage systems is the ability to flatten out load variations on the grid, permitting thermal power stations such as coal-fired plants that provide base-load electricity to continue operating at peak efficiency while reducing the need for "peaking" power plants that use costly fuels such as gas and diesel. Thermal plants are much less able to respond to sudden changes in electrical demand, potentially causing frequency and voltage instability. Pumped storage plants can respond to load changes within seconds. Pumped storage is currently one of the most cost-effective and efficient means of storing large amounts of electrical energy on an operating basis.

Although overall losses from the recharging procedure makes the pump storage plant a net consumer of energy overall, the system increases revenue by selling more electricity during periods of peak demand, when electricity prices are highest. Small scale decentralised peaking plants can be cost effective and efficient because they reduce the need for installation of centralised and large-scaled generation plants (traditionally coal fired plants).

Pumped storage and hydro generation is well suited to meeting these peak demand spikes, however scarcity of water resources means there is little opportunity for further large or medium scale hydro generation developments within Australia. Hydro power alone represents approximately 82% of NSW's current renewable energy generation capacity. The Snowy Mountains Hydro Scheme is the major contributor representing 3.5% of Australia's total generation capacity to the grid.

We have recently seen the effects of drought on large scale hydro power. In 2007 the escalation of the drought had a sever effect on the project with plans to increase flows through cloud seeding and even plans to shut down the Snowy operation until water levels in the dams were replenished (Reuters Foundation 2007).

2.4.2 Proposed 1MW Mini-hydro Plant (Closed Loop)

The proposed Closed loop mini-hydro plant (referred to as mini-hydro plant) would be a mini generation plant of 1MW total capacity. The system has been designed to supply electricity for short periods (discharges or bursts) during peak periods of electricity demand on the grid or during unstable variations in power output. The system is closed (sealed) and therefore has minimal water requirements. The final capacity of the holding tanks have not been finalised but are expected to have a detention time in the order of between 30 mins to 4 hours duration.

The main benefits of the mini-hydro plant are:

- to satisfy peak electricity demand;
- to generate revenue during peak demand and high electricity pricing;
- for load balancing of intermittent power generation mainly from wind turbine generators;
- storage of renewable energy from wind and solar generator components during low electricity demand periods or low electricity pricing

Peak demand period

The peak demand peak is driven primarily by lifestyle changes such as more appliances in the home for example larger electrical appliances (particularly air conditioners), more computers, larger televisions etc.

Building electrical infrastructure is the traditional solution to meeting peak demands periods on the grid. Electricity infrastructure is a costly and inefficient use of capital because it is required for less than 1% of the year (during peak periods). Such infrastructure can be in the form of building a peaking generator/s or new interconnectors (or increasing the capacity of an existing interconnector) to take advantage of excess capacity in another state/s whenever possible.

Other generator types are even more expensive, and some, such as wind generators, photo-voltaic cells, brown and black coal generators are not well suited to peak generation. Hydro plants respond to rapid fluctuation in demand with discharge and electricity generation relatively instantaneously.

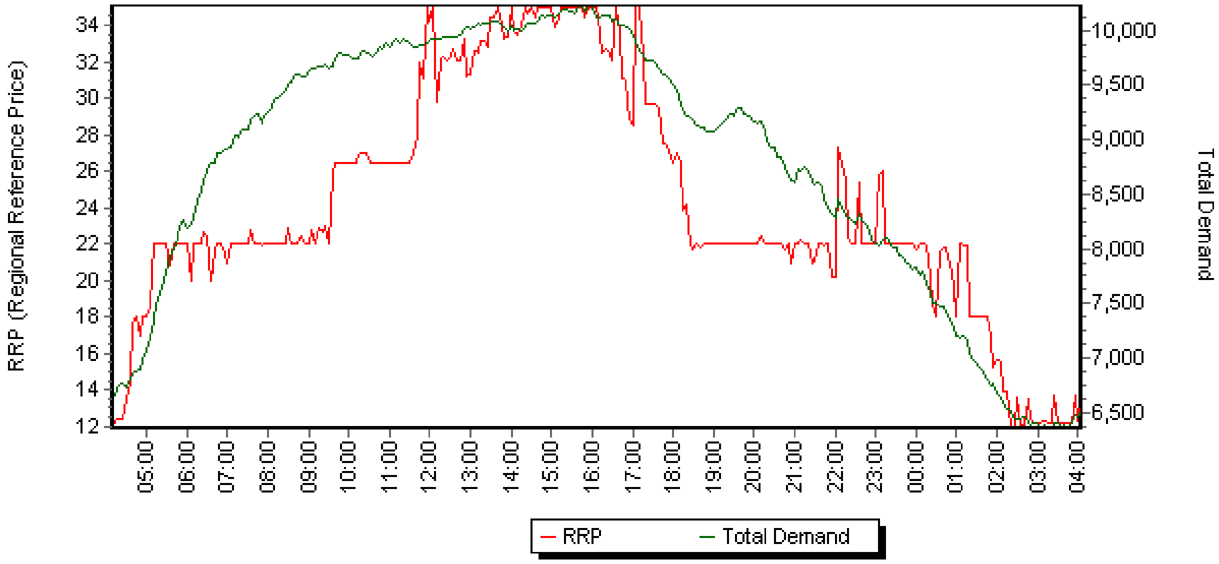


Figure 2.11 – Example showing Wholesale electricity price versus demand (NEMMCO 2008)

Peak electricity pricing

The wholesale electricity price (RRP) can rise from an average of around $34/MWh to a maximum of $10,000/MWh in any five minute period. Wholesale price peaks are not necessarily linked to a demand peak (it may be a failure of plant or other supply side constraint that causes the wholesale price to peak), but generally higher demand causes an increase in the wholesale price. Price rises may occur for short periods of time as shown in Figure 2.11 below.

The mini hydro plant would be used as a peak generator during periods when electricity pricing is high. Fluctuations in demand would need appropriate monitoring of market prices to determine optimal conditions for discharge. Hydro plants are considered one of the most efficient (around 90-95%) for conversion of electricity.

Load Balancing of power output

Electricity industry operators keep deviations in frequency and voltage within acceptable limits to prevent network faults and maintain security. Renewable energy generators such as wind and solar are considered intermittent power sources and therefore power output fluctuates with variables such as weather and seasonal patterns, topographical features (eg turbulence), wind turbine layout, and long term phenomena such as climate change.

This variability in power output will affect the 'smoothing factor' of the combination of generators in supplying optimum power quality to the grid connection. The 'smoother' the combined power output or the more predictable the supply to the grid (forecasting) the easier the integration of the Kyoto Energy Park onto the grid. Wind turbine layout (as and example) has a significant influence on power variability (as each turbine is operating under variable localised wind conditions) and hence power output fluctuations can be reduced. This smoothing effect can also reduce turbine infrastructure costs (such as reactive power compensators) needed to improve power quality for connection to the grid. In weak grid networks power quality and 'phasing' are extremely important and affect overall network integrity, security and final pricing.

The operation of various renewable technologies (including solar, wind and hydro) will greatly improve the power quality and phasing of the Kyoto Energy Park into the grid. The mini hydro plant will be used to balance variability in overall power supply to the grid for power smoothing effects.

Pumped storage of renewable energy

Currently large scaled electrical energy generated by the Kyoto Energy Park cannot be stored cost effectively and must be delivered to the grid during operation of the various generator components. The operation of the main renewable components (wind and solar) will be determined by the weather conditions favourable to each technology.

Power generated on site by the solar and wind farm components of the Kyoto Energy Park would be used to recharge the system. Recharging of the closed system would occur during low electricity demand periods, while discharging would take place during high peak demand periods and for load balancing of power output during instable network conditions. As described above this system has conventionally been used on large scale dam hydro applications for balancing supply and as a peaking plant. The Kyoto Energy Park mini hydro plant can either be monitored on site or remotely to allow optimum discharge of the system.

By using renewable energy sources to store electricity during low electricity demand net energy consumption is positive, however electricity is sourced from renewable sources. Conventional pumped storage reservoirs are not replenished by streams and evaporation losses can be significant over large storage areas. This is a significant consideration in a large scale plant and of particular importance in hot climates such as Australia, where water resources are valuable. A closed loop system has been designed to improve efficiency of the system and reduce overall water usage in charging the system. Losses within the system are expected to be negligible with any net water usage sourced from within the site from rainfall runoff.

2.4.3 Site suitability

The location of the mini hydro plant has been determined based on a site inspection of the Mountain Station site by Pamada. The exact site was chosen based design parameters of slope gradient (approx 50%), uniformity of grade (for ease of construction) and initial environmental considerations such as noise, flora and fauna, Indigenous heritage and visual.

The site is predominantly cleared of vegetation on upper reaches, with exotic grass species existing over the area for grazing purposes. Some scattered trees are present on the lower reaches which would be selectively removed during construction of the plant facility and lower tanks (see Figure 2.12). During the environmental assessment stage inspections were made and considerations given by individual consultants in key areas as summarised below.

2.4.4 Noise Issues

A noise assessment of the mini–hydro plant under construction and operational conditions was undertaken by Wilkinson Murray. Noise during operations has been modelled based on worst case conditions (i.e. cumulative noise impacts for the full operation of Kyoto Energy Park facilities

including wind turbines, solar plant and mini-hydro plant, under adverse wind conditions). The nearest residence is 2.5 km away from the proposed mini hydro plant. The cumulative noise impact associated with the operation of the mini hydro plant under worst conditions would be below background noise levels at closest residence.

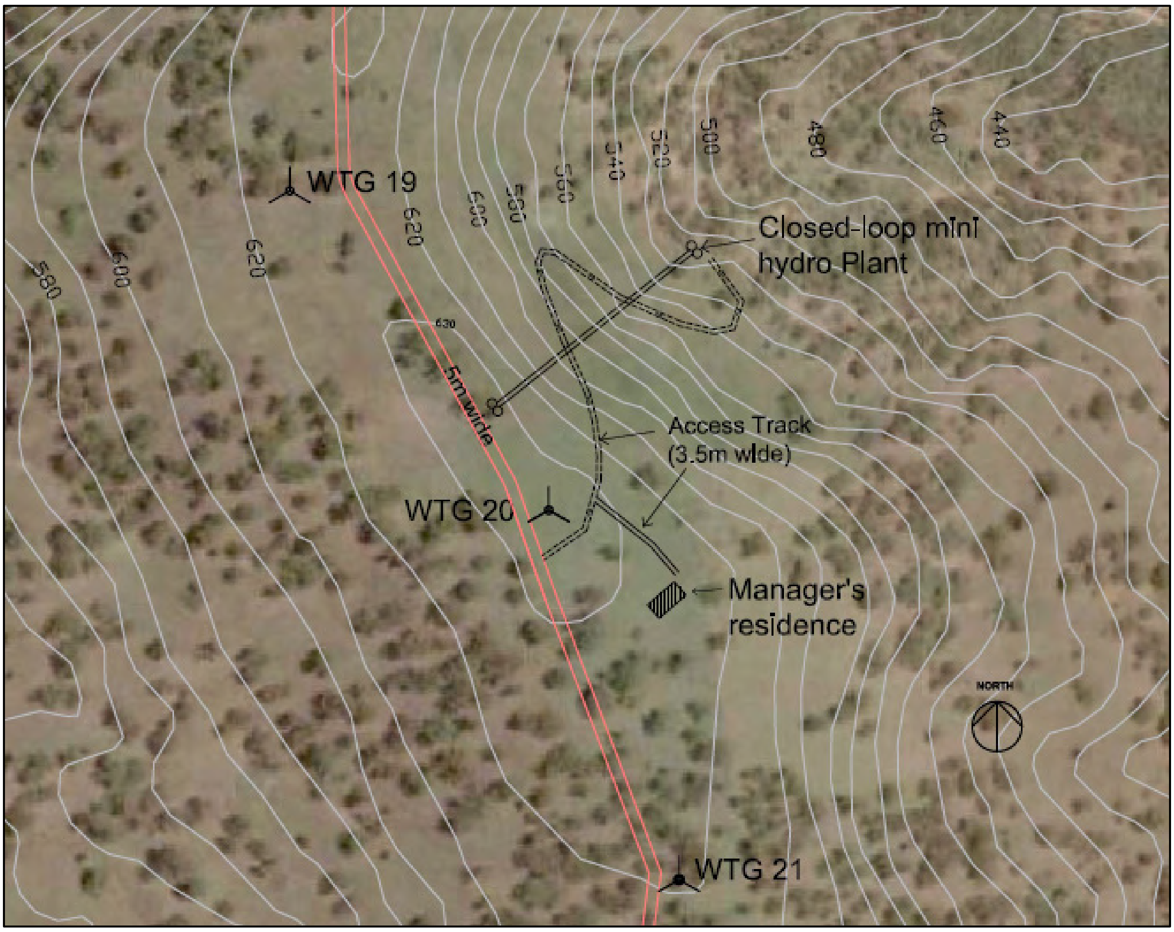


Figure 2.12 - Location of the Mini Hydro Plant- Closed-loop

To achieve noise criteria the plant units would be fully enclosed in a shed structure to limit the SWL noise emission at source to below 120dBA.

2.4.5 Heritage Issues

As site inspection for Indigenous artefacts and cultural significant of the location was undertaken by Myall Coast Archaeological Pty Ltd. A site inspection and survey was conducted on two separate occasions (13th and 30th August 2007), with Indigenous stakeholders and Aboriginal groups, Myall Coast representatives and Pamada representatives all in attendance. No artefacts or Aboriginal objects were uncovered during the site surveys on both occasions. The area has been extensively cleared in the past and under inspection was unlikely to contain Aboriginal Artefacts or objects. No objections to the site were made by Indigenous stakeholders present. No recommendations for further work prior to construction were made.

2.4.6 Flora and Fauna Issues

An inspection of the location and surrounding areas was undertaken by Conacher Travers Pty Ltd for significant flora and fauna species. The area is predominantly cleared of vegetation and has been replaced with exotic pasture for grazing purposes. Tracts of disturbed Box Woodland Grassy Forest community are present on the lower reaches (see Figure 8.0 in Section 8.0). This community is a variant of the White Box Yellow Box Blakely's Red Gum Woodland however the location has been extensively cleared and disturbed and correspondingly has significant exotic grass species and effects from nearby grazing.

Removal of this vegetation for construction of the mini hydro plant in the lower reaches will be minimal. Replanting and revegetation will be undertaken as part of the site restoration process following construction activities.

2.4.7 Visual considerations

Consideration of visibility of mini hydro plant (particularly the header tanks) from extremities of the site has been taken into consideration. Based on the visual impact assessment it was recommended that the header tanks be painted with an olive green colour and vegetation screening be adopted for the header tanks.

Design of the screening vegetation shall be detailed in the Vegetation Management Plan prepared during the final design stages of the project prior to commencement of construction.

2.4.8 Mini-hydro Plant (Closed loop) Design layout

The proposed mini-hydro plant (1MW) is simple in nature. Water will be sourced from on-site or trucked in and used to fill the header tanks. Additional top up water will be collected from rooftops during rainfall, diverted and stored in the tanks located at a high point. This stored water has a potential energy storage called 'gross head' which is the vertical distance measured between the header tank and the outlet. This potential energy is then converted to kinetic energy (moving energy) when water in the header tank is discharged under gravity.

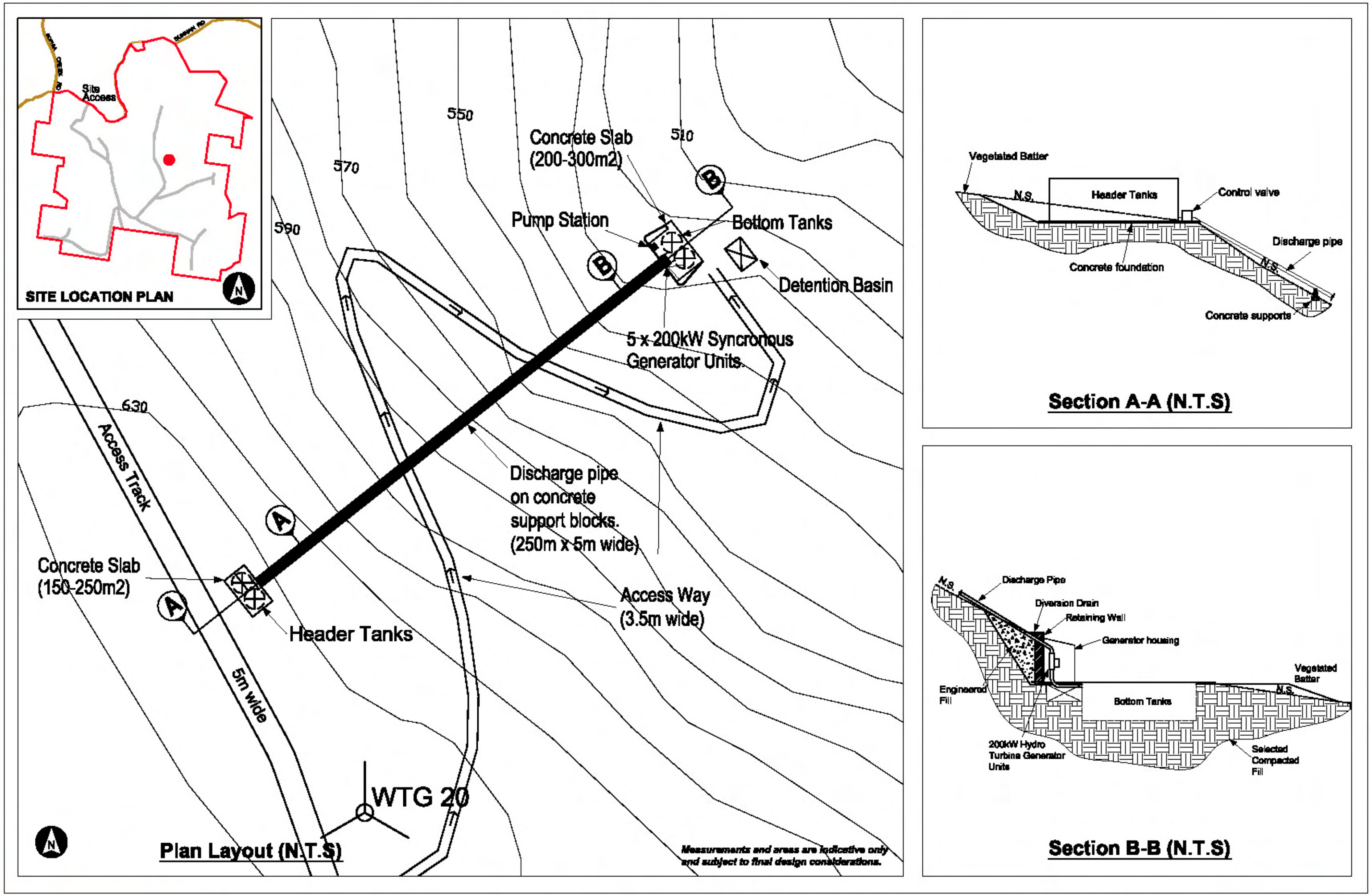
Discharging water drives a series of smaller hydro turbine units located at the lowest point of the loop. The impact of the water on turbine propellers generates electricity which is reticulated into a small connecting step-up transformer and reticulated into the site substation. At times of low electrical demand, electricity from renewable devices from solar photovoltaic and wind turbines are used to pump water into the higher reservoir. When there is higher demand, or as the power regime requires, water is released back into the lower tanks through the mini-hydro turbines, generating electricity. Reversible turbine/generator assemblies may be used as a pump and turbine combination.

Electricity for reverse pumping of water to header storage shall be sourced from excess energy generators from the wind and/or solar plants. A dedicated low voltage cable will be feed from the site substation to supply power to the plant. A separate control cable will also link the plant with the control room at the site substation for on site monitoring of the system.

The preliminary design of the mini hydro plant is shown in Figure 2.13. Final design of the plant will be undertaken during final design stages of the project. Design parameters will consider:

- Size of header/lower tanks and detention time
- Geotechnical and Reinforced concrete design;
- Installation of 5 x 200kW (rated capacity) synchronous generator hydro units
- Size and grade of pipe(s)
- Control facilities
- Top up water storage from Managers Residence

Figure 2.13 illustrates the overall preliminary design of the Mini Hydro Plant (Closed Loop).



Kyoto energypark | *Figure 2.13 - Mini hydro Plant (Closed Loop) - Preliminary Design*

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2.5 Internal Electrical Transmission Infrastructure

2.5.1 Site Substation

A substation would be constructed on the Mountain Station site for connection of all proposed electrical generators. The proposed substation has been situated in a flat area that is clear of vegetation and with minimum visibility to traffic along Bunnan Road. The substation site has been inspected for aboriginal and archaeological significance, flora and flora species or habitats, visual considerations and bushfire risk, by individual consultants. These issues are addressed in further sections to this report.

The site is suitable for construction access, fire protection and access for inspections and maintenance for utility network staff. The substation is also located on the Mountain Station site to reduce electrical losses associated with transmission of power to connection point options. The substation would contain a control room, compound area and 66 kV/132kV switchyard, all enclosed within a chain wire mesh security fence. The area of the substation compound would be typically 60m x 40m. The final design of the substation would depend upon the connection agreement and final electrical design of components.

Each of these components of the substation is described in further detail below. The location of the site substation is shown in Figure 2.14.

Switchyard

The switchyard would contain up to two transformers. The transformers would be installed on concrete raft foundations, with oil bunding around the perimeter. Two 33 kV/415 V local service transformers would be located within the bunded area. A below-ground oil separation tank would be installed to separate oil and water. The separation tank will be sized to allow for total loss of oil from a transformer.

Control Room

The control building would contain instrumentation, control and communications equipment, a small workshop, meeting room, kitchen, and a 33 kV switch room housing the switchgear, protection and communications equipment with associated power and low voltage cabling.

The control room would contain a centralised computer SCADA (Supervisory Control and Data Acquisition) system. The computer within each turbine is linked to the control room by fibre-optic communication cables laid in the same trench as the electrical cables. The SCADA system enables monitoring and controls of all wind turbines within the wind farm component, either from the control room or remotely. The SCADA system continuously scans the information received from the wind sensors in each turbine and optimises the performance of each turbine for the current wind conditions.

The control building would be of concrete slab on ground construction with steel frame, metal or brick walls, a non-reflective sheet steel 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 will be air-conditioned.

A telephone connection to the control building would be required to allow remote monitoring and control of some of the Kyoto Energy Park components. This connection could consist of overhead telephone lines or a satellite connection.

Standard 240 V/ 415 V power would also be installed at the control building. The control building will be located within the site substation as shown in Figure 2.15 or adjacent to the substation, and is expected to be a joint facility for control of the substation as well as the mini hydro and solar generators. The control building will occupy around 60 m2 (10 metres by 6 metres). A perimeter area within 25 metres of the substation and control room will be managed as an Asset Protection Zone to maintain low fuel levels.

Bund Wall

The noise assessment recommended as a precaution the construction of a 4m high bund wall around the north westerly edge of the proposed site substation. This is proposed to eliminate any possible noise exceedances at the nearby Clifton Hills Estate as a result of the operation of the substation. The bund wall will be constructed with clean overburden sourced from within the site, topsoiled and grassed with native grasses species suitable for the application.

A preliminary design layout of the site substation is illustrated in Figure 2.15 below.

Figure 2.14 - Location of Site Substation and Maintenance Building (Mountain Station)

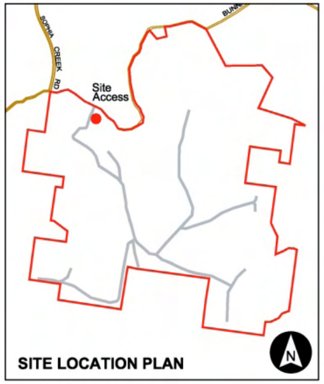
2.5.2 Internal power cables

Internal power cables shall be reticulated from the each generator component (wind turbines, solar PV plant, mini hydro plant) to the site substation.

Within each wind turbine, or in the adjacent pad-mount transformer, the power voltage is stepped up from generation voltage to 33,000V (33kV) for reticulation around the site. Each wind turbine must be connected together at reticulation voltage, and then connected to the site substation. 33,000kV step up transformers would also be used for the solar photovoltaic plant (up to 6) and mini-hydro plant (1) prior to reticulation into the underground 33kV cables.

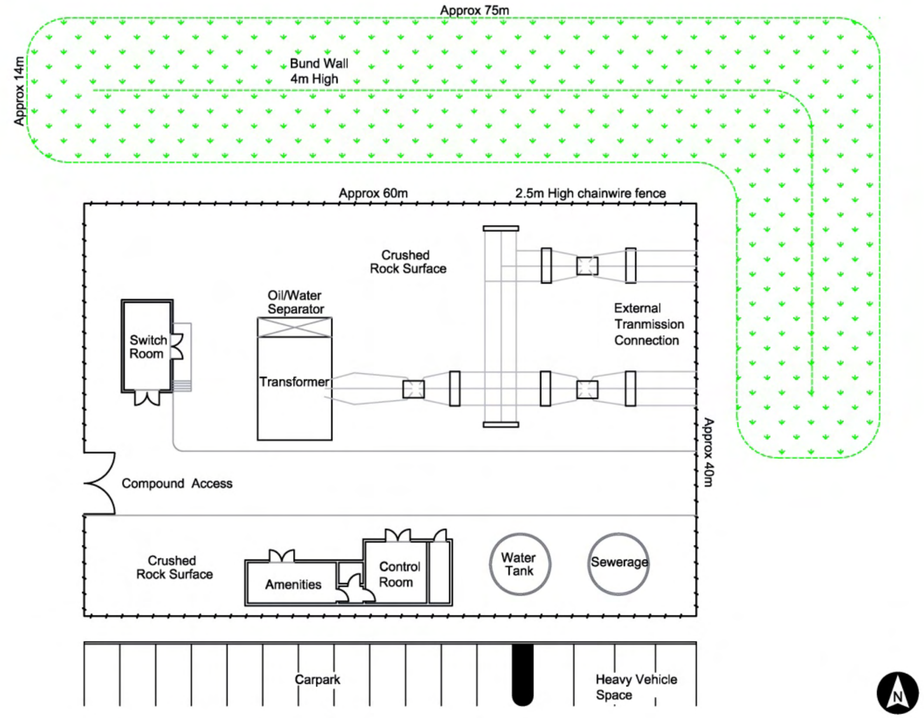
Permanent internal cabling would be installed, connecting the power output of each generator back to the site substation. Cabling would be located in buried service trenches. Underground cabling will be used along visible ridgelines to reduce the overall visual effect of the proposal. Underground cabling would generally run adjacent to the site access tracks, and include both electrical cables, control and fibre optic cables. Trenches will be approximately 1.5 metres deep and 0.75 metres wide. Independent control cables would likely be used for wind turbines, solar and mini-hydro systems.

There is approximately 14,900 metres of internal power cable for the Mountain Station site and 6,200 metres on Middlebrook Station.

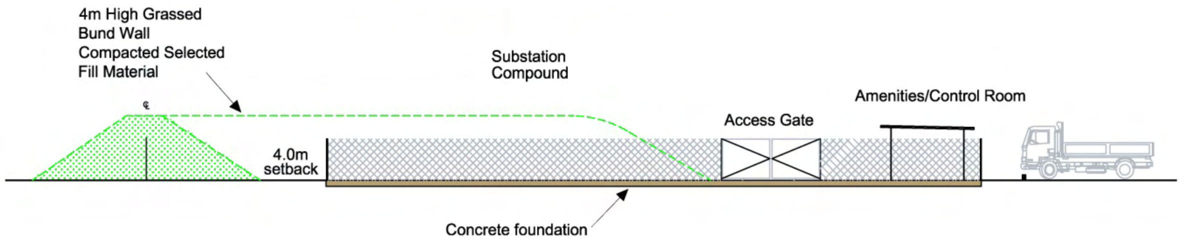


NOTES :

1. Final design os site substation to be completed prior to construction.
2. Approximate dimensions are shown based on preliminary design of substation compound (Econnect 2008)
3. Grassed bund wall shall be designed in accordance with recommendations from Wilkinson Murray Acoustics and as shown in this diagram.



Site Substation - Plan (N.T.S)



Site Substation - Eastern Elevation (N.T.S)

Kyoto energypark | *Figure 2.15 - Site Substation (Preliminary Design Layout)*

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Control Cables

Control cables that enable monitoring and control of turbine operation will be co-located in trenches with the power cables. Cable trenches would, where possible, be dug within or adjacent to access tracks to minimise any related ground disturbance. Short spur connections would come off a main cable run which would approximately follow the access track route on site.

In addition to the power reticulation cabling, control and communications cabling is required from the control building to each wind turbine. A dedicated control cable will be installed from the solar PV plant and the mini hydro plant to the site substation. 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.

2.5.3 Internal Access tracks

Internal access tracks are required, both during construction, and operation, to enable construction and ongoing maintenance of the wind farm infrastructure, in particular the turbines. i.e. the construction access roads will become the permanent access roads upon completion of construction activities.

Access tracks would be upgraded to 5m wide with a top layer of gravel supplied from an existing road base/gravel quarry in the area. New access tracks would be constructed in certain areas to provide access to the ridgeline and turbine and substation positions where required. The grade of tracks would not exceed 14%. The tracks would include drainage trenches to collect rainwater runoff from the compacted surface of the track. All access tracks would be permanently retained to provide ongoing access during operation of the Energy Park.

Table 2.4 below summarises the total length of existing and newly constructed internal access road required under the proposal.

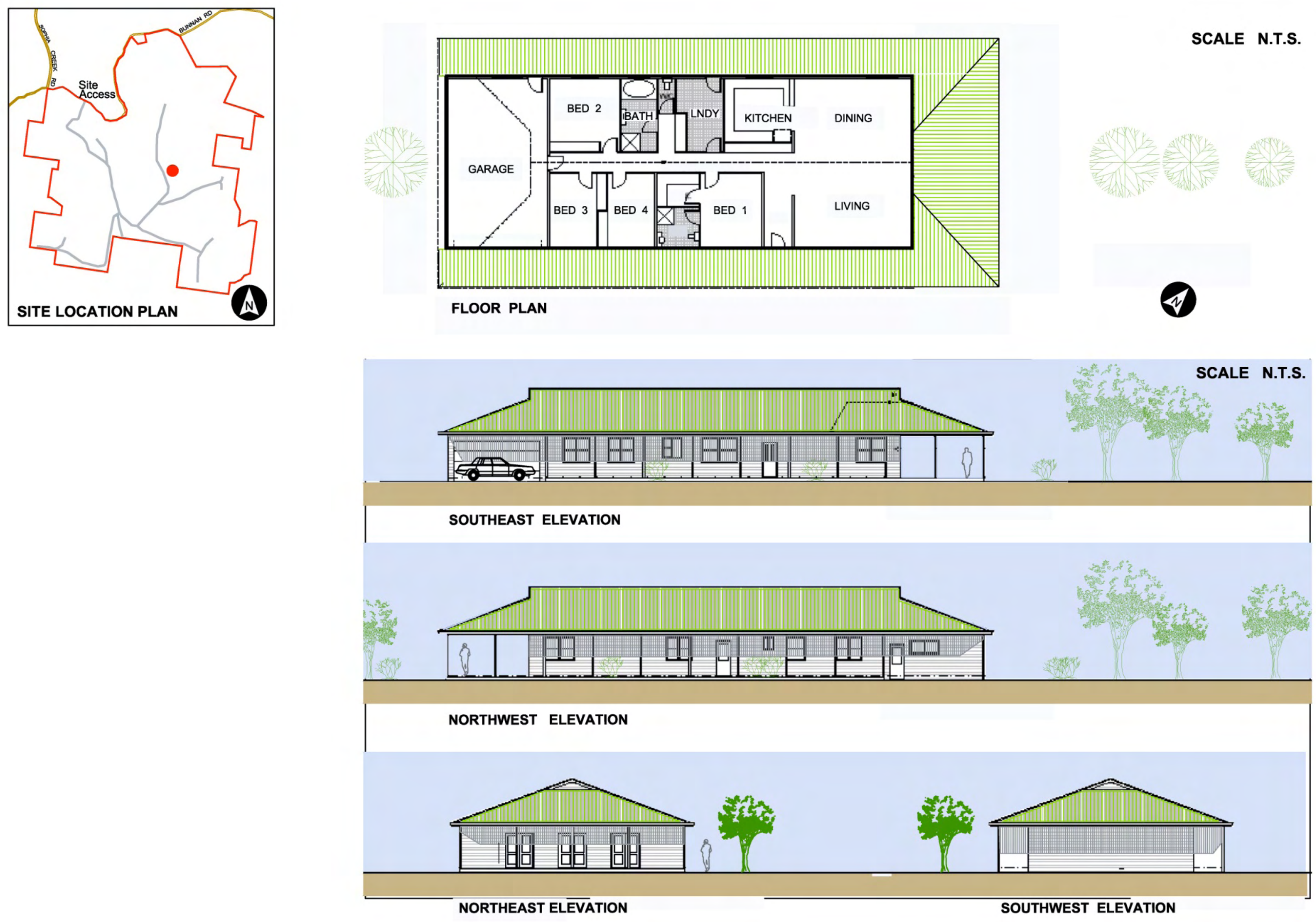
Table 2.4 - Length of Internal Access Tracks and Material selection

Site	Length of Existing Access road (m)	Length of new access road (m)	Total length of access road (m)	Construction Material
Mountain Station	11658(85%)	2112(15%)	13770 (100%)	DGB road base
Middlebrook Station	9047(97%)	310(3%)	9357(100%)	DGB road base
Total	**20.71km**	**2.42km**	**23.13km**	-

2.5.4 Manager's Residence

The Manager's residence would be used as accommodation for the Energy Park Site Manager.
The proposed location of the residence is in close proximity to Wind turbine 20 on Mountain Station. The house will be screened with vegetation with minimal visibility from the extremities of the site. The location of the proposed Manager's Residence is shown in Figure 2.12 and a typical design of the proposed Manager's Residence is shown in Figure 2.16.

Final design of the Managers Residence shall be undertaken during final design phases subject to approval. The residence shall be of similar size to a typical of 4 or 5 bedroom house.



Kyoto energypark | *Figure 2.16 - Manager's Residence (Conceptual Layout)*

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2.5.5 Visitor's and Education Centre

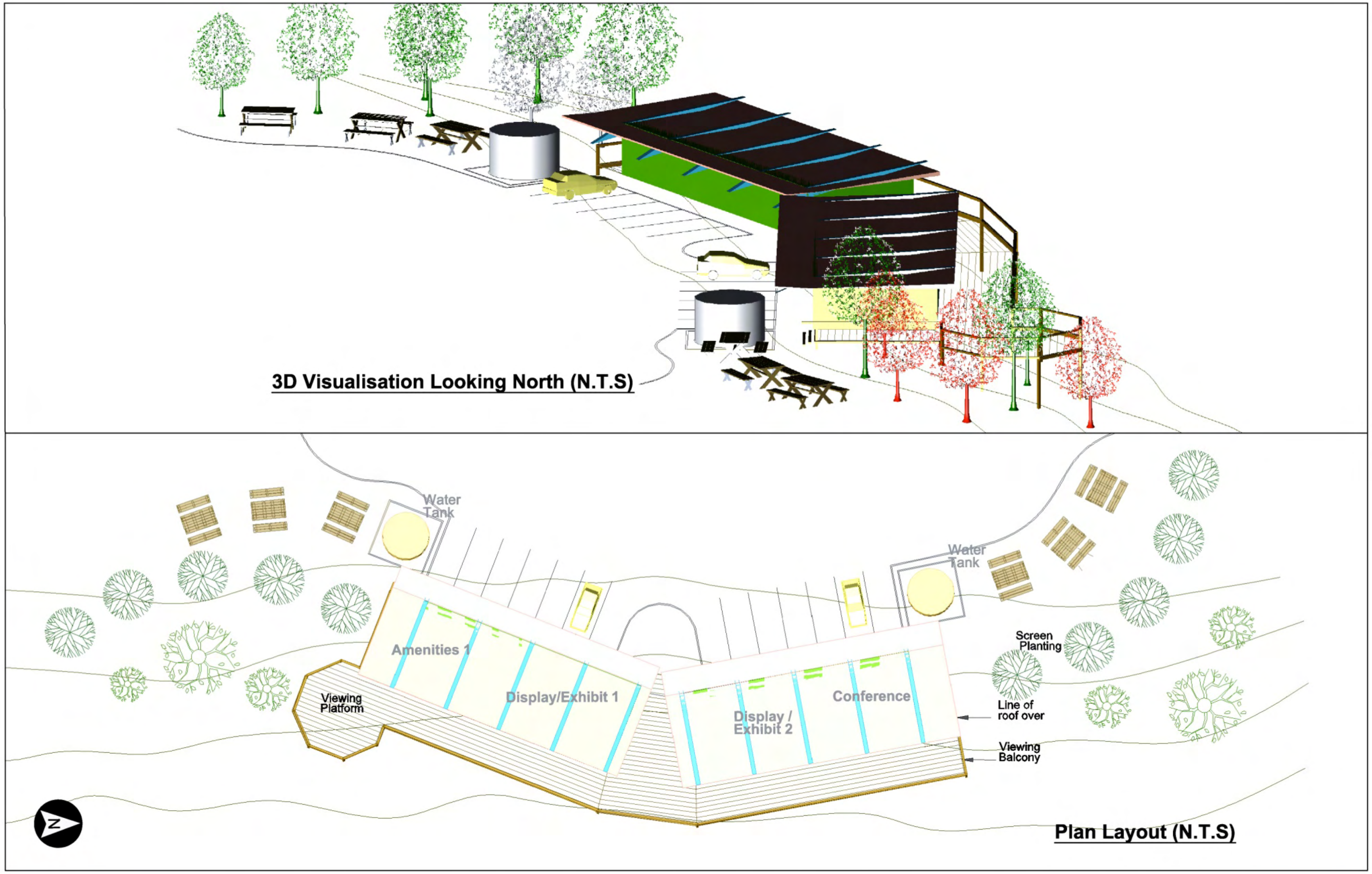
It is proposed to construct a Visitor's and Education Centre on the Mount Moobi escarpment at Mountain Station adjacent to the proposed Mt Moobi Solar PV Farm. The final layout of the centre may include an Indigenous heritage display, information about the Kyoto Energy Park, conference facilities, educational displays and amenities and a viewing balcony. The objective of the centre is to provide information for visitors, educational facilities, displays and research development for the Energy Park.

During operation of the park facilities, it will be used by organised groups, educational institutions and research institutions. The facility would be initially open on a part time basis for organised tours, educational and scientific uses and conferences. This would limit the amount of traffic using the site.

Existing tourist operations based at Middlebrook Station would continue to operate and merge with proposed activities. Following further development of the facility it may be opened on a more regular basis dependent on demand for use.

The proposed location of the Visitors and Education Facility is shown in Figure 2.4. A preliminary design of the centre is presented in Figure 2.17 below. A 3D visualisation of the centre is illustrated in Figure 2.17(i).

Final detailed design of the Visitors and Education Centre shall be undertaken during the design phase of the project. The centre shall be of sized based on agreements reached between third parties for possible use of facilities such as educational institutions or Indigenous groups. The overall internal floor space of the centre would typically be in the order of 400-600 sqm. Approximately 10-15 carspaces would also be provided behind the centre.



Kyoto energypark | *Figure 2.17 - Visitor's & Education Centre "Boomerang Place"*

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NOTES :

1. Building to comply with requirements of Kyoto Visual Assessment Study 2008.
2. Final design to be completed prior to construction.

3D Visulization - View looking North West (N.T.S)

Kyoto energypark	*Figure 2.17(i) - Visitor's & Education Centre (3D Visualization)*	This drawing is protected by copyright. Reproduction or publication of the whole or part of the drawing without a license of the owner of the copyright is an infringement of copyright.	pamada	A4

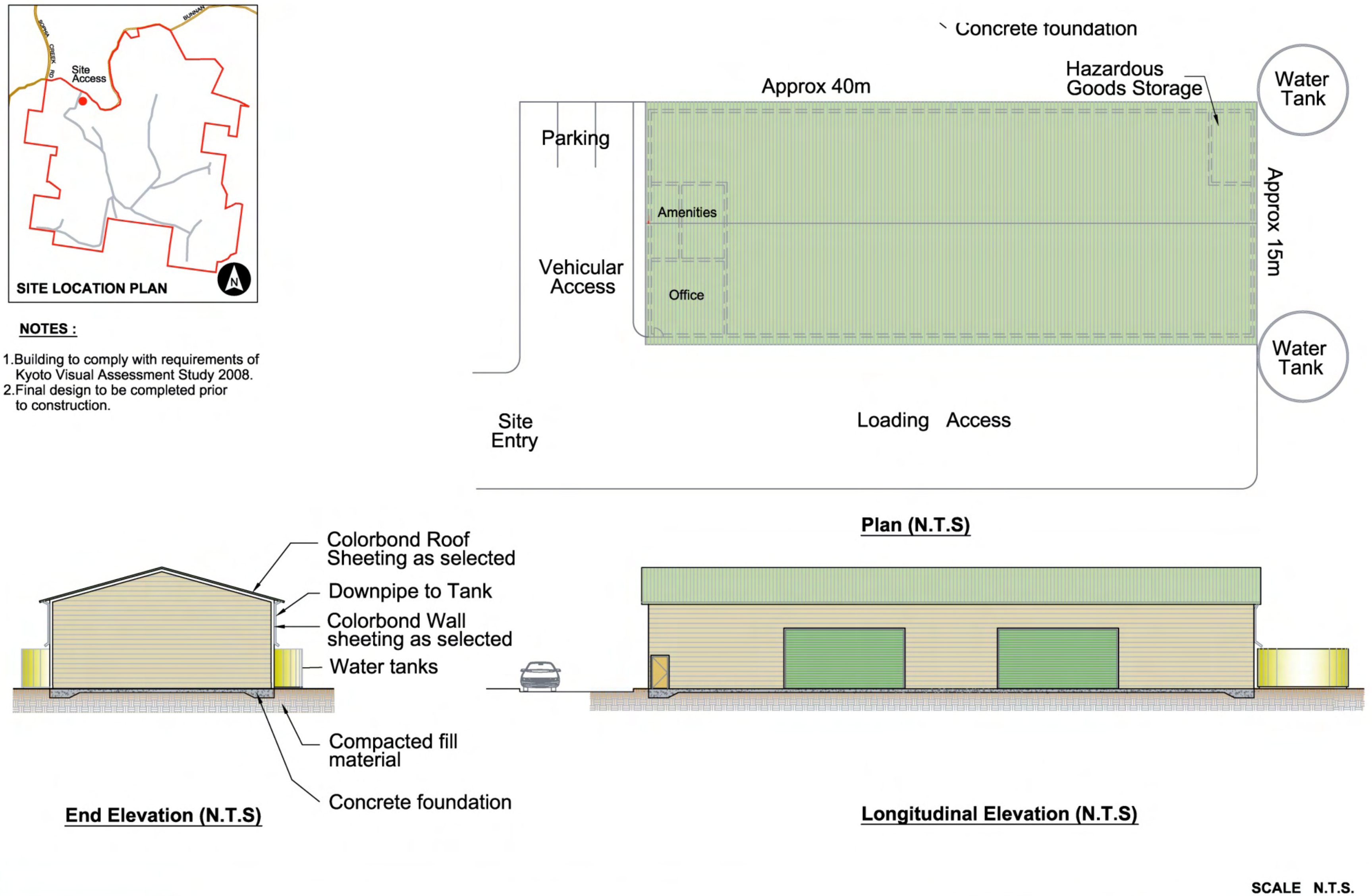
2.5.6 Maintenance Shed

It is proposed to construct a maintenance shed of approximately 40 metres long by 15 metres wide in close proximity to the site substation as shown in Figure 2.14. The building is located close to the site substation while remaining at a low visibility when viewed from the site extremities. Its location is close to the main access road at Mountain Station to facilitate ongoing operations and maintenance. The building will house instrumentation, electrical and communications equipment, routine maintenance stores, a small work area and staff amenities. A water storage tank would be used to store rainwater for use on site in the building and on site.

An option for a dual septic tank/ aerated tank system would also be considered in combination with the amenities facilities from the control room. A small shed-sized structure for storage of flammable liquids, hazardous chemicals and chemicals for servicing the turbines would be provided internally. Hazardous goods that would be stored include solvent cleaners, turbine lubrication oil and grease and hydraulic fluid. The store would be constructed of concrete and built within a fully bunded area of the building. Smoke/fire detectors and fire fighting equipment as appropriate and as required by regulation, would be provided.

The structure is proposed to be a slab on ground construction with steel portal frame, metal or brick walls and a sheet steel roof. It will be of sturdy construction, suitable for the weather conditions it will be exposed to and will be visually compatible with the rural environment surrounds.

The preliminary design layout of the Maintenance Shed is illustrated in Figure 2.18 below.



NOTES :

1. Building to comply with requirements of Kyoto Visual Assessment Study 2008.
2. Final design to be completed prior to construction.

Kyoto energypark	*Figure 2.18 - Maintenance Shed (Preliminary Design Layout)*	This drawing is protected by copyright. Reproduction or publication of the whole or part of the drawing without a license of the owner of the copyright is an infringement of copyright.	pamada	A4

File path : Z:\01 Pamada\60 Kyoto\04 Design\EA Report\Figures\Maintenance Shed

2.5.7 Site Utility Services

Domestic Water Supply
Town water supply would not be connected to either of the two sites or to any proposed facilities under this application. Water supply to the site will be mainly from rainfall runoff from rooftops. Storage tanks will be used to store rainwater generated from all rooftops. The tanks will be used for amenities in all building facilities. Water would be required in the site substation for domestic use. Rainwater would also be collected from the maintenance building and control room facility building roof and stored in a rainwater tank to provide water for use at the site, with a reserve water storage tank available for 'top up' from potable water delivery. Additional potable water would be transported to the site by truck and stored in water tanks within the compound when rainfall generated supply is low.

Water for Dust Suppression
During the construction stage of the project water will be required on an intermittent basis for dust suppression on access roads and also for landscaping works. Additional water for dust suppression and landscaping may be sourced from existing dams located at either Middlebrook or Mountain Station. During dry conditions water would be trucked to site. A maximum of 3 water trucks per day have been assumed for use however this will vary based mainly on weather conditions (temperature, wind) but also during intensive traffic usage.

Water for Firefighting
The proposed Kyoto Energy Park project is located on land that is bushfire prone. Conacher Travers have undertaken a full assessment of Bushfire risk potential for facilities located on site. A separate water tank shall be installed at each of the building sites (Managers Residence, Maintenance Shed and Visitors and Education Centre) solely for the purposes of backup water for fire fighting purposes. Water for these tanks shall be sourced from rooftops of the individual buildings, with additional top up water trucked in. For full details refer to *Section 18.4.2.3 Water Supply for Firefighting.*

Sewage Disposal
All sewage from the site substation, maintenance building, Managers residence and Visitor's and Education Centre would be treated in either a composting septic tank system or self composting system. Self composting toilets may be used for treatment of septic waste and grey water for infrequent use at the Visitors and Education Centre. Suitable subsoil conditions for hygienic disposal will need to be investigated in proximity to these facilities to allow for possible wastewater aerated, clarification and irrigation systems. Final type, size and capacity of systems will be specified during the final design of the system.

Waste Disposal
Only small amounts of domestic waste would be generated on a day to day basis and would be stored on site and removed by an appropriate licensed contractor. Disposal of oil and other hazardous chemicals shall be undertaken by licensed maintenance contractors during the operation of the site.

Farm Electrical Supply
The electrical system internal to the site will be designed to allow electricity to be drawn from the existing grid network during times when no power is being generated by the wind turbines, mini-hydro or solar array. An auxiliary transformer would be installed in the substation to allow for domestic power supply to the substation and maintenance building during operation. This electricity would be required for normal operation of the substation and other domestic buildings and facilities. A separate dedicated meter shall be installed for use by the landowner for continuation of farming activities at Mountain Station.

Kyoto Energy Park Scone is wholly an Australian Enterprise. The Management is 100% Australian.
The funding of this proposal and report is 100% Australian.
An Australian Project

Kyoto energypark

3. Project Development Phases

3.0 PROJECT DEVELOPMENT PHASES

3.1 Construction

3.1.1 Stages of Construction

The construction phase of the proposed development would be undertaken in a single stage for all works over an estimated 20 months duration. The sequence of construction activities can be described as follows:

Mountain Station Works

In general works proposed for the Mountain Station site shall constitute the following activities:

- site establishment;
- transport of personnel and materials to the site by road;
- access track construction, turbine hardstand pads and trenching for underground cables;
- installation of underground power and control cabling;
- turbine foundation construction;
- delivery and erection of 31 turbine structures on Mountain Station;
- construction of a Solar Photovoltaic (PV) Plant of up to 10MW capacity on Mt Moobi Plateau;
- site substation construction and installation;
- construction of the overhead 66kV(Option1) or 132kV (Option2) external transmission line connection to the local electricity grid;
- connection of the site substation to the external grid connection;
- installation of a temporary site depot and laydown area, including restoration and removal on completion of construction;
- delivery and installation of a concrete batching plant for concrete production and removal on completion;
- construction of the 1MW Mini Hydro Plant (Closed-loop);
- construction of a 10m x 40m (approximate) Maintenance building
- construction of a Manager's residence
- construction of a Visitor's and Education Centre on Mt Moobi
- Commissioning of the wind farm
- Decommissioning and restoration of the site

Middlebrook Station works

In general works proposed for the Middlebrook Station site shall constitute the following activities:

- Site earthworks including access track construction, turbine hardstand pads and trenching for underground cables;
- installation of underground power and control cabling;
- turbine foundation construction;
- delivery and erection of the turbine structures;
- 33kV overhead transmission line connection of the Middlebrook site to Mountain site substation via Bunnan Road;
- Construction of overhead communications lines for connection of Middlebrook Station turbines to Mountain station site substation.
- commissioning and testing of wind turbines
- Decommissioning, restoration of the site

3.1.2 Site Offices and Depot

A construction depot comprising site office facilities and a laydown area for storage of turbines components prior to erection, would be located on the Mountain Station site for use during the construction period. The proposed area is located in a cleared grassed area free of significant vegetation or vulnerable and threatened habitats. No trees or shrubs shall be removed for the site depot and laydown area.

The area has been inspected for indigenous artefacts and is not located within an area of heritage significance or near an item of heritage significance. The site depot would contain, approximately 4 demountable office spaces, storage tanks sized for amenities and emergency requirements, 2 pump out toilet blocks, a meeting room, an amenities and a first aid room and carparking area for construction staff and contractors. All buildings would be temporary and would be removed following completion of construction activities. A temporary 2 m high chain wire mesh fence would surround the site depot for safety and security. Night time lighting and security services would be provided during the construction period.

The adjacent laydown area would cover an approximate area of 1000m2 and be used to store turbine components prior to erection, cable drums, containers, workshops and machinery used on site. The site shall be maintained during he construction timeframe and fully removed and rehabilitated at the completion of construction works.

The proposed location of the site offices and depot are illustrated in Figure 3.0.

Laydown Area

A laydown area located at Mountain Station will allow temporary storage of turbine components, solar frames and modules and other components arriving to site prior to erection. The laydown area is also required for unpacking of containers, and used by various wind turbine and electrical technicians to install and prepare the nacelles, hubs and blades. Tower sections are generally taken directly to the turbine erection platform however in some cases may be stored at the laydown area until required.

The laydown area has been located adjacent to the site depot in an area that is cleared, shielded from excessive wind, flat, and ideally placed in between the site access point and turbine erection platforms.

The proposed location of the laydown area adjacent to the site depot is illustrated in Figure 3.0.

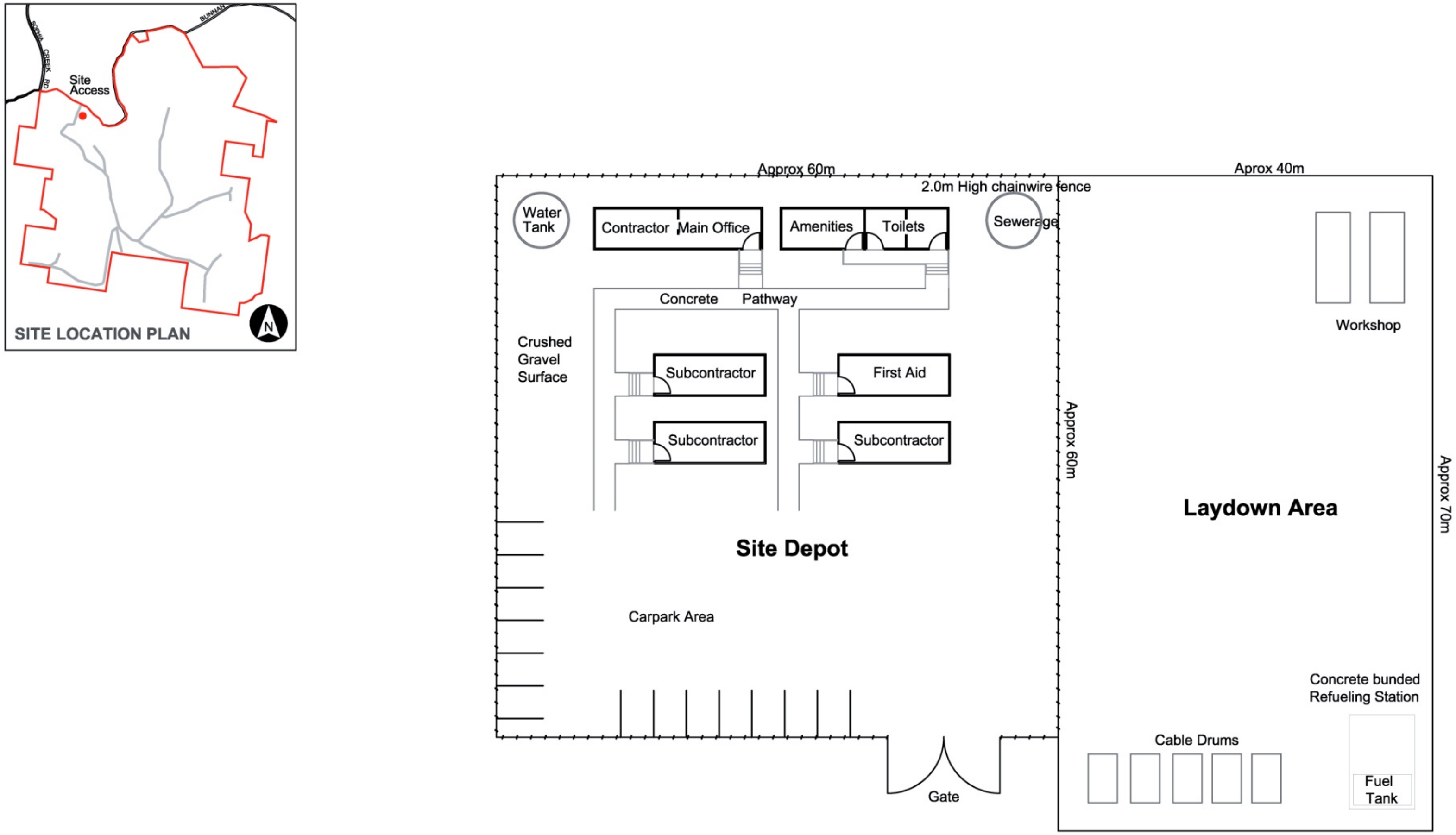
3.1.3 Concrete Batching Plant

During the construction process a concrete batching plant would be set up to supply high strength concrete for concrete works including wind turbine foundations, building slabs and solar frame foundations. The batching plant may also be used in other concrete works including in-situ concrete tanks for the mini hydro plant, concrete foundations for building pads and other minor works. The batching plant will reduce overall traffic generation especially during labour intensive periods around foundation works. Ready-mixed concrete would be used in some instances for smaller works. Ready mixed concrete would be sourced locally for smaller jobs such as building foundations or where the batching plant is not in use. Traffic estimates for the construction phase are summarised in Table 3.0. and have assumed that additional movements for building slabs and incidentals generated in relation to ready-mixed concrete for some works.

The concrete batching plant would be located at Mountain Station near the existing access road in a suitably flat area away from dry creeks of drainage depressions. The on-site batching plant will require a level area of up to 50m x 35m onsite to locate the loading bays, hoppers, cement and admixture silos, concrete truck loading hardstand, water tank, and bins for aggregate and clean sands. Depending on the final location, the site may include an in-ground water recycling first flush pit to prevent dirty water escaping onto the site, and would be fully remediated after the construction phase.

Sand and aggregate material will be sourced locally and trucked to the site to be stored in bins. Water for the batching plant will be stored on site in a rainwater tank and topped up from a water tanker delivering to the site.

The proposed location of the Concrete batching plant is illustrated in Figure 3.1 below.
Figure 3.2 shows the preliminary layout of the concrete batching plant and configuration.



Site Offices and Laydown Area - Plan (N.T.S)

Kyoto energypark *Figure 3.0 - Site Offices and Laydown Area (Preliminary Design Layout)*

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Figure 3.1 Proposed location of Concrete Batching Plant/Site Offices and Depot/Laydown Area

3.1.4 Internal Access Tracks

Access to the site during construction would be via Bunnan Road for both sites. The existing tracks within the farm have been constructed for use by motorbikes, 4-wheel drive vehicles and occasional stock transport. Due to the volume and types of traffic expected during construction all tracks (new and existing) would have to be upgraded to a maximum 5m width. Lengths of existing and proposed new access road are provided in Table 3.6. Access track construction would involve grading and removal of topsoil (only on proposed tracks), placing and compacting of crushed rock road base, and the installation of drainage and sedimentation control works.

Access tracks would generally not exceed a grade of 10%, and would be limited to a maximum of 14%. Access tracks would include grassed swales along the edge of the tracks to capture stormwater run-off. Drainage discharge would be managed to minimise erosion. Any excess excavated material would be reused as fill wherever possible subject to geotechnical testing.

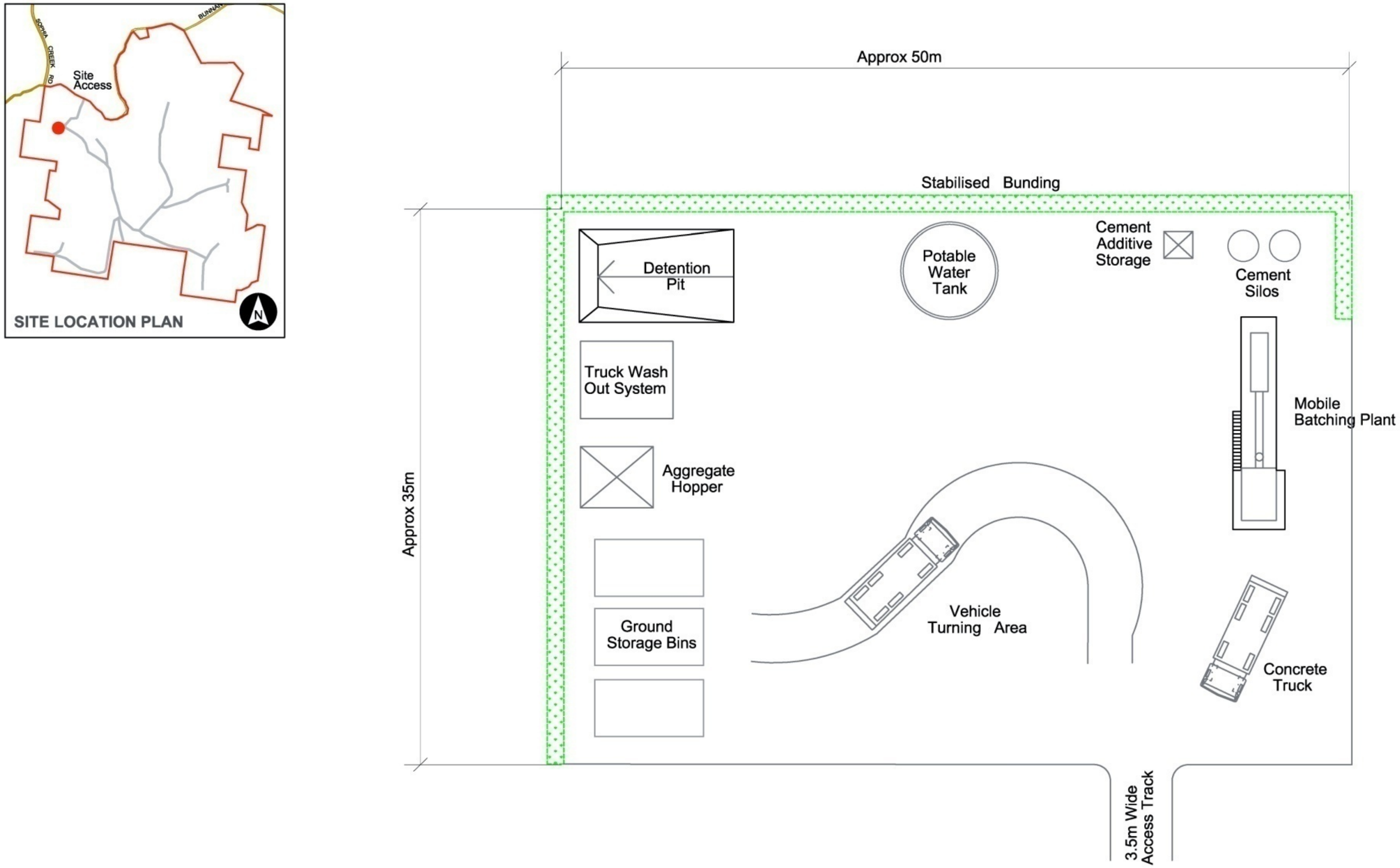
During construction, tracks would be required to enable the movement of heavy equipment such as cranes and heavy haulage of turbine components to turbine pads.

3.1.5 Crane Hard Stand Areas

A level lay down area adjacent to each turbine location would be constructed for crane use during turbine assembly. The hardstand pad shall be excavated to suitable subgrade depth material and replaced with road base material (if required) as a final surface. No concrete shall be used for the hardstand as the area shall be rehabilitated will be allowed to grass over upon completion of construction. Road base material would be transported to the site and used a compacted hardstand surface prior to erection.

Excavated subgrade would be stockpiled nearby or used for fill in track construction and earthworks. The 20 m x 30 m pad would be constructed at the same time as the access tracks. Turbine locations are mainly sited within cleared or predominantly cleared areas, however an additional 10m width around hardstand area has been allowed for in the Flora and Fauna assessment for possible vegetation clearance.

Figure 3.4 shows the general layout of the Crane Hardstand area for typical turbine construction.



Concrete Batching Plant - Plan (N.T.S)

Kyoto energypark

Figure 3.2 - Concrete Batching Plant (Preliminary Design Layout)

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3.1.6 Turbine Foundations

Excavation would be carried out by mechanical equipment. Once the foundation excavation is complete a concrete layer would be laid to provide a level working area for erecting the formwork and reinforcement. Steel reinforcing would be installed followed by placement of the lowest tower section. Concrete is then poured on top of the steel reinforcing in 450mm layers in a single pour.

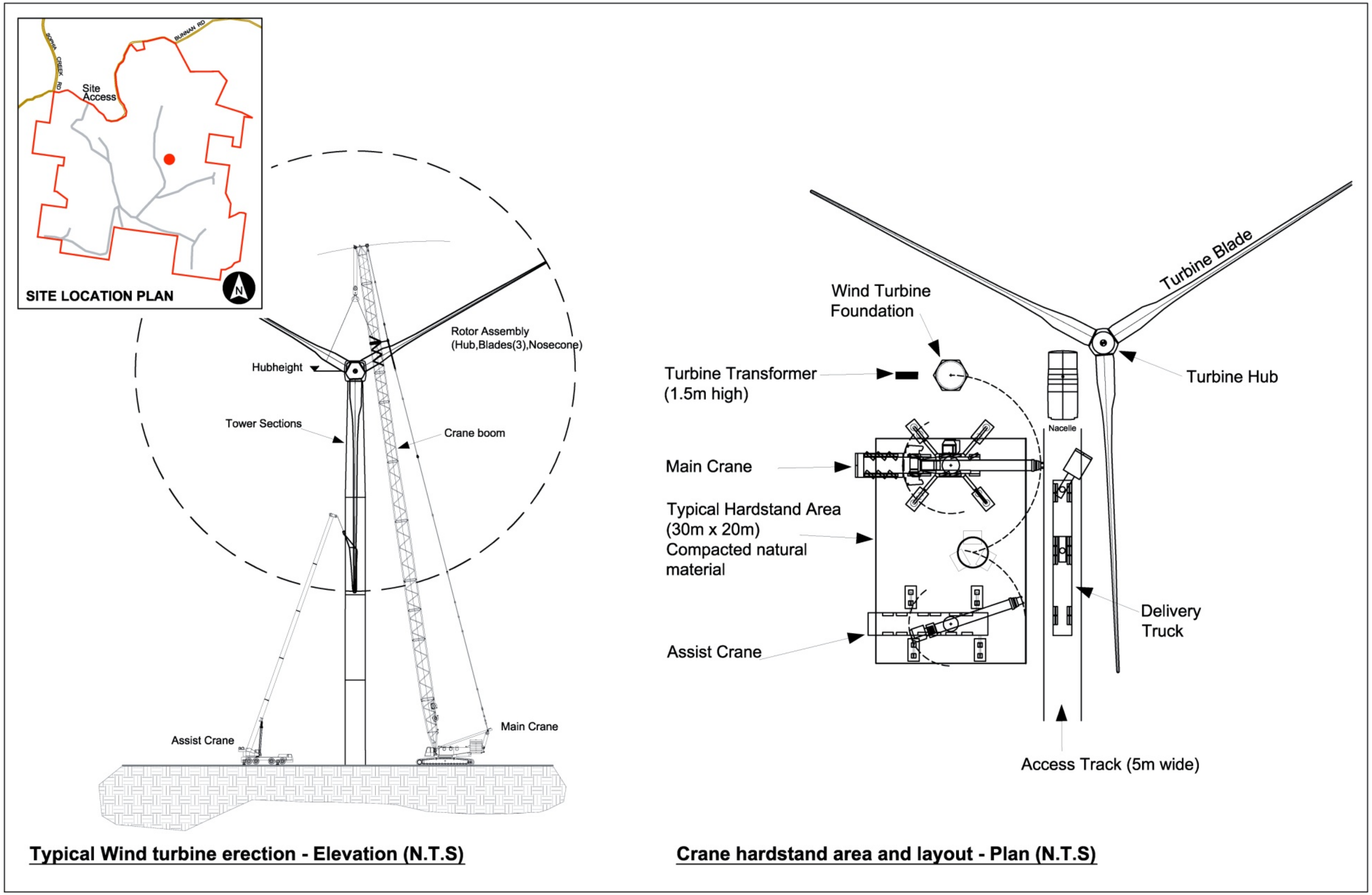
Any topsoil or rock excavated would be stockpiled adjacent to the turbine footing excavation and covered with geotextile material to limit dust generation and the loss of the material. Subject to geotechnical testing, the contractor would use excavated material to backfill the foundation footing and/or to prepare a level hard stand area for the crane pad. The area of disturbance around a turbine footing during excavation is generally 3-5 metres from the edge of the turbine footprint.

The final surface level of the turbine footing shall be buried below final ground surface level as shown in Figure 3.3. The area surrounding the footing shall be grassed with suitable locally grown grass species and maintained during the life of the turbine.

Figure 3.3 Typical Concrete Wind Turbine Foundation

On-site Surplus Excavated Material

Excavated material will be reused as much as possible to avoid the generation of surplus waste from site. Any soil or rock excavated to create access tracks or foundations would be re-used as compacted material, subject to further geotechnical testing. A requirement in the construction contract will be included to source construction materials from local sources wherever possible, including local material suppliers and contractors. All materials would be stored in dedicated storage areas, with appropriate protection installed to prevent any loss of material (e.g. dust generated from stockpiles or sediment in stormwater runoff).



Kyoto energypark *Figure 3.4 - Layout of Turbine Construction Site (Hardstand Area)*

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3.1.7 Substation Switchyard and Control Building

The proposal would require the establishment of a single substation at Mountain station for connection to the grid. Components of the substation design will include:

- Civil works
- Earthing
- Yard surface finishing
- Fence gate and electrical lighting
- 2 x transformers
- Substation control building
- Substation switch room
- Communication equipment
- SCADA/RTU control system
- Protection & controls
- Grid metering
- Auxiliary systems
- Cabling and terminations

An area of approximately 0.24 ha would be cleared and levelled by mechanical excavator, and a reinforced concrete slab would be constructed to provide the substation base. A concrete bund would be constructed to provide containment in the event of oil spillage from a transformer failure, together with an oil/water separator to remove traces of oil from stormwater collected in the bund. The substation would be enclosed within a concrete kerb and 2.5 m high chainlink fence, with the enclosed area finished with a layer of crushed rock. The substation would incorporate a range of electrical safety measures including an underground copper 'earth grid' and appropriate lightning protection.

The noise assessment identified a need for earth bunding constructed around the north western perimeter of the substation at a total height of 4m. This bund shall be constructed from suitable overburden and grassed.

Figure 2.15 shows preliminary layout and configuration of the proposed site substation. Final sizing and design of the substation components shall be undertaken prior to construction.

3.1.8 Turbine Transportation and Assembly

The Traffic and Transport Assessment (Appendix J) describes the proposed route and method of transport for the turbine components, and describes the impact of traffic generated as a result. The 105 m high turbine towers would be transported to the site in 5 parts. Each tower part would be approximately 20 m in length and between 29 to 63 tonne in weight per section. Delivery of turbine components would be scheduled so that they can be directly installed at each location where feasible, with minimal requirement for intermediate storage on site. A laydown area adjacent to the site depot has been proposed for turbine parts storage and installation. Towers and turbines would be assembled following completion of turbine foundations and in the following phases:

- ***Lift 1:*** assembly of tower (i.e. the lowest tower section is bolted to foundation stub which was installed as part of the foundation construction, then other sections are progressively bolted on);
- ***Lift 2:*** installation of nacelle on top of the completed tower;
- ***Lift 3:*** assembly of rotor (blades, hub and nose cone) at ground level;
- ***Lift 4:*** final assembly of turbine, with complete rotor lifted into position and attached to main shaft protruding from the nacelle

A large crane (main crane) and an additional small crane (assist crane) would be set-up on the crane pad, and would lift each tower section component into place followed by the nacelle and the rotor. The rotor would be assembled on the ground prior to positioning. Approximately one turbine can be lifted into place each day (weather permitting). Figure 3.5 shows the typical setup for lifting of turbine components at the crane hardstand area.

Figure 3.5 Crane Erection of Tower Tube.

Figure 3.4 shows the proposed dimensions of the crane hardstand area to be constructed adjacent to the turbine foundation for safe erection of turbine components.

3.1.9 Construction Activities Mt Moobi Solar PV Farm

Construction of a solar photovoltaic array of up to 10MW capacity is proposed on the Mt Moobi Plateau, Mountain Station. The final solar array will utilise between 15-21 hectares of relatively flat area and up to 1000 solar modules dependent on the final design mix and type of fixed structure used.

The components of the solar plant including solar panels, supporting structures, step-up substations and metering cubicles, tracker units and associated cabling. The construction of the PV plant would take approximately 6 months to install (not including transport and delivery). Main components including solar panels, supporting frames or trackers, transformers and cubicles would be prefabricated off site and installed on site. Construction activities for the plant would be limited to the Mt Moobi Plateau and involve the following:

- Installation of erosion and sedimentation structures;
- Minor cut/ fill and site preparation works;
- Installation of 33kV transformer(s);
- Underground trenches, marshalling areas, cabling;

- Construction of concrete foundations for tracker frames;
- Fitting and erection of frames and module supports;
- Installation of solar modules and inverters;
- Commissioning of Plant;
- Rehabilitation and Visual screening works

The anticipated operation timeframe for the Solar PV Plant is limited by life expectancy of the solar cells which is currently 25 years. After this time the plant would be replaced with more efficient cells or decommissioned as required. All components are recyclable.

3.1.10 Construction Activities Mini-hydro Plant

The preliminary design of the Mini Hydro Plant is contained within Section 2.4.6. Final design of the system shall be undertaken during the final design stage prior to construction. Construction of the mini hydro plant shall involve the following main activities:
- Install sediment and erosion control structures
- Clearing of vegetation as required around header and bottom tanks.
- Striping topsoil and stockpiling
- Construct 3.5 m wide access track to bottom tanks and hydro facility
- Excavation and preparation of sub-grade foundation for in-situ concrete tanks.
- Place formwork and pouring of header and bottom tanks and slabs.
- Installation of mini-hydro turbines and control plant facility
- Installation of pipework, fittings and valves.
- Electrical reticulation, control cables and step-up transformer
- Commissioning and testing
- Installation of top up water supply and storage tank.

The anticipated timeframe for completion of the mini hydro plant is 5 months duration as shown in Table 3.2.

The overall development footprint of the Mini-hydro plant is provided in Figure 2.13.

3.1.11 Internal Power Cables

Permanent underground cables shall be used internally to the site to interconnect turbine groups, the mini hydro plant and Solar PV plant to the proposed new substation on the Mountain station. Permanent underground electrical and fibre optic cables would be laid in trenches located immediately adjacent to the access tracks, alongside each turbine.

A mechanical excavator would excavate trenches 1.5-2.0m deep and 0.75 m wide. Power cables and control cables would be laid on a base layer of washed sand and covered with a layer of sand then backfilled with suitable soil. Mechanical protection and a marker strip would be installed. The trench would be backfilled and compacted back to surface level and grass reinstated to prevent erosion along the trench. Where trenches are located downslope, erosion prevention measures would be used to slow stormwater runoff and prevent erosion prior to grass establishment.

3.1.12 Construction Equipment

This assessment has estimated the construction equipment required to complete all project activities on site. Key construction machinery included below has also been used for the noise assessment modelling for construction activities under worst case conditions. Construction machinery will typically include;
- 30-40 tonne Excavator with rock breaker attachment;
- Mini Excavator for trenches;
- Grader;
- Bulldozer;
- 2 x 40 tonne articulated dump trucks;
- 2 x steel drum rollers;

- 1 x mobile concrete batch plant;
- Concrete trucks;
- Concrete pump;
- Front end loader,
- Drill rig for geotechnical work;
- Trucks (flat beds, semi-trailers, extendable trailer);
- Main and assist Cranes;
- Fork lift;
- various 4WD and service vehicles;
- Multi-tyred tractor;
- Mobile Rock Crusher

Machinery will not be in use all of the time during construction. Considerations of worst case conditions have been assessed for noise compliance by Wilkinson Murray in Appendix D.

3.1.13 Hours of Operation

Construction activities on the site would generally occur between **Mon to Fri (7am to 7pm)** and **Sat (7am to 1pm)** excluding Sundays and public holidays. Work activities outside these hours of general operations would be required to allow for the following exceptions:

- Deliveries of oversize and overmass components (including turbine towers, nacelles, blades and substation transformers). It may be necessary to transport these components outside general working hours to satisfy RTA special haulage permits (see Section 17.2). Haulage of these components would occur on back roads and at slow speeds with minimal disturbance to residencies within the area (*see Appendix J Traffic and Transport Impact Assessment*).
- Erection of turbine components by heavy lifting cranes would need to occur when wind conditions are calm enough to allow for conditions for safe erection at height. Therefore crane crews would generally be allocated over a 24 hour period during the wind turbine erection period to facilitate the safe and efficient erection of these components. Erection activities outside general working hours would only be required during exceptional circumstances. Activities are generally very quiet and would be well below noise exceedances criteria at nearest receivers as predicted in the Noise assessment (*see Appendix D – Noise Assessment Wilkinson Murray Section 7*).

3.1.14 Site Restoration

Rehabilitation of construction areas would be an on-going process following the completion of construction at each of the turbine locations across the site. In addition, cable trenches and areas around the site compound would be backfilled, restored and revegetated. Crane hard stand areas would be revegetated using soil cover and vegetable mulch with local grass seeds. Following completion of construction, drainage and landscaping works, all contractors' facilities, waste and surplus materials would be removed from the site. Ongoing maintenance of rehabilitated areas would be carried out to ensure land stabilisation when ground cover is established. Weed management would be an integral element of these rehabilitation works.

A detailed description and layout of the restoration works including timeframes will be prepared prior to construction and documented in the Vegetation Management Plan for the Kyoto Energy Park proposal.

3.1.15 Traffic Generation during Construction

Traffic movements have been split into truck and car movements. Estimated traffic movements for the construction period have been estimated and represented in Table 3.0. Truck movements would generally involve either special purpose vehicles (oversize and overmass components) and general truck deliveries for other components. Traffic movements would occur over a period of 20 months being the anticipated timeframe for the construction phase.

Turbine components arriving at the site will generally be delivered directly to turbine pad areas for assembly and final erection. A lay down area is proposed to allow for excess storage of turbine components, cable drums and other parts prior to final delivery to the turbine pads.

Between 20-70 construction employees would be required on site at any one time. Table 3.0 describes the likely vehicle types and movements involved in the construction process.

All services and materials supplied to site would be sourced externally. An option to source road based material from the existing road base quarry on Middlebrook Station has been included as an option in this report.

Table 3.0 – Estimated Construction Vehicle Movements

Item	Quantity	One-Way vehicle movements	Sourced Internally/ Externally	Vehicle type
Site Establishment				
Concrete Batching Plant	8	8	External	Semi-trailer
Site offices/depot	13	13	External	Truck
Delivery of civil plant/Cranes/machinery	35	35	External	Semi-trailer, Platform Truck, Truck
Access Roads				
Aggregate from quarry	11240m3	1613	Internal/ External	Truck
Dust suppression (3 trucks per day)	17ML	1440	External	12t Water Tanker
Turbine Foundations				
Concrete	6300m3	1260	Internal	Concrete Truck
Sand and aggregate	4221m3	603	External	Truck
Cement	1584m3	287	External	Cement tanker
Water	1391m3	116	External	12t Water Tanker
Reinforcement steel	950m3	101	External	Semi-trailer
Steel Anchors	880t	45	External	Semi-trailer
Wind Turbine components				
Tower sections (x5)	210	210	External	Extendable trailer
Nacelles	42	42	External	Platform Truck
Blades (2 per truck)	126	63	External	Extendable trailer
Hubs	42	42	External	Semi-trailer
Nose Cones	42	42	External	Semi-trailer
Containers (20'/40')	105	105	External	Truck
Transformers	42	42	External	Truck
Site Substation				
Slab	10m3	2	External	Concrete Truck
Transformers	2	2	External	Platform Truck
Other components/fence	8	8	External	Truck
Control room/Other	10	10	External	Truck
Crushed rock	150t	10	External	Truck
Closed-loop hydro Plant				
Pipe delivery	1500m	15	External	Truck

Item	Quantity	One-Way vehicle movements	Sourced Internally/ Externally	Vehicle type
Concreting Works	160m3	32	Internal	Concrete Truck
200kW hydro units	5 units	2	External	Truck
Maintenance Shed	13	13	External	Semi-trailer
Managers residence	16	16	External	Truck
Visitor's/Education Center	25	25	External	Truck
Underground 33kV cables/control	18.136km	66	External	Semi-trailer
66/33kV transmission				
Pole installation	220 poles	74	External	Semi-trailer
Line work	22km	60	External	Truck
Solar PV Plant				
Solar Trackers/frames	1000 trackers	350	External	Platform Truck
Solar Panels/Cables	20	20	External	Platform Truck
Concrete foundations	2800m3	560	Internal	Concrete Truck
Solar switchyard	1	1	External	Truck
Water	616m3	51	External	12t Water Tanker
General				
Site personnel	Av 10/day	4803	External	Car/4WD
General deliveries	12/week	880	External	Truck
Waste disposal	2/week	147	External	Truck
Site Disestablishment	41	41	External	Semi-trailer
Total		**8452 Trucks** **4803 Cars**		

3.1.16 Traffic Generation during Operations

Increases in traffic flows would occur from daily commuting of KEP management and staff, periodic maintenance and replacement parts, external consultants for environmental monitoring and replanting works, water tanker used for topping up, and traffic associated with tourism. Table 3.1 shows the estimates of operational traffic flows for each component. There would be very few intermittent daily traffic movements associated with the KEP facility.

The wind component of the park represents the greater proportion of ongoing employment. The closed loop hydro plant and solar PV plant will require operation and ongoing maintenance for the life of the plant. This maintenance will be minimal by the nature of the components and has been factored into the overall maintenance of the Park. The solar and hydro components will also be controlled within the existing control facilities of the Park and have the ability to be monitored offsite.

There would be employment associated with the manager's residence. These would include the Manager, any support/office staff and grounds keeping staff. The operation of the Visitor's and Education Centre may also employ a small number of staff.

Table 3.2 lists the basic maintenance requirements for the KEP. Much of the monthly and bi annual maintenance would be undertaken by KEP staff. Specialist maintenance crews would be used annually or during larger maintenance or component replacement jobs. Some larger replacement parts may require larger machinery to access the site however this would be on rare occasions.

External Consultants would be used mainly on a quarterly or yearly basis. Some offsetting and replanting works would require additional staff during early years of KEP operation which has been included in traffic estimates.

Additional water for amenities would be trucked to the site from an external registered bore located in Scone. Estimates for additional water usage have been included calculated and expected to be minimal over the yearly period.

Existing tourist accommodation is located at Middlebrook Station, off Middlebrook Rd. Accommodation is currently accessed by large bus groups visiting the site and also by individual tourists. Existing tourist activities on both sites include round trips to Mountain Station and Mt Moobi lookout by the landowner. It is envisaged that these tourism activities will continue along the same route and merge with tourism potential for the proposed Visitors and Education Centre.

Intermittent traffic generated would also be from visits to the site from educational groups such as local schools, TAFE students, University or tourist groups and would be expected during the daytime only. These activities are expected to be in buses (individually or in groups) with an estimate of 3-4 bus trips per week included in the traffic estimate.

Table 3.1 – Estimated Operational Vehicle Movements per annum

Item	Quantity	One-Way vehicle movements p.a	Sourced Internally/ Externally	Vehicle type
Operations				
Local KEP Management and Staff	4	1200	External	4WD/Car
Maintenance and Testing				
- Heavy Vehicle	120	120	External	Truck
- Light Vehicle	5	100	External	
External Consultants	10	120	External	4WD
Tourism				
- Bus	4	4	Internal/ External	Bus
- Car	60	60	External	4WD/Car
Additional Water	22	22	External	12T Water Tanker
Total (per annum)		**146 Trucks** **1480 Cars/4WD**		

Traffic flows during operations would equate to a maximum of 146 truck or heavy vehicle movements and 1480 light vehicle movements per annum. These movements would not considerably impact upon existing flows into Scone or along Bunnan Road or interrupt flows from additional vehicles accessing the sites.

3.1.17 Grid Connection Agreement

The Kyoto Energy Park proposal will generate between approximately 93 to 137 MW of total capacity into the local grid network. Two options for grid connection have been investigated including a 66kV connection (Option 2) and a 132kV connection (Option 4) based mainly on final overall capacity of the Kyoto Energy Park. A full description of the connection options is covered in Section 19.8 of this report.

THE local network distributor is Energy Australia who is responsible from managing the network in the area including fault considerations for new generators and cumulative impacts associated with new capacity. At the time of connection Energy Australia will also consider impact of the Kyoto Energy Park under operation by computer modelling of network impacts and fault considerations on the local grid.

Subject to receipt of approval, the Kyoto Energy Park will seek a connection agreement with Energy Australia for connection to the network.

3.2 Operation

The operating life of the generator technologies (wind turbines, solar and hydro components) is collectively in the order of 25-30 years duration.

3.2.1 Operational Agreement

The Kyoto Energy Park Company expects to reach a Warranty, Operation and Management agreement with the turbine manufacturers. This is termed a “turnkey” operation. Under this agreement, the manufacturer would agree to operate, manage and maintain for the period of the warranty on each of the generators. Once the warranty expires, the generator would become responsible for the operation, management and maintenance of the wind farm. Ongoing maintenance of the Energy Park components would be undertaken on site.

3.2.2 Detailed Design and Contract Management

Once approvals have been obtained and tenders for the design and construction have been awarded, the project design can be finalised. This stage takes account of updated wind resource monitoring (micro siting), revised energy modelling and the procurement of the latest equipment and technology that is potentially available to the proponent at that time, including turbines and solar plant technology.

Project environmental commitments, including undertakings arising from the impact assessment, consent conditions and any licensing conditions will be compiled and used to prepare the Project Environmental Management Plans (EMPs). The Project EMPs would also be incorporated into the Contract Specifications for the required construction works and equipment supply to ensure compliance and achieve the project environmental objectives. Tenders will be called using the abovementioned specifications and tenderers’ records of performance will be reviewed as part of the selection process to ensure that they are able to achieve the required performance.

3.3 Decommissioning

3.3.1 Wind Farm Component

The wind turbine components of the Kyoto Energy Park is expected to have an indicative base life of up to 25-30 years for current machines available within Australia. The design life of the turbine is based on the fatigue life of the blades and main electrical components. Once the wind turbines reach the end of their economic life, they will likely be refurbished or replaced with newer more efficient technology, in similar locations to that shown in the report.

At the end of the Kyoto Energy Park life full decommissioning would occur through a phased approach to dismantle the equipment and remove it from the site. Decommissioning steps would include:

- isolation of turbines from substation; removal of rotors and nacelles using a large crane and removal from the site for recycling. The steel tower sections would be unbolted from the concrete foundation and the foundation base would be filled in and remediated. All turbine parts are recyclable.
- rehabilitation of access tracks not required for ongoing land use activities;
- removal of the entire above ground substation infrastructure and reuse where possible; site contamination assessment of the switchyard if necessary, removal of any contaminated soils from the site and disposal at an appropriate facility. Validation survey to ensure any contaminated material has been removed;
- removal of underground power and communication cabling within trenches and rehabilitation to fully restore to original environment.
- break up of foundations within the substation and substation underground infrastructure and disposal off site at an appropriate disposal facility.

3.3.2 Mt Moobi Solar PV Farm

The solar cells would generally have a design life of 25 years. The solar modules are made to the dimensions of the frame and can be replaced during or at the end of 25 years. All other components of the plant including low voltage electrical systems and inverters would be replaced at the end of the design life for continued generation of solar energy.

Regular maintenance of the frames during operation of the solar plant would allow the design life in excess of 25 years. Other components of the plant including low voltage electrical infrastructure systems and wiring would be located in shallow pre-cast concrete trenches and would be replaceable.

3.3.3 Mini- Closed-loop hydro plant

The Closed loop hydro plant components can be replaced during the life cycle of the plant, including pipes and turbine impellers. General maintenance of the hydro will ensure a design life of at least 30 years duration. Other components of the plant are modular and can be replaced relatively easily throughout the life of the system.

3.3.4 Building Structures

During operation of the Kyoto Energy Park building structures shall be used as ancillary facilities to support operations. These facilities include the Maintenance Shed, Visitor's and Education Centre and Manager's residence. It is likely that upon full decommissioning of the site that each building component may form some residual use or function.

3.4 Development Timeframe

The main development phases are detailed in Table 3.1 together with estimates of time for completion of each.

Table 3.2 Kyoto Energy Park - Development Phases

Development Phases	Description	Duration
Kyoto Energy Park Project Approval	• Receipt of project approval	Item
Final Design	• Micro-siting Analysis and Turbine Layout Optimisation • Procurement of Generator components from market • Civil Works Design • Preparation of CEMP and EMP and sub management plans for environmental management.	5-8 months
Preparation of Contract specifications	• Preparation of contract specifications for civil works, equipment supply and electrical works.	1-2 months
Tendering	• Offers sought for specified works, tenders assessed and contracts awarded	1 month
Construction Works*	• Works including all phases of the construction program under CEMP	20 months
Connection Agreement with Energy Australia	• Contract specifications for power supply to distribution network	Item
Power Purchase Agreement	• Contract for sale of power to the grid.	Item
Project operation	• Generation and supply of electricity to the grid when suitable energy is available	25 years (solar) 30 years (wind) 30 years (mini-hydro)
Operational maintenance and environmental performance	• Monitoring of wind turbines, communications, control equipment, civil and electrical infrastructure and metering. • Maintenance of access roads and sedimentation structures • Environmental monitoring as per the EMP	Monthly
	• Lubrication and inspection of turbine systems. Condition monitoring activities such as oil sampling undertaken.	Semi-annual
	• All of semi-annual service plus inspection of bolt connections, welds • Full annual EMP report.	Annually
	• Full annual service plus complete inspection. Corrosion protection activities such as painting would be considered for all components.	Every 4 years
Replacement, refurbishment, decommissioning and site restoration	• Replacement, refurbishment and/or removal of equipment and restoration of site at end of design life	4-6 mths

**See Construction timeline Table 3.2*

3.5 Construction Timeframe

The overall timeframe for construction of the Mountain and Middlebrook Station sites is anticipated to take 20 months duration as outlined in Table 3.2 below. The actual duration may vary, depending upon the detail of the final contracts, scheduling of activities and any delays that may be encountered due to factors such as unfavourable weather conditions or supply of equipment or materials.

Table 3.1 illustrates that construction is intended to commence 8-11 months after receipt of approval.

General working hours for construction activities would be between 7am and 7pm Monday to Friday and between 7am and 1pm Saturdays. Some activities would be necessary outside general hours, including transportation of some heavier components and rescheduling of erection activities to minimise risks during extreme conditions. No work would be conducted on Sundays or Public Holidays.

Construction activities would be phased with different activities being carried out at different locations across the site, so few locations would be worked on at any one time.

The anticipated timeframe for installation of the Solar photovoltaic plant will vary with options for technology used as described. Works will include minor earthworks, preparation of concrete footings, delivery of solar trackers, installation, connection, commissioning of the plant and visual landscaping on Mt Moobi Plateau. The solar Plant would be connected via a series of step-up transformers and reticulated into the proposed 33kV electrical cable on Mt Moobi Plateau, Mountain Station.

The timeframe for completion of construction of the Closed-loop hydro plant is approximately 4 months, including minor earthworks, preparation of concrete works and pouring, installation of pipe and connections, installation of hydro units and electrical connection to the internal 33kV underground reticulation on site.
Construction of ancillary works including electrical works (substation and powerlines), buildings (Maintenance Building, Managers Residence, Visitors and Education Centre) would be undertaken by individual contractors and managed under the Construction Environmental Management Plant (CEMP)

Table 3.3 - Kyoto Energy Park - Construction Timeline

Kyoto Energy Park Construction Program	Mth1	Mth2	Mth3	Mth4	Mth5	Mth6	Mth7	Mth8	Mth9	Mth10	Mth11	Mth12	Mth13	Mth14	Mth15	Mth16	Mth17	Mth18	Mth19	Mth20
Mountain Station																				
Site Establishment	■																			
Upgrade access tracks and hardstands		■	■																	
Establish batching plant		■																		
Internal underground cabling			■	■	■							■								
Turbine concrete foundation				■	■	■	■													
Construct substation/switchyard/control							■	■					■	■						
External connection to the Grid*									■	■	■	■	■		■					
Erect WTGs								■	■	■	■	■								
Construct Mini Hydro Plant											■	■	■	■	■					
Commission Wind Turbines															■		■	■		
Construct Maintenance building															■					
Construct Manager's residence															■	■				
Construct Visitor's Education Centre																	■	■		
Install Mt Moobi Solar PV Farm (5MW)													■	■	■	■	■	■		
Commission Solar Plant																			■	
Project operation (Wind + Hydro)																			■	
Project operation (Solar)																				■
Middlebrook Station																				
Upgrade access tracks and hardstands				■	■															
Internal underground cabling					■	■														
Turbine concrete foundation							■	■												
Erect WTGs													■	■	■					
33kV to Site Substation											■	■	■							
Commission Wind Turbines																			■	

** Includes timeframe for 132kV connection Option 2 (Vemtec 2008)*

Kyoto Energy Park Scone is wholly an Australian Enterprise. The Management is 100% Australian.
The funding of this proposal and report is 100% Australian.
An Australian Project

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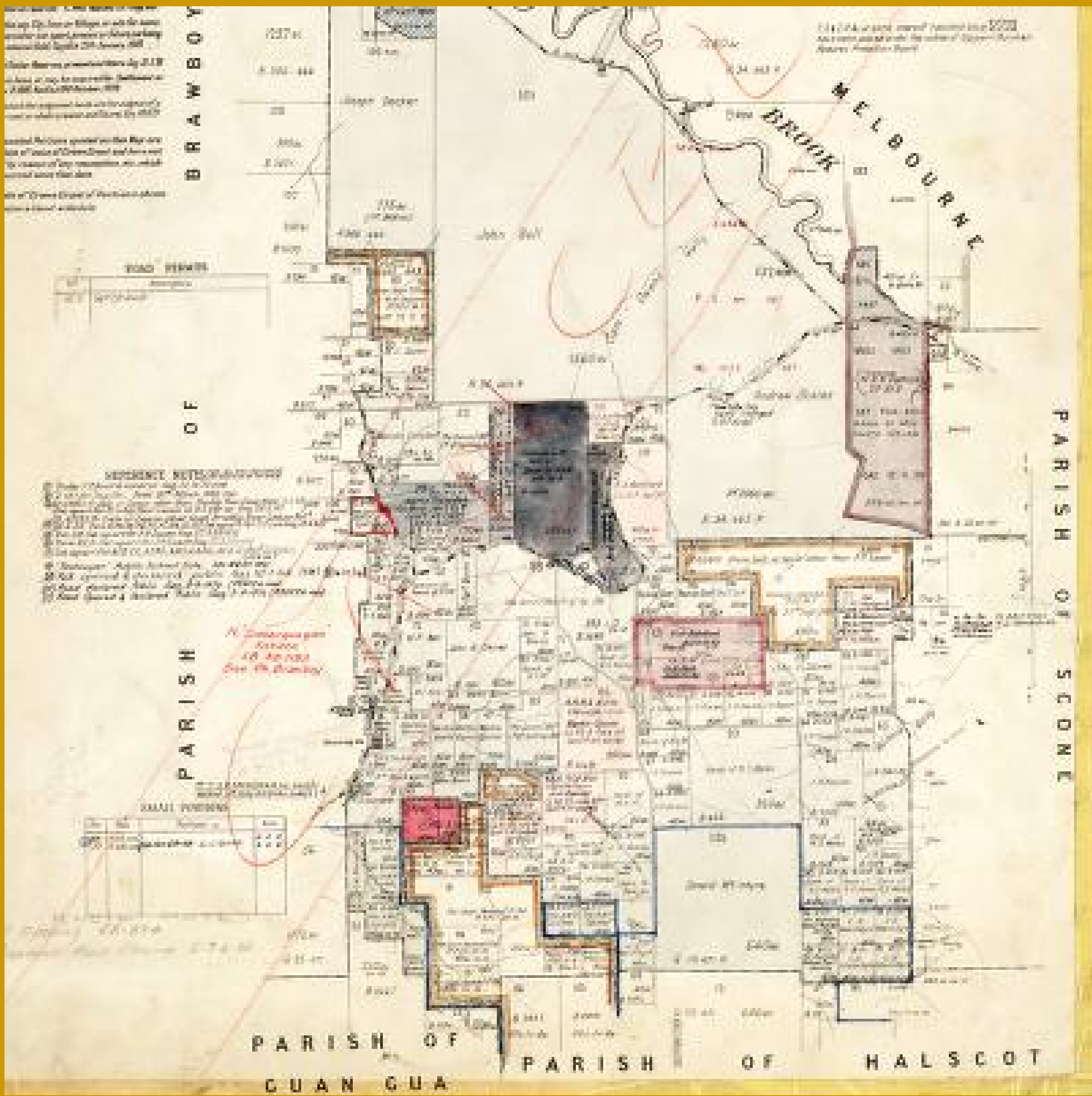
Kyoto energypark



4. Statutory Planning and Consultation

4.0 STATUTORY PLANNING AND CONSULTATION

4.1 Introduction

This section of the Environmental Assessment describes the relevant Statutory Planning Instruments as they may affect the proposal. It also sets out the consultation measures adopted in the preparation of the application.

The following summary (Table 4.0) identifies all Commonwealth, State and Local Legislation with potential to impact on the project and identifies its applicability in this instance:

Table 4.0 – Statutory legislation framework

Legislation	Applicability	Reason
A. COMMONWEALTH		
Environmental Protection and Biodiversity Conservation Act 1999.	APPLICABLE – Referred to Department of Environment, Water, Heritage and the Arts (Dep't of EWHA)	Assessment identified presence of: Threatened fauna species ; Ecological endangered population and; Endangered ecological community. Referral was made to Dep't of EWHA. EWHA deemed the proposal not to be a controlled action.
Radio Communications Act 1992	APPLICABLE	Essential function is to manage the use of the radio frequency spectrum and control licensing of transmitters. It enables "devices" to be prohibited because of potential impacts. Current licenses in the immediate area surrounding the subject site, issued under this Act, have the potential to be affected by the installation of wind turbines through electromagnetic interference.
Civil Aviation Safety Regulations 1998	APPLICABLE	The proposed wind turbines will exceed 110m in height. The proposal must be notified to CASA. CASA have indicated that obstacle lighting will be required. Further reference to CASA during design phase is intended.
SEPP 33 Hazardous and Offensive Development	NOT APPLICABLE	Studies conducted as constituting the environment of the proposal, have shown that the proposal will not adversely affect the "biophysical environment". It will not pose a risk to "human health, life or property".
B. STATE		
Environmental Planning and Assessment Act 1979 and Environmental Planning and Assessment Regulation 2000	APPLICABLE	The Minister for Planning has declared that the proposal was required to be assessed as a Major Project, under Part 3A of the Act, because it has a capital investment value in excess of $30 million.
Protection of the Environment Operations Act 1997	NOT APPLICABLE	Hydro-electricity generation is covered by the Act, but only if it generates more than 30MW of electricity. The hydro-electric capacity of the proposal is 1MW. Therefore, no license is required. A license under the POEO Act will not be required for the temporary concrete batching plant as it qualifies as a "mobile plant activity"

Legislation	Applicability	Reason
		(Activity No. 46) within Part 2 of Schedule 1 of the Act.
Threatened Species Conservation Act (1995)	NOT APPLICABLE	A 7-part test completed in accordance with Section 5A of the Environmental Planning and Assessment Act (1979) (NSW) and the Threatened Species Act (1995), indicated that the proposed development was not likely to have a significant effect on threatened species, populations, or ecological communities or their habitats.
Water Management Act 2000	APPLICABLE	roposal will not contravene or compromise the Act's principal objective of protecting, enhancing and restoring "water sources, their associated ecosystems, ecologically processes and biological diversity".
Waste Avoidance and Resource Recover Act 2001	NOT APPLICABLE	Objectives of the Act are not relevant to a proposal which does not generate waste. The principal aim of the Act is to "minimise the consumption of natural resources and the final disposal of waste...."
Roads Act 1993	APPLICABLE	A consent under Section 75V of the Act will be required. Consent for works within or over roads will be required under Section 138 of the Act.
Dangerous Goods Act 1975/OHS Amendment (Dangerous Goods) Act 2003	NOT APPLICABLE	No dangerous goods will be used or kept on the site of the proposed development.
Soil Conservation Act 1938	NOT APPLICABLE	The proposal will not adversely affect the capability or sustainability of local area soils.
Contaminated Land Management Act 1997	NOT APPLICABLE	The general objective of the Act is to remediate land where contamination presents a significant risk of harm to human health. The proposal will not result in contamination of land.
Noxious Weeds Act 1993	NOT APPLICABLE	The proposal will not result in the introduction of new weeds to the locality.
Mine Subsidence Compensation Act 1961	NOT APPLICABLE	The proposal does not involve land within a mine subsidence district.
Hunter Regional Environmental Plan 1989	APPLICABLE	The proposal fits the "Aims and Objectives" of the Plan, as set out in Clause 2.
C. LOCAL		
Scone Local Environmental Plan 1996	APPLICABLE	The Director General and the Minister for Planning must give consideration to the provisions of this Plan in their assessment of the project.

The Commonwealth, State and Local Environmental Planning Instruments and Policies of relevance are discussed below:

4.2 Commonwealth Legislation

The following Commonwealth Legislation applies to the site.

4.2.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act 1999 requires Federal Government approval for developments (actions) which are classified as 'controlled actions' under that Act. Controlled Actions are those which, under the auspices of the EPBC Act will have a significant impact on a 'matter of national environmental significance'. In relation to the subject proposal such significant impact may occur if the site were to contain, or the proposal were to affect, threatened species, ecological communities or migratory species listed under the Act.

An Ecological assessment was carried out by Conacher Environmental Group in 2007 and is attached in *Appendix A- Ecological Site Assessment (25 August 2008)*. The findings of this report are further discussed in Section 8.0 of this report.

As outlined in the Conacher Environmental Group report, a number of species listed as endangered or vulnerable under the EPBC Act 1999 were identified on site. The species found were identified as:-

a) Ecologically endangered population
   - Cymbidium canaliculatum or Tiger Orchid. Seven (7) clumps of this species where identified on the subject landholding, within the Box Woodland vegetation community.

b) Ecologically endangered Ecological Community (EEC)
   - White Box Yellow Box Blakely's Red Gum Woodland (WBYBBRW)

c) Threatened species
   - Box Woodland (grassy variant), and
   - Box – Ironbark Grassy Woodland.
   - Glossy Black Cockatoo
   - Speckled Warbler
   - Grey Crowned Babbler
   - Grey-headed Flying Fox
   - Yellow-belied Sheath Tailed Bat
   - Common Bentwing Bat
   - Eastern Cave Bat

As these species were found on the landholding, an application was made to the Commonwealth Department of Environment, Water, Heritage and the Arts to determine if they consider the proposal to be a controlled action. The Department of Environment, Water, Heritage and the Arts, in a letter dated 18 March 2008 (*Appendix A(i) – Notification of Referral decision)*, advised that the project is not a 'Controlled Action'. The project will not therefore need to be assessed under the NSW Bilateral Agreement.

4.2.2 Radio Communications Act 1992

The *Radio Communications Act 1992* is the primary Act managing radio frequency spectrum, including the issue of licenses. There were found to be four licenses within 50km of the Kyoto Energy Park that required further investigation into potential interference. Garrad Hassan contacted these license holders (two license holders in total) who confirmed that the Kyoto Energy Park proposal would not affect their licenses. A summary of the report undertaken by Garrad Hassan is contained in *Appendix F - Assessment of Environmental Issues Electromagnetic Interference (19 May 2005)* and in this Environmental Assessment under *Section 13.0.*

4.2.3 Civil Aviation Safety Regulations 1998

Under the *Civil Aviation Safety Regulations 1998 Part 139*, CASA must be notified by an aerodrome operator, of any development or structure that is likely to create an obstacle or infringe on the obstacle limitation surfaces of the aerodrome, or by a developer proposing a development greater than 110m above ground level. CASA is required to assess the information submitted in regard to this, and determine whether the buildings or structures will create a hazard. *Advisory Circular AC 139-18(0) Obstacle Marking and Lighting of Wind Farms* contains further advice and guidance on this matter. The impacts of the proposed development on the operations of Scone aerodrome are assessed in *Appendix E - Assessment of Environmental Issues – Aviation Garrad Hassan (May 2008)* and in this Environmental Assessment under Section 12.0.

4.3 State Legislation

Various Acts that operate under State Governance have potential to apply to the site. Many of these are affected by the Part 3A process, which effectively "turns them off" however they are still considered in referrals to various government agencies.

4.3.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act, 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation, 2000* (EP&A Regulation) is the primary Act controlling development in NSW. Part 3A of the EP&A Act deals with land use proposals of State significance. Under Part 3A, application is made directly to the Minister and subject to formal Environmental Assessment.

The Director General's Requirements for the preparation of the Environmental Assessment for the Kyoto Energy Park is listed in Section 1.4.1 of this report.

Part 3A was added to the Act in 2005 and provides a new category referred to as "Major Projects". State Environmental Planning Policy (SEPP) 2005 (Major Projects) (SEPP Major Projects) was enacted in connection with Part 3A and it lists projects considered to be "Major Projects" under Part 3A.

If a project is deemed by the Minister to be a major project or of state significance under Part 3A it follows the approval path outlined in Figure 4.0 below.

For the purpose of Part 3A of the Act, Section 75U advises that authorization under the following legislation does not apply for approved projects:

- Concurrence under Part 3 of the ***Coastal Protection Act 1979***,
- A permit under section 201, 205 or 219 of the ***Fisheries Management Act 1994***,
- Approval under Part 4, or an excavation permit under section 139 of the ***Heritage Act 1977***,
- A permit under Section 87 or a consent under 90 of the ***National Parks and Wildlife Act 1974***,
- An authorization referred to in section 12 of the ***Native Vegetation Act 2003*** (or under any Act to be repealed by that Act) to clear native vegetation or State protected land,
- A permit under Part 3A of the ***Rivers and Foreshores Improvement Act 1948***,
- A bush fire safety authority under section 100B of the ***Rural Fires Act 1997***,
- A water use approval under section 89, a water management work approval under section 90 or an activity approval under section 91 of the ***Water Management Act 2000***.
-

Division 8 of Part 6 of the ***Heritage Act 1977*** does not apply to prevent or interfere with the carrying out of an approved project.

Section 75V in Part 3A requires that any consent or license under the following Acts cannot be refused if it is necessary for the carrying out of an approved project and is substantially consistent with the approval under this part.

- An aquaculture permit under section 144 of the Fisheries Management Act 1994,
- An approval under section 15 of the Mine Subsidence Compensation Act 1961,
- A mining lease under the Mining Act 1992,
- A production lease under the Petroleum (Onshore) Act 1991,

- An environment protection licence under Chapter 3 of the Protection of the Environment Operations Act 1997 (for any of the purposes referred to in section 43 of that Act),
- A consent under section 138 of the Roads Act 1993,
- A licence under the Pipelines Act 1967.

Minister's Declaration as a Part 3A Project

⇩

Preparation of Preliminary Environmental Assessment

⇩

Onsite Planning Focus Meeting

⇩

Lodgement of Project Application and Preliminary Environmental Assessment to Dept of Planning

⇩

Director General of Planning (DG) Consults with Other Agencies and Issues Requirements for an Environmental Assessment

⇩

Preparation of Draft Environmental Assessment

⇩

Submission of Draft Environmental Assessment Report to DoP

⇩

DG determines if Draft Environmental Assessment is Acceptable and Suitable for Exhibition

⇩

Advertising and Public Exhibition of Environmental Assessment Report

⇩

Submissions, Reports, Preferred Project Report (if necessary), Revised Statement of Commitments

⇩

DG Prepares an Environmental Assessment Report for Determination by Minister for Planning

Figure 4.0 Steps in the Part 3A Planning and Assessment

4.3.2 Environmental Planning and Assessment Regulations 2000

In a letter dated 18 February 2009 *(Appendix O(ii))*, the Director General of the Department of Planning advised that the project relates to a project on land with multiple landowners to which Clause 8F(1)(e) of the Environmental Planning and Assessment Regulations (2000) is applicable.

The Director General also advised that Clause 8F (3)(a) of the Regulations relating to public notification prior to public exhibition applies to the project as reproduced below:

Clause 8F(3)(a) of the Environmental Planning and Assessment Regulations (2000)

(3) If the consent of the owner of the land is not required under this clause, then the proponent is required to give notice of the application:

> *(a) in the case of a linear infrastructure project or a project designated under subclause (1)(e)—to the public by advertisement published in a newspaper circulating in the area of the project before the start of the public consultation period for the project.*

As the project affects multiple landowners all affected private land owners shall be notified in the local newspaper prior to the start of the public consultation (exhibition) period.

4.3.3 Protection of the Environment Operations Act 1997

The Protection of the Environment Operations Act 1997 (POEO Act) relates to the management of pollution and waste disposal in NSW and is administered by the Department of Environment and Conservation and Climate Change (DECC). Environmental Protection Licence under the POEO Act is required for "General Electrical Works" for energy services other than wind or solar power. As such hydro-electricity generation is a scheduled activity but only if it generates or is capable of generating more than 30MW of electricity.

The hydro-electricity component of Kyoto Energy Park is only capable of generating 1MW and therefore no licence is needed under the POEO Act for this component.

In respect to the construction phase, the DECC have advised that a license will not be required under the POEO Act for the temporary concrete batching plant (CBP). The CBP would have a maximum capacity which is below the threshold capacity for which a license is required. The CBP would be capable of being transported and is to be operated on a temporary basis being for a total period of not more than 6 months in any 12 month period.

4.3.4 Roads Act 1993

A consent for works within or over roads is needed under Section 138 of the Roads Act 1993. The RTA is the appropriate consent authority for classified roads, while the Upper Hunter Shire Council is the consent authority for all local roads. The only work proposed within road reserves relates to construction of power transmission lines. However while under Section 75V consent under the Roads Act can not be reasonably refused, an application will be required.

Special oversize and over mass permits will also be required by the RTA for tower tube and blade transportation by road. This is discussed in detail in Appendix J and in Section 17.0 relating to RTA permits for transportation of Kyoto Energy Park components.

4.3.5 State Environmental Planning Policy (SEPP) (Major Projects) 2005

In letters dated 13 March 2006 *(Appendix O)* and 30 January 2007 (*Appendix O(i)),* the Minister for Planning advised that he had formed the opinion that the Kyoto Wind Farm and the Kyoto Energy Park (Stage 2) now referred to as the Kyoto Energy Park, is development of a kind that is described in Schedule 1, Group 8, Clause 27 of the State Environmental Panning Policy (Major Projects) 2005, namely, "*development for the purpose of an electricity generating facility that has a capital investment value of more than $30 million*". The Minister therefore declared the project to be a project to which Part 3A of the Environmental Planning & Assessment Act applies for the purpose of Section 75(b) of that Act.

4.3.6 SEPP 44 Koala Habitat Protection

SEPP 44 provides a planning regime for the conservation and management of natural vegetation areas that offer habitat for koalas so to ensure permanent free-living populations will be maintained over their present range.

Conacher Environmental Group undertook an assessment under the provisions of SEPP 44 and found potential Koala habitat on the site. This was in the form of White Box, Grey Gum, and Forest Red Gum food tree species as listed in Schedule 2 of the SEPP. These species comprised more than 15% of the total site coverage.

No Koalas were observed during fauna surveys and no evidence of previous Koala habitation within the subject sites was made. As no Koalas live in the area, it is considered that the site does not form core Koala habitat and therefore the SEPP does not apply (Refer to Section 8.3 for further detail)

4.3.7 SEPP (Infrastructure) 2007

SEPP (Infrastructure) 2007 provides a consistent planning regime for infrastructure and the provision of services across NSW, along with providing for consultation with relevant public authorities during the assessment process. The SEPP allows greater flexibility in the location of infrastructure and service facilities along with improved regulatory certainty and efficiency.

As outlined in this SEPP (Division 4), the proposed Kyoto Energy Park is defined as an electricity generating works, and therefore subject to the provisions of this SEPP. Under Division 5 Electricity transmission or distribution, Subdivision 1 Electricity transmission or distribution works, Pamada Pty Ltd is considered an electricity supply authority. Under Clause 41 an electricity transmission or distribution network may be carried out by or on behalf of an electricity supply authority without consent on any land. This includes construction work, lying of cable, etc. No works are proposed within National Parks, State Forests or Public reserves.

Under Division 4, Clause 34 of the Infrastructure SEPP components of the project defined as ‘electricity generating works’ would be permissible with consent on land zonings which are equivalent to the “prescribed zones” identified in Clause 33 of the SEPP. Under both these cases the provisions of the Infrastructure SEPP would override relevant prohibition provisions identified in LEP zonings. A summary of permissibility of generating components within land use zonings is outlined in Table 4.1.

4.3.8 Integrated Development

The proposal is not ‘integrated development’ as Section 75R of Part 3A excludes the Part 4 provisions.

4.4 Local Legislation

A brief description of relevant local planning instruments is provided below. Permissibility of all components of the KEP within relevant land use zonings are described in Table 4.1

It is important to note that the permissibility of transmission line networks against local zonings are not an issue as the proposed transmission line works would be permissible without consent under Division 5, Clause 41 of the Infrastructure SEPP as the Proponent meets the definition of an “electricity supply authority” and the works meet the definition of “development for the purpose of an electricity transmission or distribution network”.

4.4.1 Upper Hunter Local Environmental Plan 1986

Both Middlebrook and Mountain Station (subject sites) are fully contained within the Upper Hunter LGA as shown in Figure 4.1 and 4.2. The local planning instrument the Upper Hunter Local Environmental Plan 1986 (Scone LEP 1986). Under the Scone LEP 1986 the proposed Kyoto Energy Park is defined as “Eco-generating works” meaning;

“a building, works or place used for the generation of energy using:

- *(a) renewable resources, such as solar, wind or tidal energy and the like, or*
- *(b) resources such as methane gas produced from land-fill operations”.*

The Scone LEP 1986 aims to encourage the proper management, development and conservation of natural and man-made resources within the local government area of Scone by protecting, enhancing and conserving:

(a) Important agricultural resources;
(b) Timber, minerals, soils, water and other natural resources;
(c) Scenic and rural landscape, and
(d) The environmental and cultural heritage of the local government area.

4.4.2 Muswellbrook Local Environmental Plan 1985

Proposed works within the Muswellbrook LGA would include work for the construction of line infrastructure 'work' required for transmission line Option 4 (see Section 19.2.4).The local planning instrument is the Muswellbrook Local Environmental Plan 1985 (Muswellbrook LEP 1985). No other works are proposed within this LGA.

Table 4.1 – KEP components- Permissibility of use in local zonings

Project Component	Applicable Zoning	Permissibility of Use
Generating Works (Wind Turbines, Solar PV, Mini-hydro)	1c) Rural Small Holdings	No development works are proposed in Zoning 1(c).
	1d) Rural Holding	'Eco-Generating Works' Permissible with consent under the Scone LEP
	1i) Intensive Agricultural	No Generating works are proposed within Zoning 1(i).
	1s) Small Farm	'Eco-Generating Works' are permissible with consent under the Scone LEP
	7a) Environmental Protection "A" Scenic	'Eco-Generating Works' are permissible with consent under the Scone LEP
Manager's Residence	1d) Rural Holding	Residential buildings are prohibited in Zoning 1(d) under the Scone LEP. The Manager's residence is however an ancillary use. This residence is necessary for the safe and proper function of the KEP.
Visitor and Education Centre	1s) Small Farm	Is an innominate permissible use, with consent, under the Scone LEP. The Visitors and Education Centre is an ancillary use. The facility shall be primarily used for research, education and heritage displays consistent with the DA.
Site Substation (Mountain Station)	1d) Rural Holding	'Eco-Generating Works' are permissible without consent under the Scone LEP. Also permissible under Division 5, Clause 41 of the Infrastructure SEPP as Pamada meets the definition of an "electricity supply authority" and the works meet the definition of "development for the purpose of an electricity transmission or distribution network".
Internal and External Transmission Network	Multiple.	The transmission network would be permissible without consent under Division 5, Clause 41 of the Infrastructure SEPP as the Proponent meets the definition of an "electricity supply authority" and the works meet the definition of "development for the purpose of an electricity transmission or distribution network".

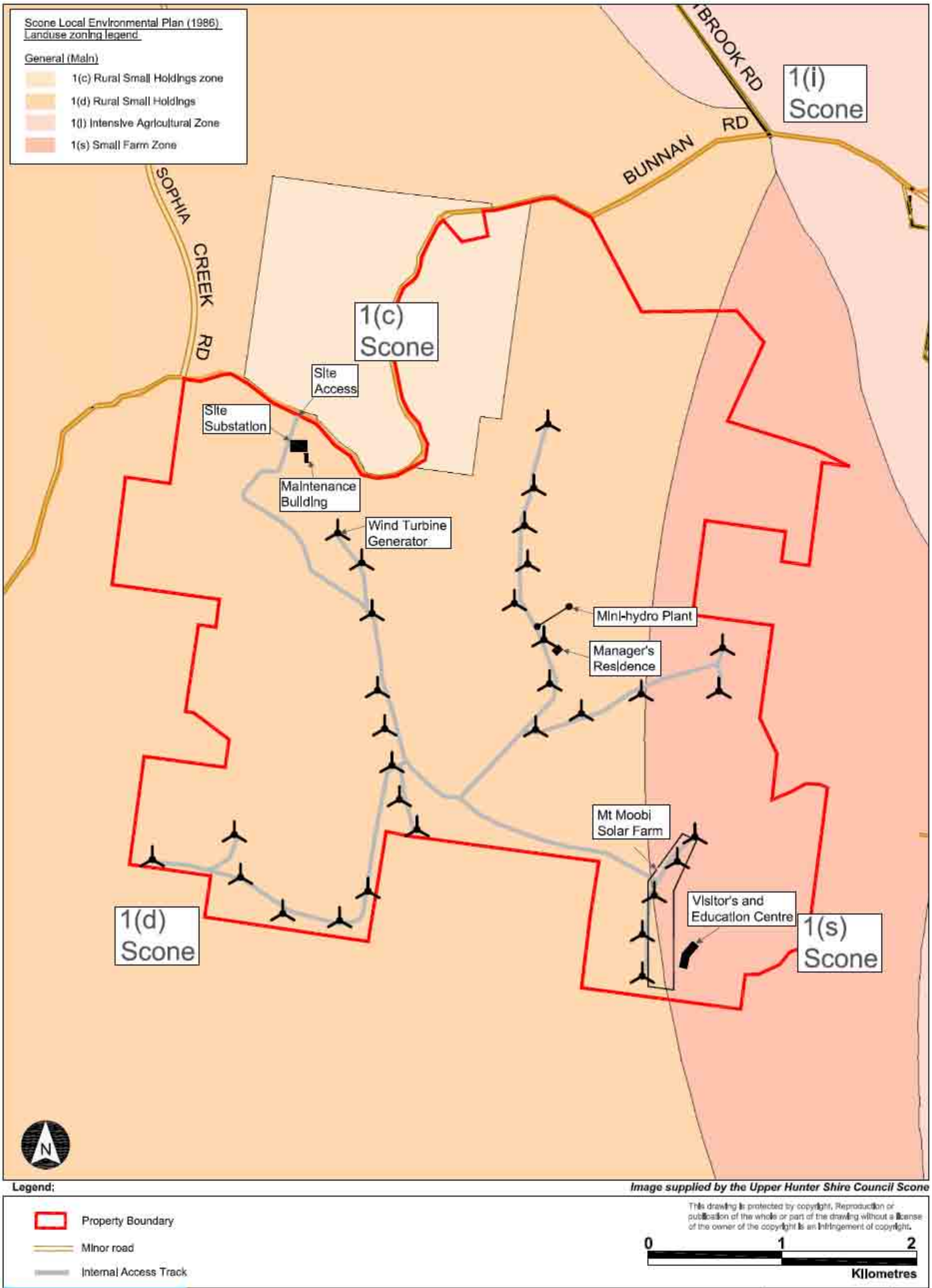
Table 4.2 describes the objectives of the zonings which apply to the land upon which the development is proposed to be located. The location of all proposed Kyoto Energy Park facilities in relation to landuse zonings under Scone LEP is illustrated in Figure 4.1 (Mountain Station) and Figure 4.2 (Middlebrook Station).

Table 4.2 – Scone LEP Zoning Objectives and applicability.

Zone	Objectives of the zone	Comment
Zone 1(d) Rural Holdings Zone	**(a)** To promote the conservation of agricultural holdings that are of sufficient area to be utilised for commercial farming practice;	The components of the Kyoto Energy Park, by nature of design, allow for the continuation of the existing agricultural/farming practices currently occurring on site and are therefore a compatible land use which will co-exist with current landuses. The proposal would also provide additional income for the land owner.
	(b) To provide for a range of compatible land uses which maintain the rural environment, character and landscape of the locality;	The proposed works are permissible with consent in relevant zonings under the Scone LEP. The Kyoto Energy Park development footprint is minimal in relation to the overall area of the subject sites (<1%) and will not disrupt or impose on the existing landuse for grazing and for agricultural land.
	(c) To encourage only development which is ecologically sustainable and carried out in a manner that will not have any adverse impacts on the environmental qualities of the locality, particularly any adverse cumulative impacts.	As a green energy source, the Kyoto Energy Park is an ecologically sustainable development which will contribute to the move towards the reduction in fossil fuel based energy. It will result in a positive ESD image for Scone. There will be minimal clearing for generator components access roads and buildings. Existing roads will be upgraded.
Zone 1(s) Small Farm Zone	• To provide for a range of compatible land uses which maintain the rural environment, character and landscape of the locality;	The components of the Kyoto Energy Park, by nature of design, allow for the continuation of the existing agricultural/farming practices currently occurring on site and are therefore a compatible land use which can co-exist. It will also provide additional income for the land owners.
	• To encourage only development which is sustainable and carried out in a manner that will not have any adverse impact on the environmental qualities of the locality, particularly any adverse	As a green energy source, the Kyoto Energy Park is an ecologically sustainable development which will contribute to the move towards the reduction in fossil fuel based energy.

Zone	Objectives of the zone	Comment
	cumulative impact;	It will result in a positive ESD image for Scone. There will be minimal clearing for access roads as existing roads will be utilized.
	• To permit underground mining;	The proposed development will not limit the potential extraction of coal. gas or any other resources within the locality. It will result in a positive ESD image for Scone.
	• To provide for small scale farming in defined areas where the potential for conflict for sustainable natural resource management and with agricultural and other productive uses can be minimized; and	There will be minimal clearing for access roads as existing roads will be utilized.
	• To permit non-agricultural land uses such as rural industries, tourist facilities and the like which are in keeping with the preceding zone objectives and which will not adversely affect agricultural productivity.	The development includes a Visitor's and Education Centre which will cater for groups, educational institutions particularly schools and research. Existing tourism activities are proposed to merge with the development.
Zone 7(a) (Environmental Protection "A" – Scenic Zone) Zone	To protect hill land, escarpments and river valleys of scenic significance and permit a variety of uses subject to more particular control as, for example, in the choice of building materials, position of a building site, access roads and landscaping.	The visual impact of the development has been assessed and mitigation measures recommended to minimize the impacts and to ensure the overall scenic significance of the locality is preserved. The details of this assessment are contained in *"Visual Assessment Report", Integral Landscape Architecture and Visual Planning (2008) (Appendix B)* and *"Assessment of Environmental Issues for the Proposed Kyoto Energy Park – Shadow Flicker and Blade Glint", Garrad Hassan (28 August 2008) (Appendix G)*. The findings and recommendations are discussed in *Section 12.0 Aviation* and *Section 11.0 Visual Impact Assessment* in this Report.

The proposed development is permissible with consent in all zones to which it relates and subject to appropriate amelioration measures is not inconsistent with the objectives of these zones.



Kyoto energypark *Figure 4.1 - Scone LEP Zoning (Mountain Station)* pamada A4

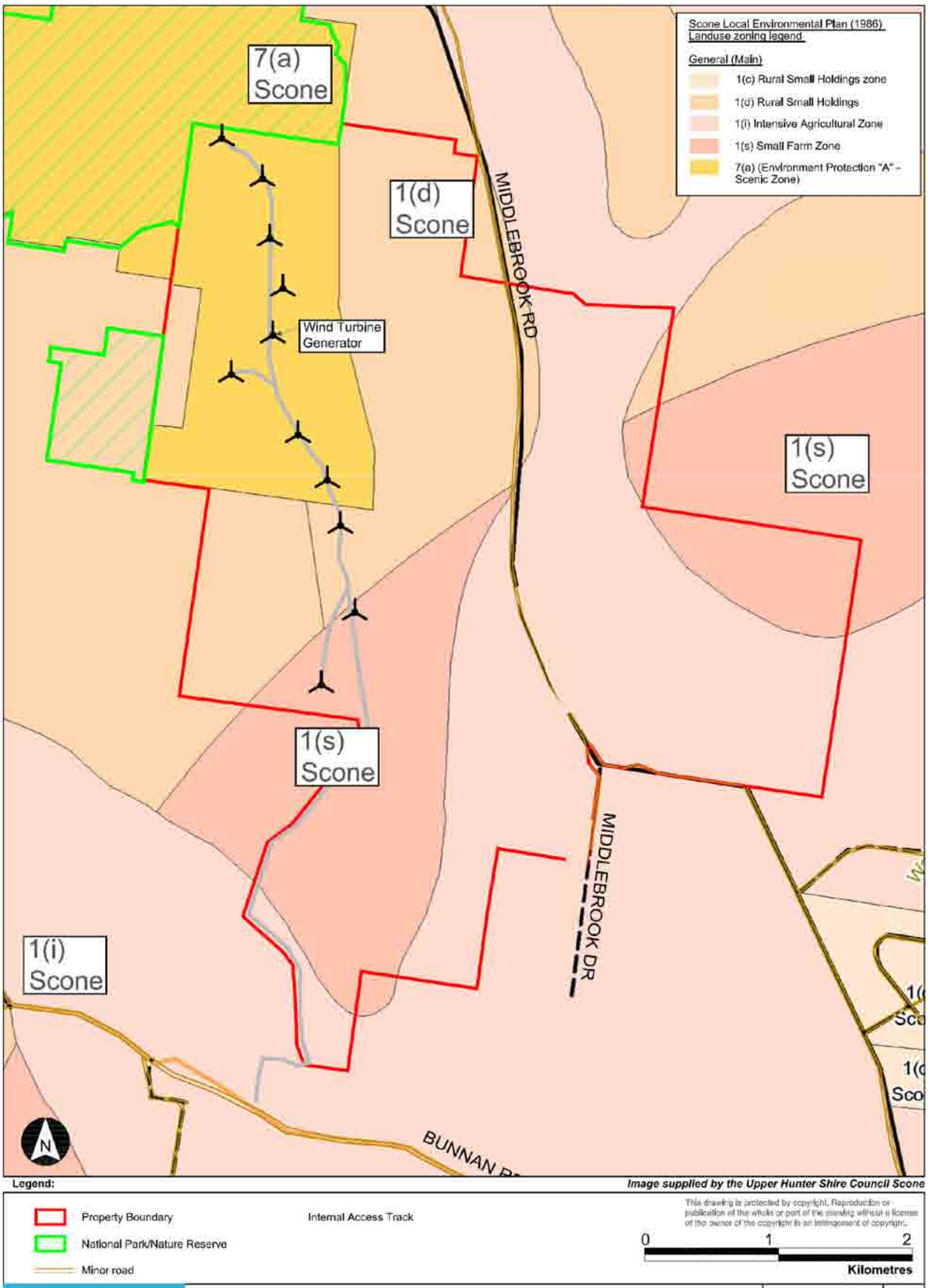


Figure 4.2 - Scone LEP Zoning (Middlebrook Station)

4.4.2 Draft Upper Hunter Land Use Strategy

The Draft Upper Hunter Land Use Strategy is a strategic planning document which, until its recommendations are incorporated into the Council's exhibited LEP, does not have any statutory effect. This Strategy identifies where growth and change are expected to occur within the Shire and proposes land use planning objectives and strategies to guide development over the next 25 years. The Strategy focuses on urban settlement, villages and residential development, rural areas and environmental values and constraints.

The Strategy also identifies infrastructure requirements to support future development, and will help inform local and state government budget processes. The intent of the Strategy is to:

- *Recommend actions for achieving the Upper Hunter community's land use objectives, consistent with the Council's vision for the future LGA and;*
- *Recommend changes to the 3 current LEPs applying within the LGA to reflect the Council's and community's vision and land use objectives, in a manner consistent with the NSW Government's planning requirements, including the Standard LEP provisions.*

Key planning issues relevant to the Kyoto Energy Park were identified in the Upper Hunter Land Use Strategy (UHLS) listed in Table 4.3.

Table 4.3 – Draft Upper Hunter Land Use Strategy – Key objectives

Key Planning Objectives	Relevant Objectives of Upper Hunter Land Use Strategy (UHLS)
Protection of Agricultural land and viability	• Agriculture production accounts for approximately 82% of the existing landuse in the Upper Hunter LGA and a significant proportion of the related employment. The main proportion of these industries including equine, viticulture and horticulture which are potentially sensitive to impacts from coal mining activities. • The Kyoto Energy Park will generate electricity from non polluting resources and displace resources that can be potentially harmful on the sensitive landuse activities within the area. • The existing landuses on site, predominantly grazing, aviation and tourism will in the most part continue unaffected by the Kyoto Energy Park proposal.
Climate change implications for landuses	• The Kyoto Energy Park would have positive implications for mitigation of climate change with no production of Greenhouse Gases and other chemical air pollutants during operation.
Rural water quality and availability and protection of catchments	• The Kyoto Energy Park generating components have minimal water requirements for production of electricity. Wind turbines and the solar PV plant do not require water for operation. The Closed loop mini hydro plant is a sealed system and will have negligible water requirements for operation. Water will be sourced from rooftops on-site and stored in rainwater for tanks for use in site amenities and for drinking water.
Recommendations for the Development Guidelines for Scone Airport and surrounding land	• The impact of the proposed development on the operation of Scone airport have been addressed in *Section 12.0 Aviation* and were assessed in *Assessment of Environmental Issues – Aviation Garrad Hassan (28 August 2008) (Appendix E)*. Mitigation measures are proposed to address any impacts. Final consultation with CASA is required for impacts related to 7 turbines on Middlebrook Station.
Heritage issues, scenic and cultural landscapes	• The impact of the proposed development on heritage issues was assessed in *Aboriginal Heritage Assessment*, undertaken by *Myall Coast Archaeological Services Pty Ltd (16 September 2008) Appendix H* and

Key Planning Objectives	Relevant Objectives of Upper Hunter Land Use Strategy (UHLS)
	European Heritage Assessment Myall Coast Archaeological Services (15 September 2008) Appendix I and are discussed in Section 9.11Heritage of this Environmental Assessment .
Aboriginal Heritage Assessment	• Aboriginal objects or artefacts were not observed on site nor were any areas of potential identified. Due diligence will be undertaken during any surface excavation works (excavations, regarding) to ensure that if objects are found correct procedures are followed. Further recommendations are outlined in Section 9.11 Heritage of this Environmental Assessment .
European Heritage Assessment	• The assessment concluded the development is neither adjacent to nor likely to affect any known heritage items, although it does overlook Castle Rock (located approximately 1.3 km from the closest turbine). The proposal will not have an adverse impact on any listed items of local, state or federal heritage value.
Biodiversity and natural ecosystems	• The potential impacts of the development on flora and fauna are assessed in the *Ecological Site Assessment*, and *Bird Impact Assessment*, prepared by Conacher Environmental Group (2008) (Appendices A and A(iii) respectively, and are discussed in *Section 8.0 Biodiversity, Flora and Fauna*. The Ecological Site Assessment also takes into consideration impacts on the Towarii National Park and the recommendations of the Hunter Central River Catchment Action Plan.
Alternative energy production	• The Strategy predicts an increased trend over the next 25 years towards development of alternative energy production and marketing of a clean green image. The Kyoto Energy Park will contribute to this trend towards cleaner alternative energy sources. The existing agricultural practices on the subject sites and in the vicinity of the sites will not be affected, thereby meeting the general aims and rural related objectives of this Strategy.

4.5 Relevant Development Guidelines

The following guidelines are applicable to the development:

- Department of Planning's draft *NSW Wind Energy Draft Environmental Impact Assessment Guidelines, 2002*
- South Australian Environmental Protection Authority's *Wind Farms – Environmental Noise Guidelines, 2003*
- NSW EPA *Industrial Noise Policy, Jan 2000*
- Chapter 171 of the NSW EPA *Environmental Noise Control Manual, 2004*
- Department of Environment and Conservation's *draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation*
- Australian Wind Energy Association and the Council of National Trust's *Wind Farms and Landscape Values: Stage 1 Final Report – Identifying Issues, March 2005, Appendix B: Wind Farms and Landscape Values: Final Issues Paper*
- Departments of Environment and Conservation and Primary Industries' draft *Guidelines for Threatened Species Assessment*
- Auswind's *Wind Farms and Birds: Interim Standards for Risk Assessment, July 2005*
- Commonwealth Department of Environment and Heritage's *Cumulative Risk for Threatened and Migratory Species, March 2006*
- NSW Rural Fire Service's *Planning for Bush Fire Protection 2006*
- Civil Aviation Safety Authority's draft advisory circular AC 139-18(0) *Obstacle Marking and Lighting of Wind Farms, December 2005*
- ARPANSA *draft Radiation Protection Standard for Exposure Limits to Electric and Magnetic Fields*

The above Guidelines have been taken into consideration in the methodology and assessment of the respective components of this Environmental Assessment. Discussion in relation to the matters of relevance to the project is included in the respective Technical Reports contained in the Appendices (Volume 2) as well as in the summary discussions contained in relevant sections of this Environmental Assessment.

4.6 Government Stakeholders and Consultation

On 1 May 2007 the Director General of the Department of Planning issued the Environmental Assessment requirements in relation to Part 3A of the Act. In preparing his requirements, the Director General consulted with the agencies listed below in relation to their requirements:

- NSW Department of Environment and Conservation
- Department of Natural Resources
- Hunter Central Rivers Catchment Management Authority
- Upper Hunter Shire Council
- NSW Rural Fire Services

The Director General also required the Pamada to undertake an appropriate level of consultation with the following additional agencies and interest groups:

- Roads and Traffic Authority
- Department of Primary Industries
- Energy Australia/Transgrid
- Civil Aviation Safety Authority (CASA)
- Woonarua Local Aboriginal Council and
- The Local Community

4.6.1 Consultation with Authorities

Project development and consultation planning with the government agencies has included:

- Consultation with the Upper Hunter Shire Council in relation to a development application for a wind monitoring tower in mid 2004, prior to the gazettal of Part 3A of the Environmental Planning & Assessment Act;
- Regulation informal and formal consultation, commencing with informal discussions used to refine the overall project definition, implementation and management;
- On initiating the project, a formal Planning Focus Meeting was held at the Upper Hunter Shire Council Chambers in Scone on 31 January 2007. The meeting also included a visit to the proposed sites at Middlebrook and Mountain Station properties;
- Numerous face-to-face meetings with Upper Hunter Councillors and Senior Council staff, presentations and progress meetings to the Upper Hunter Shire Council since early in the project phase;
- Regular progress meetings and briefs to Councillors and senior Council staff during the Environmental Assessment discussing environmental investigations and outcomes and to gather information on issues of concern to Council, local residents and nearest neighbours;
- Following receipt of the Director General's Requirements (DGRs) on 7 May 2007, Pamada issued a formal letter to identify government stakeholder agencies who were not in attendance at the Planning Focus Meeting or which had not provided requirements to the Director General. The letter described the proposal and sought information on matters that should be addressed in the Environmental Assessment. It was issued to three Federal government agencies, twelve state government agencies, including: the Office of Renewable Energy Regulator; the Civil Aviation Safety Authority; the Department of Utilities, Energy and Sustainability; the Government Radio Network and; the NSW State Emergency Service.
- Direct voice or email contact with government agencies to provide additional information, discuss issues raised earlier or to clarify details in the responses received;
- Consultation and meetings with network providers including Connection Inquiries to Energy Australia and Transgrid, and a meeting with the National Electricity Market Management Company NEMMCO.
- Issue of copies of all Community Information Newsletters to the contacts in the Government Departments and agencies identified in the Environmental Assessment phase.

Comments received from the agencies and interest groups have been considered in the assessment of the respective issues. Discussion of the issues is included in the relevant sections of this report.

Further consultation with Government authorities are summarised in the *Community Participation Plan Appendix N*. Extensive consultation with Government Departments and Agencies identified in the DGRs have also been made directly with individual consultants undertaking environmental studies and are contained within those reports.

Community consultation is discussed in the following Section 4.0 - Community Participation.

4.6.2 Planning Focus Meeting

A planning focus meeting was held on the 31st January 2007 at the Upper Hunter Council Chambers and included an inspection of the sites.

Those who attended included are summarised in Table 4.4 below.

Table 4.4 Kyoto Energy Park Planning Focus Meeting Attendance

Group/Agency	Representative
NSW Department of Planning (Infrastructure)	Neville Osborne
NSW Department of Planning (Infrastructure)	Mark Turner
NSW Department of Environment and Conservation	Mitchell Bennett
Hunter-Central Rivers Catchment Management Authority	Steve Eceles
Upper Hunter Shire Council	David Casson
Upper Hunter Shire Council	Paul Smith
NSW Department of Primary Industries	Cameron Ricketts
NSW Department of Primary Industries	Julie Edman
BBC Consulting Planners	Julie Horder
Pamada Pty Limited (the Proponent)	Mark Sydney
Pamada Pty Limited (the Proponent)	Jacquie Ryan
Middlebrook Scone Pty Limited (Landowner)	Allan Henderson
Apologies were received from the following:	
BBC Consulting Planners	Bob Chambers
NSW Department of Planning (Hunter)	Amy Blakely
NSW Department of Natural Resources	Anthony Bryson
NSW Rural Fire Service	Doug Stevens

Issues were raised by some of the representatives of each department attending the meeting. These comments were recorded (Refer to *Appendix N- Community Participation Plan*) and have been addressed by expert consultants during the environmental assessment stage.

Initial Consultation letters describing the project were forwarded to relevant government agencies and service providers whose requirements were not included in the Director General's requirements or who were not involved in the Planning Focus Meeting (PFM). These include the following list of government agencies and groups:

Table 4.5 Kyoto Energy Park - Other Government Agencies consulted

Category	Group/Agency
Approval Authority	Department of Planning (DoP)
Other Agencies/Groups	Department of Environment and Conservation (DECC)
	Roads and Traffic Authority (RTA)
	Department of Primary Industries (Minerals, Fisheries and Agriculture) (DPI)
	Department of Natural Resources (DNR)
	Hunter-Central Rivers Catchment Management Authority
	NSW Rural Fire Services (RFS)
	NSW Mine Subsidence Board
	Local Aboriginal Land Council and Key Indigenous Stakeholders
	Local Community
Local Government	Upper Hunter Shire Council (UHC)
Commonwealth Government Agencies	Commonwealth Department of Environment and Heritage (DEH)
	Office of Renewable Energy Regulator (ORER)
	Civil Aviation Safety Authority (CASA)
	Air Services Australia
	Department of Defence
Energy Service Providers	Energy Australia (EA)
	Enerserve (EA)
	Transgrid
	NEMMCO

Figure 4.3 Planning Focus Meeting Mountain Station Scone

Kyoto Energy Park Scone is wholly an Australian Enterprise. The Management is 100% Australian.

The funding of this proposal and report is 100% Australian.

An Australian Project

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Kyoto energypark

5. Community Participation

5.0 COMMUNITY PARTICIPATION

It was a requirement of the Director General (DG) of Planning that "an appropriate level of consultation" with government agencies, interest groups and the local community be undertaken in the preparation of this Environmental Assessment. This Section describes the consultation process and identifies the issues raised by stakeholders during that process. Reference is also made to the Sections within this Environmental Assessment where these matters have been addressed.

5.1 Community Participation Strategy

To facilitate effective Community Consultation and to satisfy the requirements of the Director General's, Pamada:
- Prepared a Community Participation Plan to ensure the effective dissemination of information and the collection and documentation of the responses;
- Identified the full range of stakeholders, including authorities in addition to those identified by the Director General;
- Discussed the issues and distributed information to ensure that this relatively new technology (to the area) could be fully understood and evaluated by the community;
- Identified the need to differentiate the consultation process for government authorities and other quasi-government bodies, from that designed for the local community, local organisations and business groups.

5.2 Community Participation Plan

The Community Participation (refer to *Appendix N)*, was prepared specifically in relation to the process of consulting all interest groups other than the identified government and quasi-government authorities.

The key objectives of this Plan were to:
- Identify all key stakeholder groups and gain an understanding of their particular area of interest and influence on project outcomes;
- Develop appropriate methods for engaging each stakeholder group;
- Provide the local community with accurate information about the proposed Kyoto Energy Park;
- Provide opportunities for the community to raise issues, make comments, ask questions and provide essential local knowledge;
- Indicate how the feedback would be considered in the decision-making process and set prioritisation of issues .

The other component of consultation with the general community was the Community Engagement Plan. The key elements of the Community Engagement Plan were to undertake:
- Earliest possible dissemination of information about the project via the various media outlets;
- Development of a range of appropriate communication materials, activities and events, to best meet each particular communication need;
- Personal communication with all local residents, community groups and businesses;
- Create greatest possible knowledge about the proposal at a local level;
- Create greatest possible opportunities for face-to-face meetings with nearest residents and direct feedback;
- Ensure continuity of opportunities for individual and group engagement throughout the life of the project, including site visits and information leaflets;
- Ensure local enthusiasm for and "ownership" of the project.

5.3 Community Consultation Methodology

In accordance with the Community Consultation Plan, consultation to August 2008 has included:

5.3.1 Media Coverage

The bulk of media coverage was undertaken by the local newspaper, the Scone Advocate. Several articles have appeared in the Newcastle Herald and the Sydney Morning Herald with specific discussion generated on ABC Radio programs (Muswellbrook and Newcastle) and NBN TV news. It should be noted that media coverage in relation to the initial wind farm proposal began as early as 2003. Because of the unique nature of the project media coverage has been extensive and is ongoing.

The newspaper articles have generally maintained a neutral position and have been informative. Articles have outlined both positive and negative impacts of the proposed development. At a regional level there has been a greater focus on the potential of the development in combating global warming and supplementing coal fired power production. A summary of media coverage received to date is contained in *Appendix M Media Coverage and Advertisements*.

Arguments supporting the development are based on environmental issues while arguments against the development are predominantly issues such as impact on landscape, serenity, noise, viability efficiency and appropriateness.

The proponent's strategy for media management has been to:

- Engage the media in the Community Participation Plan;
- Issue press releases about the progressive status of the project;
- To establish a page on the project website to list the chronology of media coverage of the project for access by all the community.

The development of the proposal in the context of the local area will ensure that media interest and coverage will be ongoing.

Figure 5.0 Examples of Newspaper Media

5.3.2 Public Consultations

In accordance with the Community Participation Plan a number of methods of consultation were undertaken in relation to the proposed Kyoto Energy Park. These included preliminary community consultations undertaken by the proponent, face to face meetings with local residents, phone conversations with key community organisations, local media coverage, letters and community updates, meetings and formal presentations, and a Community Information Day (refer to Section 5.3.4). Additionally information and announcements have been made on the Kyoto Energy Park website.

Public consultations have been summarised below. The following initiatives have been undertaken to facilitate direct consultation between the community and the proponent:

- An initial Community Information Newsletter on (1 January 2007), followed by a formal letter to all local residents, introducing the project and advertising of the details relating to an inquiry phone line;
- Formal presentations of the project inception and progress meetings to the Upper Hunter Shire Council (Scone) and to the Local Aboriginal Land Council at Muswellbrook;

- On site indigenous archaeological survey with the Local Aboriginal Land Council and Identified Aboriginal stakeholders;
- Establishment of the Kyoto Energy Farm website in October 2007, to allow the community direct access to updated information;
- Establishment of the Pamada Scone Office just off the main street in Scone. This office was staffed on a part time basis (usually 2 days per week), by the Kyoto Community Liaison Officer for meetings and appointments.
- Community information update brochure January 2007, 2 July 2007 and 3 January 2008 (see Figure 5.1 below);
- Community Information Day, promoted to all members of the public, by direct mail outs, advertisements and articles in local press, Council 'Whats on' website, brochures and posters set up in shop fronts and public places;
- Meetings with local residents, held on either a one-to-one or small group basis with residents in the vicinity of the proposal;
- A number of phone interviews generated from the establishment of the Stakeholder Register;
- Independent consultation and telephone questionnaires with local business stakeholders by Key Insights Pty Ltd as part of the Socio-Economic investigation and Community Feedback Survey;
- Response by the Kyoto Energy Park Liaison Manager to queries and concerns raised by residents.

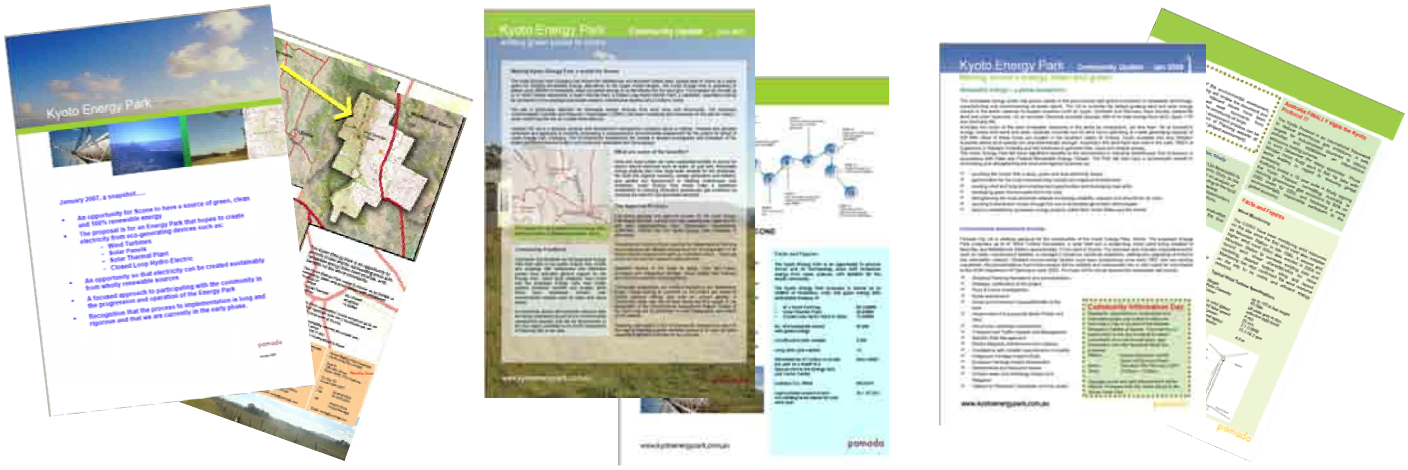

Figure 5.1 Examples of Community Information distributed to Local Community and Stakeholders

5.3.3 Consultation with Stakeholders

As part of the community consultation process Pamada were active in informing community groups and business organisations with the Scone area. These included presentations, and progress flyers to the Scone Chamber of Commerce and the Country Women's association. Pamada were also involved in a Scone High school project competition, which was published in the Newcastle herald (*Appendix N*).

A Scone Office was used during the consultation period just off the main street in Scone (see Figure XX below). The office was staffed by the Community Liaison Officer on a part time basis (usually two days per week). The office was also used for meetings with numerous residents, media consultation, general office duties and communications. After hours numbers were displayed during unattended hours.

As part of community consultations, Key Insights' established a stakeholder register comprised of key interest groups in the Scone area (including community groups and forums, schools, government organisations and chambers of commerce). Of the twenty two interest groups identified, Key Insights conducted seven phone interviews with representatives from these organisations.

An overview of phone consultations conducted with key community organisations about Kyoto Energy Park provided a brief insight into the community's current awareness, concerns and interests. Upon conducting phone interviews, a lack of interest in the subject and knowledge of the development was evident. The majority of people interviewed, were aware of the proposal once given a brief description of its location.

Overall, consultation with stakeholder groups uncovered mixed views about the proposed Kyoto Energy Park. The lack of responses indicated limited interest in the project; however, issues surrounding information accessibility and availability were highlighted.

A full description of organisational consultation and outcomes is contained in the Key insights report Appendix K.

The Community Information Day was organised to provide community stakeholders with current up to date information about the project.

Figure 5.2 Pamada Scone Office off Kelly Street, Scone

5.3.4 Community Information Day

The Community Information Day was held on Saturday 16th February 2008 and was held to provide the community with access to project information, speak with the proponents and core consultants, understand project issues to date, ask questions about the development and comment on the proposal. An estimated 150 local people attended, and a total of 56 feedback forms were received.

The views of those community members who attended, ranged from strong opposition to strong support. Those most strongly opposed to the project were more likely to be immediate neighbours. Some residents of the Scone township were also concerned about the impacts on the amenity of the town. Those in support of the proposal were generally committed to “green energy”. Many appeared be open minded and curious or attended with a specific question for the proponent.

The responses received indicate that whilst support does exist for the proposed development, there are still many residents undecided and have further questions and concerns. It should be noted that typically, those opposed to a project are more likely to make a submission in writing.

Furthermore, the feedback forms highlight that most residents are supportive of environmental quality, renewable energy and sustainability.

Figure 5.3 Community Information Day held at Scone Equine Research Centre

5.4 Issues Raised by the Community

As a result of the independent Community Information Day Survey initiated on the Community Information Open Day, Key insights Pty Ltd received 56 feedback forms. In summary, there was mixed support for the proposal. The community's main concerns related to the proposed location of the wind farms in the area generally but in particular:

- the potential for noise impacts;
- the aesthetic/visual impacts; and
- the effect on local property values and the use of the land.

Other concerns raised included:

- the effects on flora and fauna (loss of vegetation, impact on threatened species eg. bird strike);
- detract from the rural character and cultural heritage of the area;
- greenhouse gas emissions;
- electromagnetic interferences;
- traffic and transport;
- construction impacts and grid connection impacts;
- possible vibrations; and
- dust.

The potential for greater employment during construction was acknowledged by the general census. It should also be noted that while many submissions were concerned about the potential impacts of the proposed Kyoto Energy Park in the locality (as identified above), there was considerable support expressed for the idea of introducing renewable energy sources reflecting a general community concern for the long term contribution to climate change solutions and general health and well being of the environment.

In addition to those issues of concern raised by the community, Pamada supplemented the list of issues to be addressed with those raised by the Focus Groups, with other issues raised in the assessment documents for other development of a similar nature and the issues for consideration in the Council's Local Environmental Plan and Land Use Strategy.

A copy of the Community Information Day Report undertaken by Key Insights Pty Ltd is attached in *Appendix K - Key Insights Pty Ltd- Community Information Day Report (25th February 2008)*.

5.5 Prioritisation of Issues

Independent of the review and ranking of Focus Group concerns, all community queries were logged by Pamada. A copy of this record was made available to the community consultation specialists to allow these issues to be included in the specialist's review and analysis of all feedback. At the time, Pamada ranked all of the issues raised by the community as a HIGH priority. The potential environmental impact of all other issues was then ranked HIGH, MEDIUM or LOW dependant on their likelihood and consequences.

The HIGH ranking issues were identified as noise; visual impact; flora and fauna, reduced property values and impacts on the use of land from grid connection. Community members who are opposed to the development are predominantly surrounding and adjoining residents.

Community members who are in favour of the development see the Kyoto Energy Park as an opportunity to support environmental sustainability, renewable energy use and regional economic benefits (predominantly residents from the wider Scone and Upper Hunter communities).

The results of the identification and prioritisation of issues have been used to inform and focus the discussion and analysis contained in this Environmental Assessment.

5.6 Specialist Investigations Undertaken

Following an initial evaluation of all of the potential and actual issues of concern raised by government authorities and the community, a range of technical reports were prepared as part of the process of preparing this Environmental Assessment.

These reports provide an evaluation of the technical issues associated with the project and include recommendations for mitigation and/or management measures to avoid, or at least minimise, the potential or actual impacts likely to arise from the development. Following this an Environmental Risk Analysis and a Statement of Commitments was provided and formed the basis of a range of management plans and preventative works to appropriately address those issues of concern identified in the consultation process.

5.7 Status of the Consultation Process

Pamada has completed an extensive public sector and private sector consultation program which has informed the completion of the required Environmental Assessment. The process will continue throughout all subsequent phases of the project, including throughout construction and its ongoing operation.

Pamada initiatives that are to continue to be implemented include:

- An ongoing consultation program to provide information during the public exhibition, construction and operational phases.
- Access to the Pamada enquiry line, email and website.
- Ongoing communication with all community stakeholders to ensure delivery on Pamada commitments resulting from the Environmental Assessment.
- A "Nearest Neighbours" strategy as a supplement to the Construction Environmental Management Plan (CEMP) to ensure community access to senior project staff for resolution of concerns.
- It is to be noted that Pamada is also committed to provide seed funding for on-going community and education programs. It will do this by facilitating the Mt Moobi Foundation Charter managed by non politically-aligned community representatives.

No windfarms in Scone

Going through recent issues of The Advocate missed on a trip to Spain I was unpleasantly surprised to read of a proposed installation of wind farms on hills near Scone.
Parts of Spain we drove through are awash with wind farms. Blighted by them would be a better description.
These windfarms may be a triumph of industrial design, and in promotional pictures and videos they do have a certain individual elegance.
But, up close, they are gigantic, up to 150 metres high; as tall as a football field is long plus 50 per cent.
In groups or rows they completely overwhelm and visually annihilate the landscape for kilometres around.
Nobody who is financially or politically disinterested in wind farms but who lives close enough to see or hear them finds them attractive, quite the opposite.
Scone district does however have some of the most attractive country in NSW, heritage grade landscape I suggest.
We don't need the visual pollution of heavily government (ie taxpayer) subsidised wind farms. Please put them in some else's backyard.

By Dr Mj Hunter
The Scone Advocate 28 June 2007

Windfarms needed to save our valley
Thursday, 23 August 2007
Posted By Jan Clifton

What do we want for our valley? Cleaner, less polluted air or filthy clouds of carbon loaded emissions slowly choking us and all our surroundings and our planet.
We must seek an alternative to coal generated electricity.
Power stations, jet fuel, petrol burned by cars, oil refineries and diesel all used in mining account for almost 65 per cent of our country's annual greenhouse gas emissions.
While our government argues Australia is on track to stabilise emissions, it clearly not, although we are beginning to hear the words climate change, global warming, and the greenhouse effect.
Call it what you may, it all boils down to one subject, destruction.
Figures show carbon emissions have hit 590 million tonnes per year from Australia alone; our contribution to the cloud of destruction blanketing the earth.
Something beyond most people's comprehension.
And we like to consider ourselves a responsible, developed country.
We in the Hunter Valley are being used as political pawns in a governmental competition of monetary greed of the Super Powers, and damn the consequences.
The future for our children and grandchildren is not a healthy one unless we do something positive now. Each one of us.
Let us harness the sunlight and wind for power and electricity.
A skyline dominated by wind turbines? Surely better than an overturned countryside churned and ravaged, devoid of life, disrupting our agriculture, thoroughbred horse breeding, dairy, winemaking and tourism industries and further jeopardising hundreds of millions of dollars of investments and thousands of jobs.
Smell the roses now. The end process is pretty attractive. Cleaner breathable air, cleaner unpolluted water, cleaner oceans, cleaner living and happier people.

- MORE Letters to the Editor

The Scone Advocate

Figure 5.5 Examples of Resident Letters as seen in the Scone Advocate and published on the web.

Kyoto Energy Park Scone is wholly an Australian Enterprise. The Management is 100% Australian.
The funding of this proposal and report is 100% Australian.
An Australian Project

This document has been produced on Options Recycled PC 100 paper.
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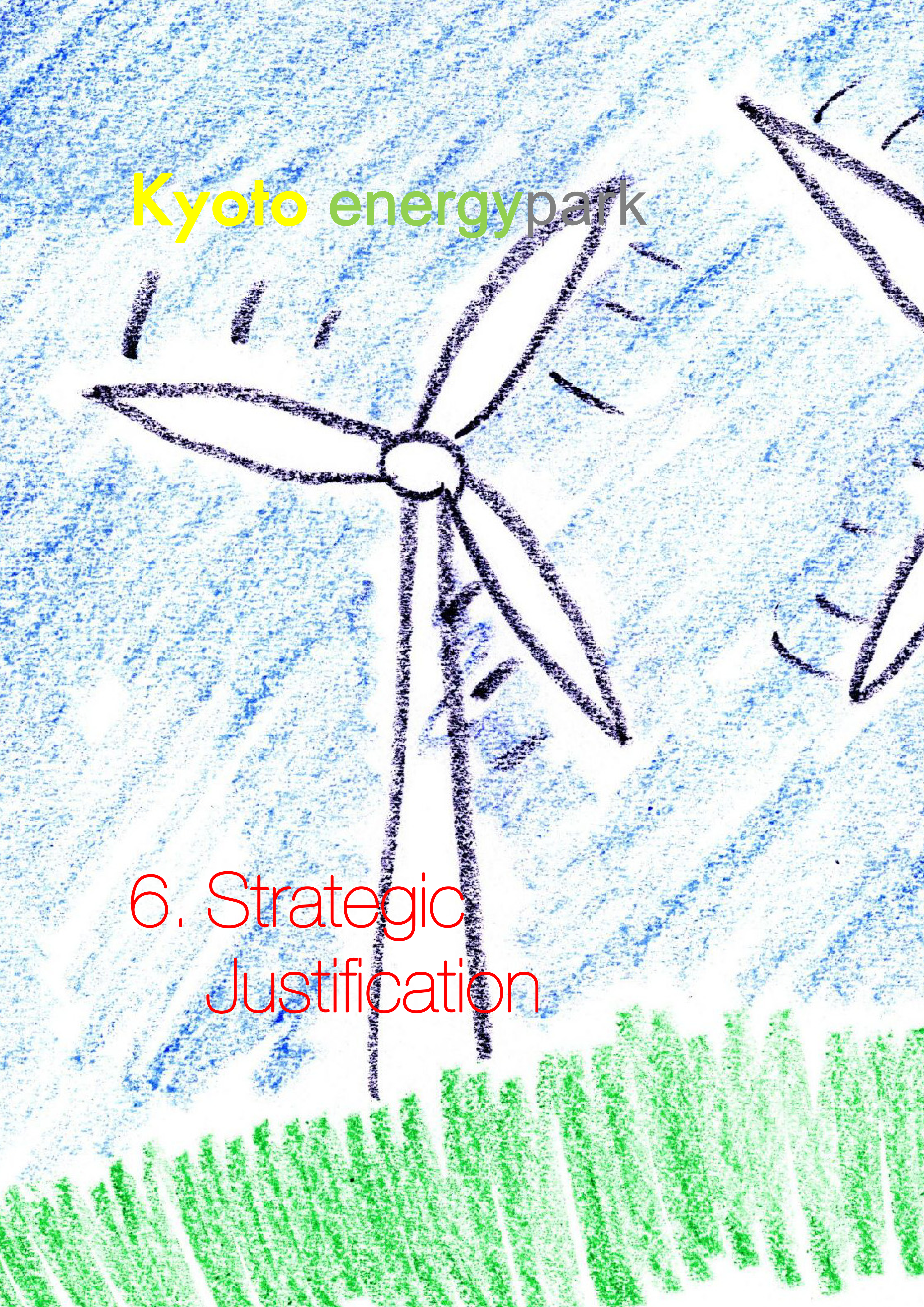


Kyoto energypark

6. Strategic Justification

6.0 STRATEGIC JUSTIFICATION

6.1 Introduction

Demand for energy rises as world economic growth increases. In particular, the emerging economic power houses of China and India are fuelling the rise in the global demand for energy. The effects of steeply rising oil prices, the growing risk of climate change impacts (now recognised as one of the world's major economic challenges) and the push to reduce carbon emissions, are all driving demand for clean, renewable energy production, to replace (or at least supplement) stationary fossil fuel generated power. At the forefront is wind power generation, currently the lowest alternative energy cost producer. Global pressures in energy prices and greenhouse gas emissions have seen most developed countries take steps to increase the contribution of renewable energy in the energy sector.

According to figures released by the International Energy Agency (IEA) in 2007 the global wind energy market has been growing at a rate of 20-30 % per annum since 1998. The IEA also predicts the annual global wind energy capacity to increase by over 20% p.a. for the next five years. In 2007 wind power generation equated to about 1.3 % of the global electricity consumption and in some countries contributes over 40 % of total energy power generation. In 2007 the global wind industry was estimated to employ 350,000 people worldwide up from 300,000 employees in 2006.

The report released by the IEA acknowledges that wind power, along with energy efficiency and fuel switching (coal and petroleum to gas) will play the major role in reducing emissions from the power sector over the next 10-20 years, the critical period in which global emissions must peak and then begin to decline to avoid the threat of dangerous climate change.

Figure 6.0 The potential for impacts from Climate Change is a global issue

6.2 Status of the Australian and NSW Renewable Energy Market

Survey results suggest that there is considerable public support for the use of renewable energy and energy efficiency in Australia. Australia's renewable energy industries cover numerous energy sources and technologies at various stages of development and commercialisation. Renewable energy technologies currently contribute about 8-9 % of Australia's electricity supply, with large scale hydro by far the largest single contributor. The recent expansion of the Mandatory Renewable Energy Target (MRET) have seen more opportunities for diversification of renewable energies such as wind power, photovoltaic, and solar thermal technologies in Australia. The deployment of these technologies provides opportunities for mitigating greenhouse gases.

Currently the biggest opportunity for mainstream renewable energy contribution is wind power. By the end of 2007, Australia had 0.8 gegawatts(GW) of installed wind power capacity, distributed nationally over 43 wind farms. By comparison in 2007, Germany had 22 GW, US 16 GW, Spain 15 GW, India 8 GW and China 6 GW. Australia currently produces less than 1% of its electricity from wind power, compared to approximately 19% of electricity production in Denmark, 9% in Spain and Portugal, and 6% in Germany.

The total wind energy capacity in 2007 was divided between South Australia (48%), Western Australia (25%), Victoria (16%), Tasmania (8%), NSW (2%) and Queensland (1%). Wind power generation has been productive in coastal regions especially in the southern states where winds are consistently stronger and air mass is colder and denser.

Also state based renewable energy targets in these states contributed to rapid development of wind power generation. In 2007 NSW drafted the New South Wales Renewable Energy Target (NRET) resulting in an increase in the number of current projects coming online. All state based renewable incentives have now been superseded by the renewed federal MRET.

Solar photovoltaic (PV) technology generates electricity from sunlight, and it can be used in grid-connected and off-grid applications. Photovoltaic applications have been successful in Australia for smaller scale applications, remote power supply and for domestic uses. The Australian government has recently introduced further rebates for PV roof top applications in an attempt to stimulate the uptake of domestic commercialisation and support the solar industry in Australia. Australia was first to develop the Sliver Cell TM technology which uses just one tenth of the costly and limited supply of silicon used in conventional solar panels while matching power, performance, and efficiency. Large scale applications (1-30MW PV plants) have been emerging overseas in Germany, Spain and the United States mainly as a result of government support in the form of rebate and feed in tariff schemes.

A commercial scale photovoltaic plant is currently being planned for Mildura in north-west Victoria. At 154 MW (A$420 million of capital investment) of rated capacity this plant would be the worlds largest and estimated to supply up to 45,000 homes with electricity needs.

6.3 Demand for electricity in NSW

Historically NSW has had a safe and secure supply of energy, which has underpinned long term economic growth. Historically energy supply has been cheap in NSW, due in part to the abundance of black coal, which is burnt to generate electricity. Electricity usage and efficiency have not been high priorities for consumers as the commodity has been relatively cheap, for all types of consumers. Over 90% of electricity is generated from fossil fuels (see Figure 6.1 below). Large scale hydro represented by the Snowy Mountains Scheme represents the largest renewable contribution in NSW.

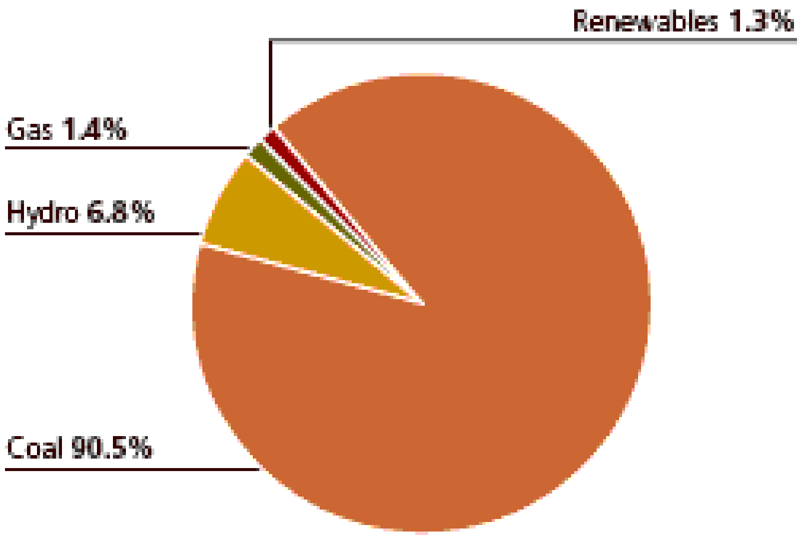


Figure 6.1 Electricity generated in NSW by fuel source (DEUS 2006)

New South Wales currently has a generator capacity deficit and consequently imports about 15-20% of its total electricity from Queensland and Victoria via the interchange networks. This adds to the cost of electricity for consumers in NSW and reduces overall efficiencies from increased transmission losses over major networks. The New South Wales Government is currently considering options for new power stations within the Hunter region including new gas fired power stations (peaking plants).

The Queensland Hunter Gas Pipeline is also currently before the NSW Department of Planning for transportation of coal seam gas from Queensland to the Hunter.

The National Electricity Market Management Company Limited (NEMMCO) prepares an annual Statement of Opportunities which forecasts reserve capacity deficits for each state. NSW is forecast to have a reserve deficit of 283 MW of net capacity by 2014/15 (NEMMCO 2008). A large proportion of this deficit is for peak demand capacity i.e. during summer and winter months.

The installation of the Kyoto Energy Park facility would significantly contribute to the overall electrical generation capacity issues for NSW. Furthermore the installation of a Solar PV plant would directly reduce peak load capacity issues during high demand summer periods.

6.3.1 Predicted Growth in Demand for Electricity in NSW

Electricity demand is expected to grow over the next two decades mainly as a result of increased population but also indirectly through economic growth and demographic factors. Strong demand for new housing is forecast as metropolitan centres such as Wollongong-Sydney-Newcastle continue to expand with large land release subdivision and densification. In line with the forecast growth in electricity demand, transmission and distribution lines are currently insufficient to carry the higher forecast load factors and will also be required to be upgraded. According to Transgrid the growth in demand for electricity in the high population density area from Newcastle-Sydney-Wollongong is expected to grow at about 300MW p.a. Most of this electricity will continue to be sourced outside of these areas, from electricity generated from gas, coal or wind.

Increased household incomes and a stable economy have lead to greater increase in demand for electricity especially during peak demand periods as households purchase more and larger electrical appliances. The use of air conditioners in NSW homes has risen from around 31% in 1994 to 54% in 2005 and is expected to reach 75% of homes by 2014. The ownership of dishwashers also jumped from 25% to 43% over the same period (ABARE 2005)

Cheap electricity has made these changing demand patterns possible, and the underlining growth in economic activity from other sectors, such as mining, agriculture will continue to underpin demand.

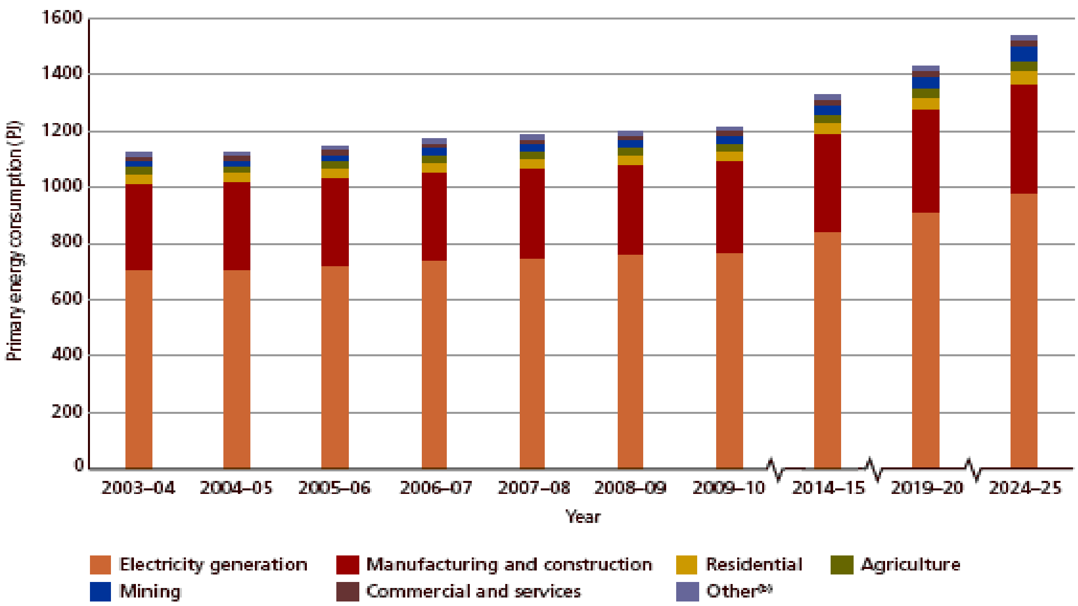


Figure 6.2- Predicted Energy consumption in NSW (ABARE 2005)

A report released by the Australian Bureau of Agricultural and Resource Economics in 2005 (ABARE 2005) predicted the energy consumption across all industry sectors up until 2025. Figure 6.2 above predicts the largest growth for the electricity generation sector, while mining is forecast to have the highest rate of growth over the period.

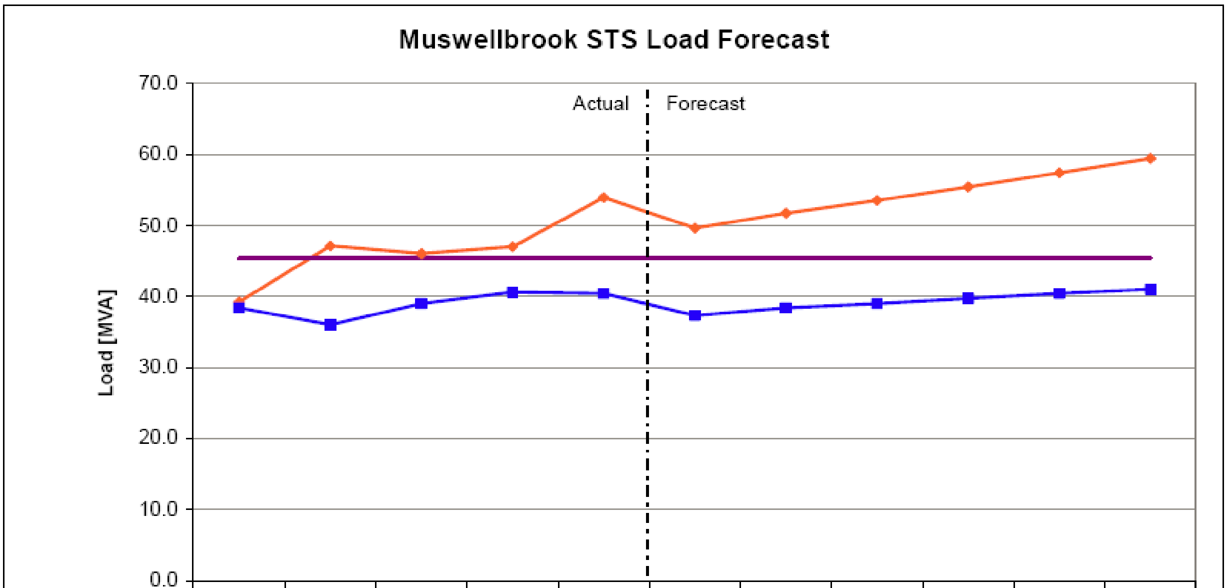
The growth in electricity generation is directly related to the rapid expected growth in demand for electricity across NSW.

6.3.2 Demand for Electricity in Muswellbrook/Scone Area

Energy Australia have identified network upgrade works in the Muswellbrook and Scone area to address supply side limitations and replace worn equipment. Energy Australia have also identified load forecasts for the Muswellbrook/Scone area which include forecasts for demand based on committed spot loads coming online (eg mines) and general load growth. Graphs showing the expected demand for load (up until 2012) for the Muswellbrook STS and the Scone substation connection options in Figure 6.3 and Figure 6.4 respectively. These are the two preferred points for connection of the Kyoto Energy Park to the grid.

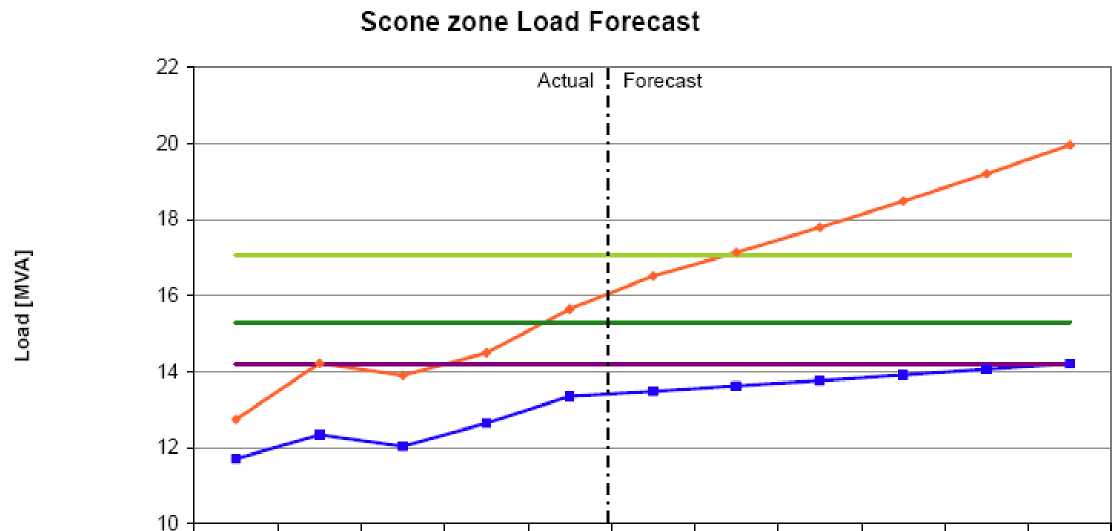
Both graphs show summer load (i.e. demand) exceeding capacity at these two substations up until 2012 and beyond. The connection of the Kyoto Energy Park to either of these points (subject to detailed fault level considerations) would reduce the overall importation of electricity from other generation sources at Muswellbrook (principally Liddell and Bayswater Power stations) thereby reducing overall transmission losses and increasing stability of the local network.

Furthermore solar photovoltaic power has a close correlation with demand in summer periods where air conditioning systems represent a large proportion of the network load. The inclusion of solar photovoltaic power is expected to provide significant stability to the network at these two points due to the current deficiency in capacity during summer periods.



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Summer Load	39.2	47.1	46.0	47.0	53.9	49.6	51.7	53.5	55.4	57.4	59.4
Winter Load	38.4	36.0	39.0	40.6	40.4	37.3	38.4	39.0	39.7	40.4	41.0
Firm Capacity	45.4	45.4	45.4	45.4	45.4	45.4	45.4	45.4	45.4	45.4	45.4

Figure 6.3 – Demand forecast at the Muswellbrook STS (Energy Australia)



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Summer Load	12.74	14.22	13.9	14.49	15.64	16.51	17.13	17.79	18.48	19.2	19.96
Winter Load	11.71	12.34	12.03	12.64	13.35	13.48	13.62	13.76	13.91	14.06	14.21
Summer Firm Capacity	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
Winter Firm Capacity	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3
Summer 1% Risk Level	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0

Figure 6.4 – Demand forecast at the Scone STS (Energy Australia)

6.4 Mitigation of Greenhouse Gases

6.4.1 International Greenhouse framework

According to figures released by the CSIRO atmospheric carbon dioxide levels have increased by 30% during the past 200 years, with the major human related sources from fossil fuel combustion and land clearing. This far reaching phenomenon has pressured governments to focus attention on reducing impacts associated with a carbon based fuels and energy generator systems.

The Intergovernmental Panel was established in 1998 by the United Nations Environment and the World Metrological Organisation (WMO) to undertake scientific research into climate change and advise leading governments on implications. These concerns over changes to climate patterns, more erratic weather conditions and biodiversity impacts have lead to development of measures such as the Kyoto Protocol (1997) and Emissions Trading Schemes(ETS). It is within a global context that the Commonwealth Government of Australia has put in place policies and measures to reduce Australia's greenhouse gas emissions and their effect.

The Kyoto Protocol (1997) is an international treaty under which developed countries have agreed to limit net greenhouse gas emissions. Australia was one of the few nations that didn't ratify the protocol but promised to limit growth in greenhouse gas emissions to 8% above the1990 levels by 2010. In December 2007 Australia finally ratified the Kyoto protocol locking in the commitment to reduce greenhouse gas emissions by 60% on 2000 levels by 2050.

The Australian government has also put in place policy mechanisms to achieve greenhouse gas emission reduction targets including the Mandated Renewable Energy Target (MRET), the Greenhouse Gas Abatement Program (GGAP), the Greenhouse Challenge and the Emissions Trading Scheme. Of these the most important mechanisms for renewable energy implementation are the MRET. The ETS is planned to commence by no later than 2010 following recommendations from the Garnaut report to be released in September 2008.

The NSW Government has developed a number of policies, programs and initiatives aimed at reducing greenhouse gas emissions and promoting renewable energy.

6.4.2 Mandatory Renewable Energy Target (MRET)

The Mandatory Renewable Energy Target (MRET) commenced on 1 April 2001 under the Renewable Energy Electricity Act 2000.The initial MRET target required the generation of 9,500 gigawatt hours (GWh) of extra renewable electricity per year by 2010. The Federal Government's 2004 MRET Review report recommended an increase in the MRET to 20,000 GWh/year by 2020, however the recommendation was not adopted. In December 2007 the federal and state governments agreed to amalgamate the existing state based renewable energy targets into the new national MRET. The Federal Minister for the Environment has recently announced an increase in the MRET from 9,500 GWh to 45,000 GWh by 2020 (DCC 2008). This new target is expected to be legislated in early 2009.

The Mandatory Renewable Energy Target (MRET) places a legal liability on wholesale purchasers (eg electricity retailers) of electricity to proportionately contribute towards the generation of renewable energy. Purchasers are liable to buy a predetermined number of RECs each year, or pay a penalty. Purchasers may make their own contracts with renewable energy providers or trade in RECs with prices negotiated on a case by case basis.

The proposed Kyoto Energy Park will generate electricity from renewable resources which will generate Renewable Energy Certificates (RECs) under the MRET scheme. Under the scheme, the Kyoto Energy Park will be eligible for a Renewable Energy Certificate (REC) for each 1MWh of renewable energy that the park generates. This RECs can then be sold independently by the Kyoto Energy Park or traded.

The full costs of MRET have already been taken into account by electricity retail companies in power prices set by them. Therefore, the Kyoto Energy Park will not increase prices for NSW residents or businesses. In fact, it will reduce the costs of production by reducing transmission losses to the region.

6.4.3 Electricity Generation and Greenhouse Gas Emissions

Australia has the second highest greenhouse gas emissions per capita in the world, the highest belonging to the US. Fixed or stationary energy production represents a large proportion of Australia's total contribution to global warming. Figure 6.5 below shows the contribution of the respective sectors of the economy to Australia's total greenhouse gas emissions. Electricity generation contributes a large part of the emissions from stationary energy and in 2005 accounted for 70% of stationary energy and represented 35% of Australia's total GHG emissions for the country. Greenhouse Gas Emissions from electricity generation increased by 50% between 1990 and 2005 (AGO 2005).

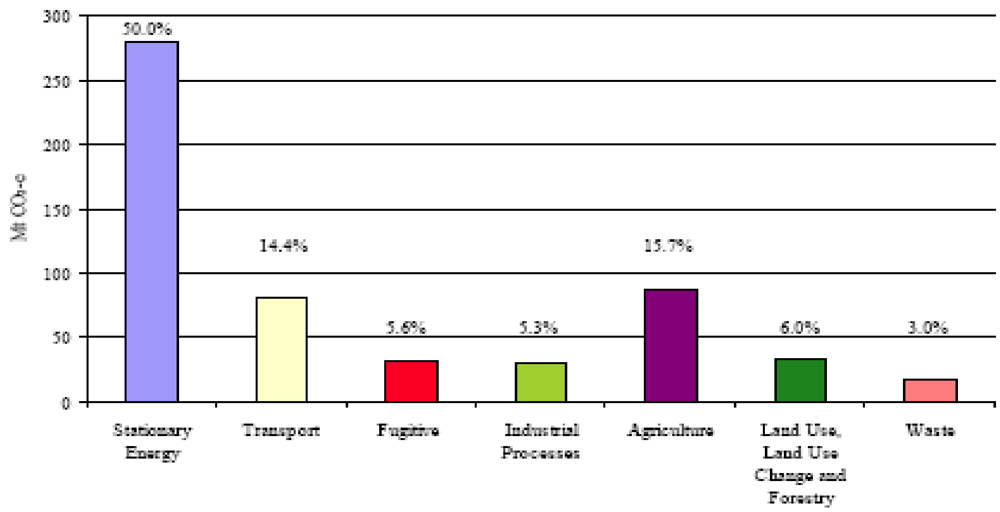


Figure 6.5 Contribution to GHG emissions in Australia by sector (AGO 2005)

Therefore over a third of Australia's GHG emissions are from the electricity supply industry. The Electricity Industry is currently dominated by fossil fuel based energy production of coal (black and brown) and gas with renewable energy production represented mainly through hydro schemes. Figure 6.6 illustrates the mix or energy resources making up the electricity supply sector across Australia.

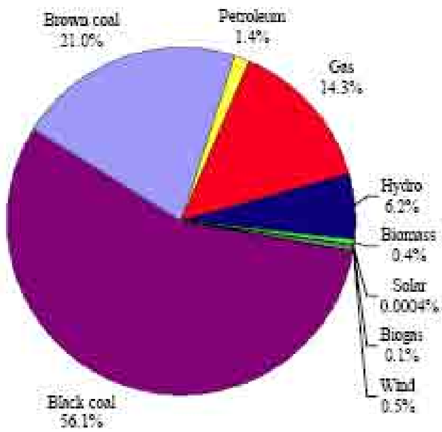


Figure 6.6 Australian Electricity generation sources (AGO 2005)

According to DEUS figures, approximately 6% of NSW's current energy usage is sourced from renewable energy. 82% of this is from hydro with 3% from wind and 1% from solar.

Renewable energy refers to electricity generated from energy sources that naturally replenish. The Kyoto Energy Park is designed to harness the energy generated through the use of solar panels, wind turbines, and hydropower. Renewable energy limits the production of greenhouse gases relative to the generation of equivalent amounts of electricity from fossil fuel. The development of the Kyoto Energy Park represents an important component to curbing greenhouse gas emissions. Both the Federal and state government's have introduced measures to support emissions reduction and increase renewable energy generation as described above.

6.4.4 Greenhouse Gas Benefits from the Kyoto Energy Park

The proposed Kyoto Energy Park project will generate electricity from green renewable resources including a solar, wind and a closed hydro system. The project will avoid generating Greenhouse Gas Emissions (GHG emissions) associated with producing electricity from fossil fuel (mainly black coal) and thermal type power stations.

Greenhouse Gas Emissions are generally expressed in terms of "CO_2-equivalent" with over 95% of the greenhouse impact of energy production a consequence of the CO_2 from fuel combustion. There is also some effect from methane (from black coal mining and natural gas production) and nitrous oxide.

A Life Cycle Assessment of the GHG emissions calculates the difference between the GHG emissions saved (or displaced by not using fossil based electricity) and the GHG emissions consumed due to the manufacture of component parts, construction activities, operations and maintenance and eventual decommissioning and disposal or materials recovery (referred to as lifecycle emissions).

The following simple formula describes the overall Life Cycle Assessment:

***GHG emissions** (net)* = ***GHG emissions** (displaced)* - ***GHG emissions** (lifecycle emissions)*

The proposed Kyoto Energy Park will have a maximum total generator capacity between 93 and 137MW as summarised in Table 2.0 (Section 2.1.3). While the Kyoto Energy Park is generating, it has the potential to displace other electricity generators that compete for supply to the National Electricity Market (NEM). Greenhouse gas emissions are saved during renewable energy production displacing fossil fuel generator demands on the NEM market. The generators supplying the NEM are predominantly large coal fired power stations, with some hydro-electric plant contribution mainly from the Snowy Mountains Hydro Scheme.

The NSW Pool Coefficient is used to calculate the average emissions intensity of electricity sourced from the electricity grid in NSW. It represents the amount of greenhouse gases emitted (expressed in tonnes of CO_2-equivalent) per megawatt hour of electricity supplied from the 'pool' of major power stations serving the NSW electricity grid. Since the electricity sourced within NSW is predominantly from coal-fired power (greenhouse gas producing), the pool coefficient is closer to 1 or 100%. The greater the contribution of hydro or other renewable sources to the electricity grid supply the lower the pool coefficient will be or the less greenhouse gas intensive the electricity supply from the grid.

The Pool Coefficient has a value of 0.954 (tonnes CO_2-e/MWh) and forecasts indicate an increase to 0.96 by 2011 by which time the Kyoto Energy Park could be operating. For the purposes of calculating Greenhouse Gas Emissions displaced by the Kyoto Energy Park (Section 6.4.6) a pool coefficient of 0.96 shall be used. This is a conservative estimation as it includes the contribution from hydro and other renewable sources in the calculation as described above.

While emissions displaced will be the same lifecycle emissions will be different for each generator component (wind, solar and hydro) of the Kyoto Energy Park and shall be analysed separately below.

6.4.5 Life Cycle Assessment (LCA)

Solar Photovoltaic Plant

The proposed Mt Moobi Solar PV Farm will generate clean and renewable energy from the sun and therefore no GHGs are emitted during production of electricity from this generator. The energy used in the manufacturing, installation and decommissioning of the Solar Farm (i.e. lifecycle assessment) can be estimated to determine net GHG emissions for this component.

It is important to note that in many cases the embodied energy in the concrete foundations, frames and inverters, including the human labour for installation can be considerable depending on primarily on the solar supporting structure or frame design. Four options for solar frame design have been included in the overall report. This Life Cycle Assessment has assumed a fixed-frame supporting structure which is representative of the worst case or the greatest embodied energy used in the design.

Therefore lifecycle emissions for this particular photovoltaic plant was largely attributed to the embodied energy used in the solar cell manufacturing process particularly the type of solar module (multicrystalline or thin film modules), materials used in frames and foundations (steel, aluminium, concrete), and energy production based on site and climatic conditions (peak daylight hours and insolation levels), energy used in the installation and maintenance and initial transport. Energy used for transportation, installation, O&M and decommissioning was found to be negligible over the life of the plant in this case.

The Energy Payback period for a thin film solar module has been conservatively estimated at approximately 2.7 years (Alsema 2004). This is for a stand alone rooftop mounted PV system. Additional energy requirements for construction and installation have to be taken into account as described above.

A study undertaken by the US department of Energy in 2004 looked into the lifecycle emissions for a 4.6 MW fixed frame photovoltaic plant in the US. The Energy Payback Period was calculated to be 0.37 years for the plant, considerably less than a rooftop mounted PV. The Energy Payback Period is the time taken to produce the amount of energy that was used in the manufacturing and installation of the plant or Embodied Energy (see Section 6.4.7).

The low Energy Payback Period was largely attributed to the design optimisation of the plant frame and foundations. The plant was a fixed frame rigid design which reduced the overall material content of the frame and concrete foundation requirements. This Environmental Assessment has assumed a simple fixed frame steel structure and thin film solar modules design. Fixed frame structures are generally rigid and require minimal concrete foundations dependent on the foundation and loads on the structure.

Four options for frames have been proposed for the Mt Moobi Solar PV farm at Kyoto Energy Park namely fixed, single axis, dual axes and CSP. Final design of the PV plant will occur subject to approval The lifecycle emissions rate and payback period of the single axes option is likely to slightly higher than the US example based on lower insolation levels, differences in frame structure and foundation preparation. The payback period for the other options would vary with frame design and tracking motor specifications but would not be considerably higher due to increased energy yields from these machines.

Green House Gas (GHG) emissions have been conservatively estimated at a rate of 0.03 tonne/MWh for the fixed frame plant. This is assuming a thin film module design with basic fixed frame and concrete foundation structure. Furthermore infrastructure requirements for high voltage systems installation and maintenance have been included in the wind turbine calculations. Therefore by combination of renewable energy generators in the park GHG emissions could be considerably reduced.

It is also noted that the environmental profiles of photovoltaic are further improving as efficiencies and material utilization rates increase and this kind of analysis needs to be updated periodically.

An LCA for the solar farm component is summarised in Table 6.0.

Wind Turbine Generator

Wind turbines generate green sustainable energy, and hence no GHGs are emitted during electricity production. However, seen from a life cycle perspective GHGs are emitted during the various processes in the life cycle of a wind turbine (i.e. lifecycle emissions). Based on data from Vestas the wind turbine manufacturer the amount of energy used in manufacturing, transportation, construction and installation (embodied energy) has been estimated at 70% with the balance of 30% during operations and decommissioning. A lifecycle analysis on the V90- 3.0 MW turbine undertaken by Vestas in 2006 estimated required consumption of 4304 MWh of electricity to produce a single V90- 3.0 MW turbine. Based on this data an estimate of 0.021 tonne GHG /MWh can be conservatively presumed for the life of the wind turbines

An LCA for the wind farm component is summarised in Table 6.0.

Mini hydro Plant

The 1MW mini hydro plant would be discharged during peak demand periods when electricity prices are higher. The water would be pumped back (recharged) during off peak periods sourcing power from wind turbine or solar components for pumping. As the energy used during recharge is from the renewable sources on site net energy would be positive. As the overall contribution to power capacity is less than 1% for the mini hydro plant lifecycle emissions would be assumed to be negligible over the life of the facility. Furthermore the plant is to be used for balancing intermittent power flows from the Kyoto Energy Park and satisfying peak demand periods on the market, which has a minor benefit on reducing infrastructure requirements for the Kyoto Energy Park and for the electricity network.

6.4.6 Greenhouse Gas Emissions Displaced by the Kyoto Energy Park

Wind Turbine Generators

Based on displacement of the equivalent generation to that produced by the wind farm component and using a forecast NSW Pool Coefficient of 0.96 (2011) as an indicator of the emissions intensity for the displaced generation then the wind turbine generators output could over a year displace electricity production that would have otherwise produced about 307,000 tonnes of greenhouse gases for the year. The actual level of emissions savings depends on a range of factors but most importantly the types and amounts of generation that are displaced relative to the wind farm contribution.

Emission savings of 307,000 tonnes of greenhouse gases each year represent about 9.2 million tonnes over an initial 30 year life compared to electricity produced by the NSW 'pool' of generators. At this rate, the wind farm component (42 turbines) will over a very short time achieve more emissions savings than is involved in the production of the wind farm components and their transport to the site and construction (lifecycle emissions).

Mt Moobi Solar PV Farm

A full site analysis was undertaken by Econnect in 2008 based on site conditions and plant output. The displaced GHG emissions savings for the Mt Moobi Solar PV Farm has been estimated based on a maximum generation capacity of 10MW for a fixed photovoltaic array. Based on generator production calculations the annual GHG saving for the solar farm is estimated at 17,318 tonnes GHG per year. Based on a 30 year life of the solar modules this equates to a saving of 519,500 tonnes of greenhouse gases over the life of the solar modules.

A Life Cycle Assessment of the net Greenhouse Gas (GHG) emissions estimates for the Kyoto Energy Park are summarised in Table 6.0.

Table 6.0 Kyoto Energy Park - Life Cycle Assessment (LCA)

Generator Component	Lifecycle GHG emissions (tonne/MWh)	Lifecycle GHG emissions displaced (tonne) (A)	Lifecycle GHG emissions produced (tonne) (B)	Lifecycle GHG emissions (net) (A - B)
Wind Turbine Generators	0.021	9,210,000	201,656	9,008,000
Solar photovoltaic plant	0.03	519,500	17,500	502,000
Mini hydro plant	-	-	-	-
Total	**0.054**	**9,729,500**	**219,156**	**9.5 mil tonne**

6.4.7 Energy Payback period

The embodied energy refers to the amount of energy required to manufacture and install the generator to the point of use. The Energy Payback Period is based on the period needed to generate the amount of energy equivalent to the embodied energy of each plant component which is usually quick in comparison for wind and solar generators.

The embodied energy has been estimated for each generator component based on energy used to manufacture, transport, construct and install i.e. energy used up to the point of use.

The energy payback period has been estimate as follows:

- Wind turbine generators (Vestas V90) = 5-6 months
- Solar photovoltaic plant (fixed PV array) = 12-13 months

6.4.8 Conclusion

The overall maximum rated capacity of the Kyoto Energy Park is 137 megawatts (MW) which represents a total generator capacity between wind turbines (92%), solar photovoltaic (7%) and closed loop mini-hydro (1%).

The savings in emissions of greenhouse gases (in tonnes of CO_2 equivalent) has been estimated at a maximum of 9.5 million tonnes over a 30 year lifecycle for the solar and wind farm components. This equates to an annual saving of approximately 317,000 tonnes greenhouse gases from the operation of the Kyoto Energy Park.

The Closed loop hydro plant represents a positive net energy balance as it will use renewable electricity generated from site for recharging of water storage. Lifecycle emissions for the hydro component were not calculated but are not expected to be significant as materials and labour during construction (with the exception of the mini hydro turbines) will be sourced locally.

The Kyoto Energy Park would supplement power to the grid displacing other conventional generators within the NEM market. The electricity generated by the Kyoto Energy Park would supply in the order of 62,000 households per year based on an average household electricity consumption of 5,000 kWh per year. It should be noted that average energy consumption in the Upper Hunter LGA in 2006 was 1230KWh per year per household (Key insights 2008).

The electricity produced by the proposed Kyoto Energy Park will be fed into the electricity supply grid to provide a proportion of the community's power needs. Increased generation of electricity using renewable sources from the park can result in net savings of GHG emissions for the Electricity Supply Industry. Renewable power generation will generally be taken up by the NEM displacing fossil fuel generators in off market contracts.

Conventional coal or gas fired power stations have high emissions from mining and combustion activities. In comparison renewable generators utilise zero emissions resources to produce electricity and emissions savings. Renewable energy technologies are thereby considered as having the lowest possible greenhouse gas impacts.

6.5 Principles of Ecologically Sustainable Development and Greenhouse Gas Emissions

Sustainability and sustainable development, or ecologically sustainable development (ESD), are used in relation to the need for development to readdress the association between development and its impacts on the natural environment. ESD has become central to industrial development.

The 5 principles of ESD central to the development of new energy resources are:
- Inter-species Equity – the conservation of biological diversity and ecological integrity;
- Intragenerational Equity – the provision of equity within generations;
- Intergenerational Equity – the provision of equity between generations;
- The Precautionary Principle – the assumption in decision making, that there is, or will be a serious or irreversible threat to the environment; and
- The Global Dimension – the internationalisation of environmental cost.

Inter-species Equity

This relates to the impacts a development may have on the flora and fauna sharing the environment in which it is located weighed up against the benefits. In terms of the proposed Kyoto Energy Park, the wind turbines pose the greatest risk to the surrounding fauna. In particular, bird strike associated with the Wedge-tail Eagle (*Aquila audax*) and the Nankeen Kestrel (*Falco cenchroides*). An EMP will be prepared for the site which will include measures for monitoring these species and actions to address any impacts arising.

In relation to the impact on the flora, it is considered that given the highly disturbed nature of the site that the Kyoto Energy Park will have a negligible impact on regional biodiversity. Additionally, the DEWHA have deemed the proposal was not a 'Controlled Action' under the EPBC Act 1999.

In this respect, it is considered that the impacts associated with the proposal are minimal in relation to the benefits gained by implementing a renewable energy based electricity supply which contributes to a reduction in greenhouse gas emissions associated with fossil fuel based energy production.

Intragenerational Equity

This relates to the access of electricity to all generations at an affordable cost. The Proposed Kyoto Energy Park will achieve this as it relies on free sources of electricity generation – i.e., the sun and wind. The electricity produced will be fed back into the main grid and available for all to access at a reasonable cost.

In this respect, these benefits out weigh the potential negative impacts.

Intergenerational Equity

The proposed Kyoto Energy Park offers intergenerational equity primarily through the very nature of the methods of electricity production. As clean, renewable resources, rather than fossil fuels are used in the process, there are zero emissions adding to the greenhouse effect. This, in effect, will aid the move toward a 'cleaner' more sustainable environment which will be available for future generations.

The Precautionary Principle

It must be acknowledged that it is not possible to eliminate all risk involved in a proposed development or technology. However, the use of renewable sources of electricity production are considered a safer method of production when global warming appears to be a certainty in using other more traditional forms of electricity generation.. With the use of renewable resources there is no risk of the production of air and water pollutants such as CO_2, NOx, SOx, Mercury and Selenium associated with fossil fuelled powered stations, or exposure to radiation associated with nuclear power plants. For those risks involved, such as bird strike, and aesthetic and noise impacts, management and mitigation measures can be implemented. Such measures are proposed to be implemented for those risks associated with the proposed Kyoto Energy Park. There are no unknown or unquantifiable threats to the environment associated with the proposed Kyoto Energy Park that will require a precautionary approach to be adopted.

The Global Dimension

The proposed Kyoto Energy Park will not produce any off-site impacts. In fact, the development will contribute to Australia's targeted reductions in greenhouse gas emissions under the Kyoto Protocol.

6.6 Socio-Economic Impacts

Key Insights Pty Ltd were engaged by Pamada to undertake the Socio-Economic Study for the Kyoto Energy Park proposal. The assessment evaluates the likely socio-economic impacts associated with the proposal as is contained within *Appendix K – Socio Economic Impact Assessment (Key Insights 5th September 2008)*.

With regard to Social Impact Assessment, one of the most important components is that of community consultation. While considerable consultation has already been carried out, a Community Information Day aimed at informing community members and enable to their input was conducted on Saturday 16th February, 2008. This Information Day allowed Key Insights Pty Ltd to independently assess current community issues, aspirations and concerns about the development of the site through the documentation of discussions undertaken during the session and the analysis of findings emerging from feedback.

6.6.1 Scone demographics

The Kyoto Energy Park proposal contributes to meeting environmental and social needs as outlined in local and regional policy and planning documents including environmental health, eco-generating works, tourism, climate change, economic development, and cultural and heritage recognition. The proposed development has the potential to further enhance Scone's social infrastructure, with minimal risk or adverse impacts.

Scone has a population of 5,080 people and falls within the Upper Hunter Shire Council, which was formed in 2004 when the shires of Scone, Merriwa and Murrurundi were amalgamated. The socio-economic profile of Scone and the Upper Hunter reveals a strong labour market, with low unemployment and high workforce participation.

The male workforce, in particular, appears to be well-placed to provide input into various aspects associated with the project. The dominant industries of employment are manufacturing and construction. The dominant occupations for Scone males are "technical and trade", "machinery drivers and operators" and labourers. Input across these industries and occupations will be central to the establishment of the Kyoto Energy Park. Furthermore large construction contractors, haulage contractors and industrial suppliers are located within the Newcastle and Hunter areas.

6.6.2 Socio-economic Impacts

The Kyoto Energy Park proposal creates the opportunity to establish a sustainable energy market and provide renewable energy to regional electricity markets. Furthermore, it creates the opportunity to contribute to state-wide greenhouse reduction and renewable energy targets, whilst promoting long-term environmental benefits and increased economic activity within the region.

The investment of considerable funds during the construction and establishment of the Kyoto Energy Park will contribute to the creation of employment across a range of industries including construction, transport and manufacturing sectors.

The most significant economic component of the project will be during the manufacturing and construction phase. The total expected capital expenditure for the project is between 140 and 190 million dollars depending on the final Kyoto Energy Park overall capacity. It is estimated that the proportion of expenditure that may be captured domestically is in the order of 82 to 122 million dollars, representing a proportion of approximately 60% of total expenditure. The domestic proportion of capture of this expenditure may grow by the time the project is commenced if a higher proportion of components can be sourced within Australia.

With regard to employment generation, the manufacturing and construction phase represents the largest employment provider for the project. Table 6.1 estimates the total direct job years generated for the construction of 42 wind turbines and associated infrastructure.

Table 6.1 – Kyoto Energy Park - Total direct job-years created

Capacity	Total direct job-years (7.5 per MW)	Total direct Australian Job-years (3.7 per MW)
89MW	**668**	**329**
126MW	**945**	**466**

The solar and hydro components operate at high efficiencies with low maintenance relative to the wind farm component. Accordingly, additional employment for the solar and mini hydro components is not expected as resources would be pooled into the wind farm component.

Scone has a low unemployment rate (currently around 4% or close to full employment), which combined with a high participation rate of 62.2% may indicate a labour market operating at, or near capacity. It may therefore be the case that additional specialists may need to relocate to Scone for a time to fulfil some positions related to this project. Additional workers to the area will positively impact on local businesses, through an increase in customers and clients.

The creation of on-going employment for the Kyoto Energy Park is in the order or 10 to 15 fulltime equivalent jobs.

6.6.3 Multiplier Economic Impacts

Multiplier impacts refer to the indirect flow-on, or benefits related to economic activity. The dispersed nature of the supply chain for renewable energy components will mean that a considerable proportion of indirect employment will be captured by firms beyond the immediate area. However, some components of the initial activity, such as construction, are likely to be sourced locally. Quantifying the employment effects resulting from multipliers is difficult due to the complex and emerging nature of the renewable energy sector.

Estimates based upon the expected output from the Kyoto Energy Park for indirect jobs associated with the project are estimated between 1351 and 1,911 Australian job years. These multipliers are very broad and give no indication as to the geographic breakdown of indirect employment.

The economic impact of construction of buildings (Managers, residence, Maintenance shed and Visitor's and Education Centre) is expected to create a further 14 direct jobs and a further 43 indirect jobs.

There will also be considerable multiplier effects on local employment opportunities in particular, as a result of the project. The indirect employment flowing from these locally based industries is more likely to be captured locally, providing increased economic activity for Scone and the Upper Hunter Shire. These multipliers will be also felt throughout the region and further field as firms supply inputs for manufacture and construction, and corresponding wages are expended.

With regard to the operational phase of the project, the economic flows associated with the selling of power onto the power grid are difficult to ascertain but would also represent an economic benefit.

6.6.4 Regional benefits

Other regional benefits of the Kyoto Energy Park proposal have been summarised below.

Other Climate change threats

Climate change impacts are also projected to have an impact on electricity generation and supply particularly coal fired electricity generation. These risks can include:

- increased threats from storm, lightening and bush fire damage which may increase damage related to electrical infrastructure transmission over long distances associated with centralised power generation;
- reduced water availability for cooling of thermal and coal fired power stations;
- increased costs for wholesale electricity as the cost of process cooling water increases and water supply decreases;
- reduced operational capacity of main network feeders during periods of very high temperatures
- increased peak demand from air conditioners due to periods of above average temperatures
- Impacts on existing hydro projects such as the Snowy Scheme (6% of NSW's total electricity supply) through drought affected water shortages

Less reliance of fossil fuel prices

Domestic and industrial consumers have become use to cheap and efficient supply of electricity with little barriers to supply. However changing environmental and geo-political circumstances means the risks to energy supply and associated costs are changing. The rising cost of oil and gas due to strong global demand means Australia is vulnerable to the fluctuations of world prices for these commodities. With the projected introduction of the Emission Trading Scheme (ETS) in 2010, the cost of electricity from conventional coal fired power stations is predicted to increase mainly as a requirement to balance carbon emissions from these sources. The Kyoto Energy Park will generate carbon offsets under the ETS which would be taken up by carbon intensive emitters such as coal fired power stations.

Decentralised power generators

A single coal fired power station in NSW can generate up to 2640 MW or approximately 20% of the total NSW capacity. Centralised power generation increases the potential risk attached to the loss of supply,

Figure 6.7 Bayswater Coal-fired Power Station

be it from potential terrorist attacks, major network damage and faults, storm or fire damage resulting from changing climatic conditions. Renewable energy technologies are generally considered ‘embedded generation’ as they are decentralised and distributed throughout the network. By decentralising power sources the losses from large scale transmission of power is minimised. The Kyoto Energy Park will contribute towards capacity deficiencies identified at connection points.

Public Opinion about Wind Farms

Opinion polling conducted in October 2006 by AC Neilson on behalf of Australian Wind Association (Auswind) showed an overwhelming acceptance of wind power by the broader community.
Key findings included:

- Nine out if ten Australians are aware of climate change and concerned about environmental issues.
- Seventy eight percent say Australia should be a leader in greenhouse gas reduction
- Nearly three out of four Australians recognize coal fired red power stations as a major contributor to climate change.
- Three out of four believe the federal government should do more to support wind energy and reduce carbon emissions.
- 68% are willing to pay more for environmentally friendly energy sources.

In general, people are very supportive of renewable energy, but not in their backyard.

6.6.5 Local Benefits of the Kyoto Energy Park

Approximately 70% of the local Scone area is based on rural type agricultural pursuits. The negative economic impacts of climate change are likely to be felt much more considerably in the local area than in urban areas of NSW, therefore the benefits of this project are also likely to be significantly weighted in favour of the local community.

Diversification of industry and skills sector

Australia is recognised as one of the driest continents in the world and will be one of the most affected by climate change. The rural and regional communities will be particularly affected. The development of renewable energy has the potential to diversify communities away from traditional industries, such as farming that will be heavily impacted by climate change and furthering drought conditions. During the early stages of the project Pamada were contacted by the Muswellbrook TAFE who are commencing a Renewable Energy Certificate Course and are interested in utilising the site for educational purposes and training.

Contribution to the Rural and Regional Communities

In July 2008 a report was released by the Bureau of Meteorology and the CSIRO that predicted the impacts on rural communities and particularly drought affected regions from climate change. According to the report droughts could occur twice as often, cover twice the area and be more severe in key agriculture production areas within the next 20-30 years, commencing by 2010. These climate forecasts are causing both governments and farmers to reassess land usage and diversify their earnings away from being totally reliant on farming incomes. Hosting a renewable energy park can be another income source for rural communities operating and benefiting from adverse climate conditions.

In recent years many local rural communities have realised the potential for adding new pollution free industries into communities. Many wind farms have developed in regional areas and these are looking to the renewable energy sector as a source of future prosperity. As an example the rural town of Ararat City in western Victoria, already the home to the Challicum Hills Wind Farm, is now looking to establish a renewable energy business precinct, with the potential as a manufacturing and transport hub for southeast Australia.

Local network integrity and reduced risk of faults

The connection of the Kyoto Energy Park will involve upgrading the existing lines in the area and associated electrical infrastructure. This will contribute to network infrastructure development in the area improving the network integrity, distribution and security for all stakeholders including local community.

Major Environmental Benefits

The Kyoto Energy Park will displace the uptake of conventional coal fired electricity in the local area and contribute towards meeting demand for future development in the area. The Kyoto Energy Park offers significant environmental benefits over fossil fuel power stations:

- the development footprint of the Kyoto Energy Park proposal is less than 1% of the total area of the combined sites thereby minimising destruction and disturbance of vegetation and habitat, landscape, biodiversity corridors, soils, and associated impacts;
- the project components would be fully decommissioned following the design life and are fully recyclable leaving minimal impacts on the landscape;
- no greenhouse gas emissions during operation of wind, solar and hydro generators;
- no air pollutants such as nitrous oxides, sulphur oxides, heavy metals or particulates are emitted as a by product;
- no production of wastewater to pollute natural waterways including temperature increases, siltation and sedimentation of receiving waters;
- no requirement for storage of water in large man made water reservoirs;
- no excess water use for project generator components;
- no long term heavy vehicle traffic movements and associated impacts on local amenity and rural roads;
- no waste products (nuclear or otherwise) which require long term disposal.

Water Consumption of Coal fired Power Stations

Fossil fuel fired power stations use large amounts of potable water in their operations, primarily for cooling water (in cooling towers) and for boiler make-up water. Any reduction in the use of fossil fuel fired power stations will lead to a reduced demand on NSWs finite sources of water. This in turn will free up water for more productive uses, and is also likely to have longer term benefits to creek quality and thereby water quality.

Macquarie Generation own and operate two of the countries largest coal fired power stations just south of Muswellbrook in the Upper Hunter Valley. Water for these stations are sourced from the Hunter River and Lake Liddell. Annual water consumption figures are represented below:

Table 6.2 – Water Consumption in Hunter Coal-fired Power Stations

Company	Power Facility	Coal Consumption (Tonne/year)*	Water Consumption (ML/year)*	Power Production (GWh/year)*
Macquarie Generation	Liddell (Hunter River / Lake Liddell)	5 million	25,000	10,000
Macquarie Generation	Bayswater (Hunter River / Lake Liddell)	8 million	36,000	17,000
TOTAL		13 million	61,000	27,000

**Source: www.macgen.com.au*

Water usage for these two power stations equates to approximately 12% of Sydney's water consumption per year (Sydney Water 2008).

Based on an annual energy generation from these two power stations of 27,000 GWh/year, this equates to a total annual water consumption of 2200 Litres per MWh of electricity produced. Therefore the Kyoto Energy Park is likely to reduce water consumption in the Hunter Area by approximately 536 to 792 million litres of potable water per annum.

The Kyoto Energy Park will contribute towards the development of Scone as clean and sustainable region of the Upper Hunter. The Kyoto Energy Park is a clean, non-polluting, renewable, replenishable resource for the area in direct contrast to the Muswellbrook region which is dominated by the coal fired power stations and associated open cut mines.

Kyoto Energy Park - Operational Water Consumption

Conventional plants generating power from fossil and nuclear fuels use large amounts of water for cooling. Wind turbines do not use water for cooling purposes. In some arid countries small amounts of water is required for cleaning of blades (dust and insect build up) where rainfall is insufficient.

The Solar PV Plant would have negligible water requirements. Cleaning of PV panels would be undertaken manually approximately twice per year, or during rainfall periods.

The Mini-Hydro Plant would be charged prior to operations. Water losses to the system would be minimal as the system would be sealed. Some minor losses would be expected from evaporation and small leakages. During maintenance water would be stored in tanks. Additional water would be required to replenish levels, estimated to be an additional water cart per month.

Fresh water would be required for drinking, maintenance works and for the Managers Residence.

Table 6.3 –Kyoto Energy Park – Operational Water Consumption (ML/p.a.)

Component	Water Consumption (ML/p.a.)
Wind Turbines	-
10MW Solar PV Plant	-
Mini-Hydro Plant (Closed Loop)	0.07
Emergency Fire-fighting (Storage)	0.02
Amenities (Manager's residence, Visitor's & Education Centre, Maintenance Shed, Site Substation)	0.49
Total Operational Water Consumption (ML/year)	0.58
Annual Water Consumption per MWh (L/MWh)	1.6

The total water consumption for the Kyoto Energy Park has been estimated at 0.58 ML (580,000 Litres) per annum, as illustrated in Table 6.3 above. Based on an annual energy generation from the Kyoto Energy Park, estimated at 354,600 MWh per annum (see Section 2.1.2), this equates to a total annual water consumption of 1.6 Litres per MWh of electricity produced.

This is the equivalent of less than 0.07% of the annual water consumption of Bayswater and Liddell (Macquarie Generation) power stations combined.

Approximately 30% of operational water consumption requirements would be sourced from rainfall falling on rooftops of proposed buildings and stored in tanks adjacent to site facilities. This water shall be used mainly for amenities on site at buildings and facilities.

Approximately 90% of the estimated water consumed on site would be for amenities (e.g. toilets, hand washing facilities and drinking water), in the order of 490,000 Litres per annum. Grey water recycling facilities for amenities shall be used to considerably reduce the need for external water supply on site. It is expected that up to 60% of grey water can be recycled on site. Composting toilet facilities will also be considered on site during the final design of facilities.

Additional water would be trucked to site from a registered bore located within the Scone town. No water shall be sourced from registered bores within the sites or from farm dams for operational water consumption.

Increased tourism to the area

The addition of a tourism component in the form of the Visitor Education Centre would provide further economic benefit to the local area. It would provide employment on the site and additional income from visitors. As a consequence other businesses in the area may benefit; especially those equipped to supply the tourist trade such as accommodation and food providers. Other tourism drawcards for the Upper Hunter (such as the equine industry) may also benefit from the increased profile that Scone and the Upper Hunter would receive as a supplier of renewable energy.

The presence of the Kyoto Energy Park will also provide an additional source of revenue, in terms of leases, to the landowners where the park will be located. The expenditure of this income by the owners in the local area will further benefit the economy.

Moobi Foundation Charter

During the operation of the Kyoto Energy Park, the proponent (Pamada) would facilitate the formation of the Moobi Foundation managed by non politically-aligned community representatives selected from the community including a representative from the Kyoto Energy Park Company. Other groups may include the Upper Hunter Council, Scone Chamber of Commerce, Country Women's Association and others as nominated.

The Moobi Foundation would be set up to oversee the foundation and determine eligible programmes for support in the community. The allocation for funding and relevant programs would be decided by the representatives of the Moobi Foundation. It is likely that the funds will support local education and community programs, however the decision for where funding is allocated would be decided by the representatives of the Foundation.

Through the Moobi Foundation it is proposed The Kyoto Energy Park Company would provide seed funding for on-going community and education programs on a yearly basis. The Foundation will also assist with the raising of further funds to enable and support local good living and thriving enterprise.

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6.6.6 Social and Economic Impacts Conclusions

The development of the Kyoto Energy Park has estimated economic benefits at a number of phases, depicted below as manufacturing and construction, construction and installation, ongoing maintenance, the associated multiplier effects, and the construction of on-site buildings. Main economic benefits include the following:

- The manufacturing and construction phase represents that largest economic injection into the local and regional economy.
- The proposed Kyoto Energy Park will include up to 42 wind turbine generators on two sites. Typically 60% of total expenditure for wind turbine construction and installation is captured domestically, and it creates an estimated 3.7 total direct Australian job years per MW. Total job years are estimated to be 329 to 466, depending on installed MW capacity.
- The wind farm component of the park will provide estimated ongoing 10 – 15 fulltime equivalent jobs over the operating life of the project.
- The Estimates based on the expected output from the wind power at the Kyoto Energy Park and the multiplier estimates from the literature for indirect jobs associated with the project range between 914 and 1595 job years.
- Based on the expected expenditure of $15m on the buildings will create 14 direct jobs and a further 42 indirect jobs.
- The proposed Visitor Education Centre would provide further benefits to the region through tourism and the associated income derived both directly and indirectly from that, as will the lease income generated for the land owners from the where the park is located.

The Kyoto Energy Park proposal creates the opportunity to establish a sustainable energy market and provide renewable energy to regional markets. Furthermore, it creates the opportunity to contribute to state-wide greenhouse reduction and renewable energy targets, whilst promoting long-term environmental benefits.

In analysing and assessing the potential social and economic impacts of the proposed Kyoto Energy Park, it can be concluded that while there is the potential for some negative impacts to occur, these are localized and are able to be mitigated.

Potential positive socio-economic impacts:

- Creation of employment opportunities for local residents during the construction and operational phases
- Significant environmental benefits through the promotion of renewable resources, its contribution to meeting regional, state and national greenhouse gas and climate change targets and due to the proposed development generating no new emissions or pollution from its operation.
- Contribution to the local and regional economies via the potential use of local and regional resources during construction and through the generation of increased tourism
- Potential to promote local culture and heritage (Indigenous and non-Indigenous), education programs and tourism to the region.

Potential negative socio-economic impacts associated with the proposed development include:

- The visual amenity of selective near and adjoining neighbours may be adversely impacted, however these impacts can be mitigated through mitigation and planning, design and visual screening.
- With regard to the impact of the development on land values, the Land Value Impact Assessment concluded that there may be some potential for short term land devaluation, which has a high potential of being influenced by community perceptions, however, this impact may moderate itself over due course and become a neutral or positive impact (see Section 6.7.7).

Potential for negative social and community impacts have been identified, however these are manageable and need to be viewed in context of wider regional benefits, shifts in common thinking towards climate change and greenhouse emissions and policy and planning contexts.

6.7 Strategic Planning considerations

6.7.1 Site History

The Upper Hunter was occupied by the Wannaruah Aboriginal People prior to European settlement and comprised two family groups or clans - the Tullawong and Murrawin. The Tullawong inhabited the Dart Brook area and the Murrawin occupied the Junction of the Pages and Isis Rivers near Gundy. Employment was sought on surrounding farms. The first European settler to the area was Henry Danger whose assessment of the area led to pastoral settlement.

The proposed site consists of two separate rural properties of several hundred hectares containing high ridgelines. The current property was part of the original land grant in 1825 of Invermien and Satur. The properties underwent various changes and subdivisions and amalgamations until in 1924 when it was under the ownership of WC Barnes. In 1939 Mrs Grace Munro bought the property. The proposed sites are now owned by a single landholder and are completely within the Upper Hunter Shire. There are several buildings /sheds on the property are not of heritage significance.

Land-based production and activities form the foundations of the Scone economy. It is predominantly based on the equine and agricultural industries. A retail sector has developed in support of these industries.

Local Government support for renewable energy production began in 2005 when the Upper Hunter Shire, Scone Local Environmental Plan 1986 was amended to allow Eco-generating devices in the Shire.

Additionally, in 2005, the Upper Hunter Shire Council approved the proposed installation of additional Wind Monitoring towers on both the Middlebrook Station and Mountain Station sites.

6.7.2 Suitability of the Kyoto Energy Park location

The current site was identified by the former NSW Sustainable Energy and Development Authority (SEDA) in 1995 as one of eleven sites in NSW suitable for generation of electricity from wind. SEDA installed a wind monitoring mast on the Mountain Station site in 1999. The CSIRO has been continuously monitoring and modelling wind conditions on site since the year 2000 (over 8 years of data), confirming the locations suitability for wind generation (see Section 2.2.5).

In 2004 EHN (Oceania) Pty Ltd initially commenced discussions with the landowner to seek approval for a 'wind farm' on the Mountain Station site. No formal agreements were reached with the landowner and discussions were dismissed. The NSW Wind Atlas also recognised the importance of the Scone area for wind generation in the document published in 2006.

Pamada Pty Ltd recognised the importance of the site and the suitability for a renewable energy park including solar and mini hydro technologies. In November 2006 Pamada engaged Garrad Hassan to undertake an assessment of the wind viability of the site. The assessment has demonstrated that there is sufficient wind resource to develop a medium scale wind farm at the proposed site. Pamada also engaged Econnect in December 2005 to undertake a high level electrical connection feasibility study to determine likely connection costs to the grid. Econnect also completed an analysis of the site for a commercial scale photovoltaic plant up to 10MW in total capacity in 2007 following consideration of other alternatives to design.

Other characteristics of the site which have considered the initial strategic planning alternatives were:

- moderate wind speeds over the two sites (6.5-7.5m/s @105m agl - Mountain; 6.5-7.5m/s @105m agl – Middlebrook)
- dominant and uniform wind patterns from the W and SE over both sites.
- sparse vegetation on predominantly cleared landholdings and largely modified vegetation communities;
- relatively low concentrated population in immediate area with nearest residencies greater than 1 km away from proposed turbines;
- good local road access to site to allow transportation of oversize and overmass vehicles;
- strong connection options in close proximity to the subject sites;
- a single landowner

A second wind mast was installed on the Mountain Station site in 2006 monitored by the CSIRO to confirm viable conditions for wind power generation and to generate wind shear coefficients.

The use of grazing land for development of the wind turbines will not significantly affect its potential for grazing. Once developed, the area of land required by the development will be minimal in comparison to the overall size of the properties (<1%). During construction, there may be a greater impact due to the increased numbers of personnel onsite, movement of large equipment and materials, earthworks and temporary storage of equipment on the ground. The areas affected during construction will be managed through EMPs prepared prior to construction with arrangements made for the landowner and staging of the development phases.

6.7.3 Access and Transport

Scone has significant transportation advantages being situated along the New England Highway and main Northern Railway line. While the major road and rail links are advantageous Scone has relatively poor public transport facilities between major towns and rural villages. Local bus services exist within the Scone area and neighbouring towns such as Wingen, Bunnan and Parkville and Murrurundi.

The region is well serviced with education facilities. Educational facilities include nine primary schools and three secondary schools. There are two TAFE colleges in the area (Scone and Muswellbrook), with the closest universities being the University of Newcastle and University of New England (Armidale).

The Muswellbrook TAFE is conducting a new course in renewable and sustainable energy, one of the first TAFE campuses in NSW to offer this course. The Muswellbrook TAFE coordinated has contacted Pamada Pty Ltd early in the project to discuss the new course and possible interaction with the Kyoto Energy Park and educational facilities for students.

6.7.4 Native Title Claimants

The Wonnarua People have been recognised by the Native Title process and are the registered Native Title Claimants in the Wonnarua area. Federal Native Title Legislation recognises the traditional rights of the Indigenous Native Landholders under Australian Law.

In 1993, the Commonwealth passed the Native Title Act to recognise and protect traditional rights of Native Title Holders over their land. New South Wales introduced legislation to reflect the laws administered by the Act. A more recent High Court decision confirmed that freehold title completely extinguished native title.

The proposed site is in the Wannarua Local Aboriginal Land Council area. As the Wonnarua People are the registered Native Title Claimants they have particular rights under Native Title legislation however Native Title rights can only exist over land where it is not private freehold land. The native landholders were consultated extensively during the planning stages of the development and have no objections to the proposal.

6.7.5 Surrounding Landuses

Scone is primarily a large service town for the surrounding rural areas. The Upper Hunter region has significant equine and agricultural industries combined with a rapidly expanding coal mining interest to the north and south. Development within Scone includes a main street shopping centre with stand alone individual retailers, commercial, medical, educational facilities and residential development. Development surrounding Scone includes a sealed airport, a number of large horse studs and an equine centre consisting of a race track, training facilities, TAFE college, vet centre, and conference/reception area.

The Upper Hunter has a significant agricultural sector occupying around 82% of the land in the LGA. The dominant non-agricultural land uses include urban, rural residential and coal mining. The main landuse activities within the area are summarised as follows:

- Grazing (mainly sheep but some cattle)
- Horse studs
- Dairy and piggeries
- Cereal cropping
- Intensive agriculture (vineyards and olives)
- National Parks and reserves
- Rural properties and homesteads
- Rural residential subdivisions
- Underground coal mining

The nearest coal mine to the site is the Dartbrook mine which is located just west of Aberdeen and approximately 14km south east of the Mountain Station site boundary. The Dartbrook mine was an underground mine and has now been closed with the longterm planning of this mine not known. There is currently a proposal for the Bickham Hill coal mine which his located approximately 18km directly north west of Middlebrook Station site boundary. The Bickham Hill mine currently has a bulk sample pit and is planning to submit a development application for an open cut mine in the near future.

The Scone Aerodrome is located 5km east of Mountain Station and approximately 4 km southeast of Middlebrook Station.

6.7.6 Impacts on future surrounding landuse

Future changes to land use could include different types of pastoral activities, increased rural residential development, possible sub-division of land and increasing rural industrial development.

Population growth in the Upper Hunter LGA is mainly concentrated around the Scone and Aberdeen areas. The population of Scone was estimated at 5085 in 2006, with population growth expected to increase by between 0.25% to 0.5% over the next 25 years, mainly from 'lifestyle changes' coming into the area.

The Upper Hunter Council approvals data shows that between 1996 and 2005 there was an average of 15 subdivisions per year over the whole LGA. This includes subdivisions for both urban and rural areas. This is very low considering the large proportion of rural lots in the LGA. The Upper Hunter Land Use Strategy 2007 estimates that to accommodate future growth approximately 70% of new dwellings will be located in urban areas and 30% of new dwellings in rural areas, mostly within the Scone area. This equates to a maximum of 15 to 20 new dwellings or subdivisions each year in rural areas predicted up to the year 2032. The current demand for subdivision is primarily from existing individual landowners on rural properties.

The dominant landuse activities in the vicinity of the Kyoto Energy Park sites are illustrated in Figure 6.8. There are currently some areas around Scone zoned for rural residential which are currently only 60-70% developed, and likely to be further developed, prior to new rezonings being released. Some potential future areas were identified in the UHLS as having potential for long term rural residential areas and are shown in Figure 6.9 below. The blue circles indicate potential future residential zones that could be considered in the next 25 years.

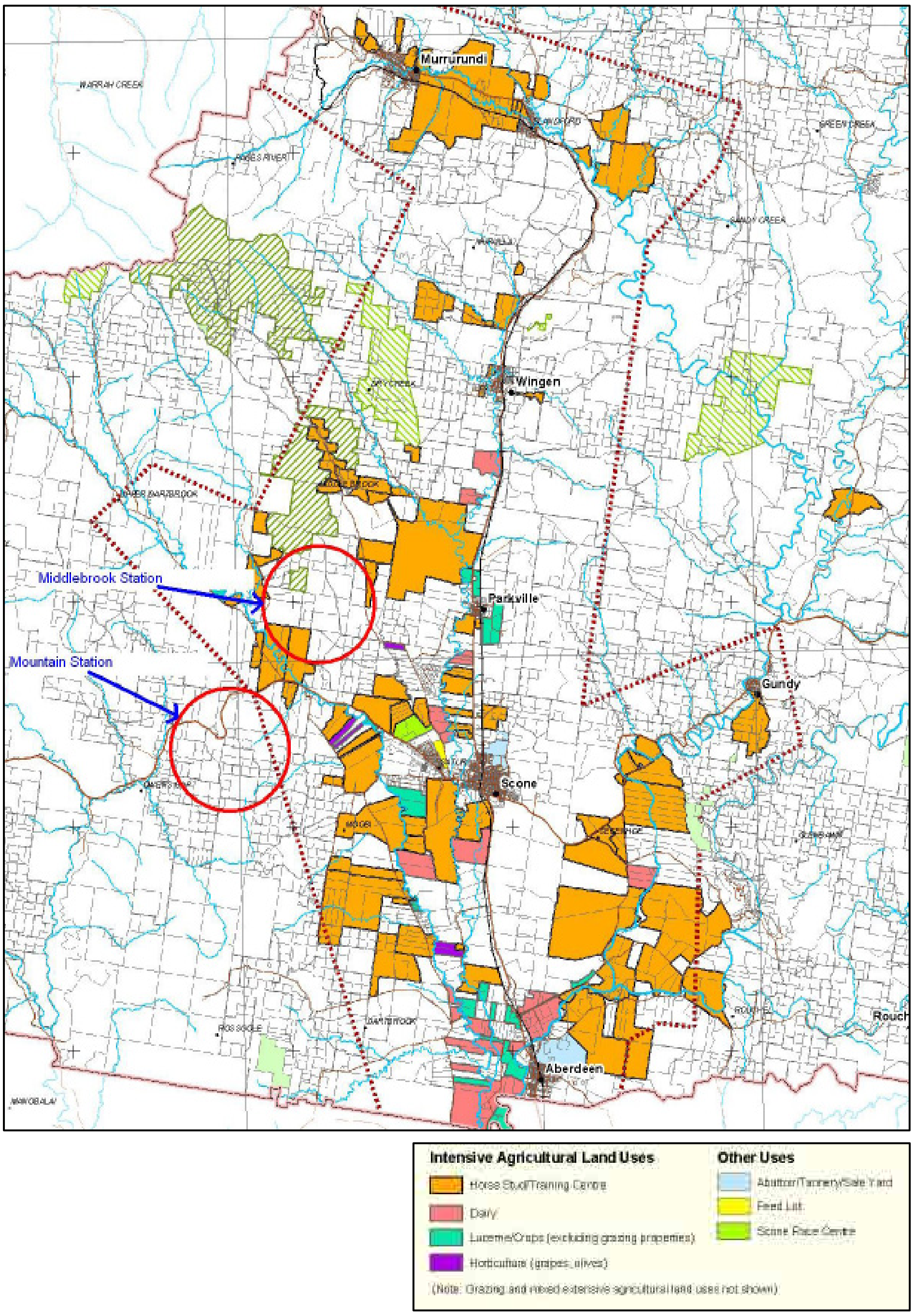

Figure 6.8 Kyoto Energy Park Existing Surrounding Land-uses (Department of Planning

The Scone West Rural Residential zone includes a provision for approximately 30 rural lots at an average area of 10ha per lot. This area is purely an investigation area and has not been rezoned to allow for development. A transmission line route option (Option 2 or 4) is proposed to transect the area however the line would be confined to the existing road reserve and not impact upon any future rural lots should they be rezoned.

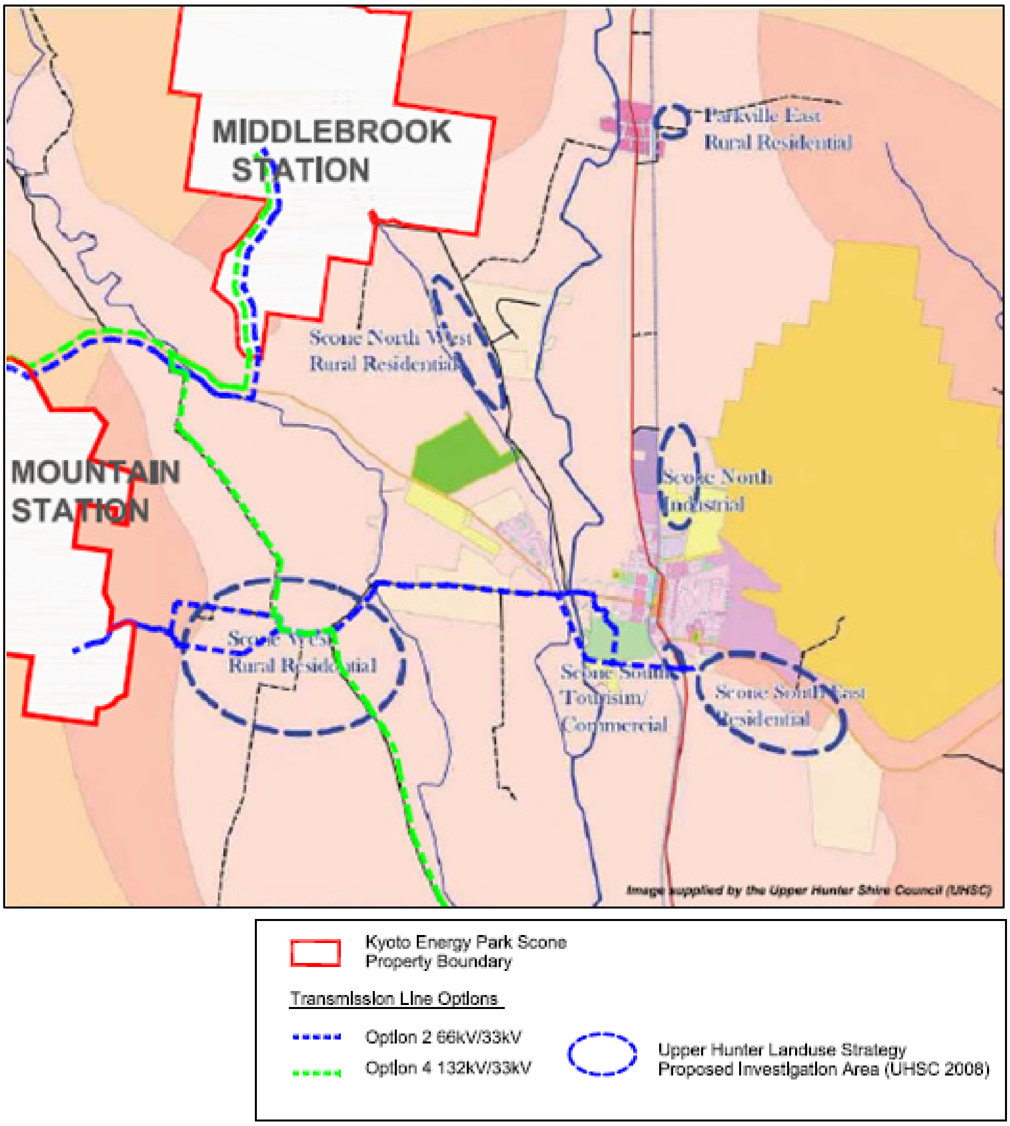

Figure 6.9 Existing and potential rural residential land use zonings (Draft Upper Hunter Land Use Strategy 2007)

The Scone area is generally considered as potential future coal mining area based on resource alone (see Section 14.0). Restrictions with respect to depth and complexity of resource, social and environmental impacts such as community acceptance, sterilization of agricultural land, impacts associated with road and rail traffic, environmental impacts on the Scone surrounds, transport access and buffers to urban and rural and zones, would need to be resolved prior to mining occupation in close proximity to Scone township.

The installation of the Kyoto Energy Park will not limit the future use of the subject properties for grazing or other intermittent landuses on the subject sites.

6.7.7 Potential Devaluation of Property

Key Insights Pty Ltd have undertaken a socio-economic impact assessment which has included an assessment of possible land devaluation from effects of wind turbines on surrounding properties. Bob Dupont Land Valuations Pty Ltd were engaged by Key Insights to provide advice on the potential for land devaluation as a result of the Kyoto Energy Park project specifically from wind turbines (see attached report in Appendix K(i). The background review was based on an assessment of existing evidence in the market both in Australia and internationally, information of the development, an inspection of the local area, knowledge of land values in the Scone region and the impact developments of this nature have on land values.

A major study was conducted in the USA by the Renewable Energy Policy Project (REPP) which examined 24,300 property transactions from 10 locations, over a six year period prior to the siting of wind turbines and three years following installation (see Appendix Q(i). The study concluded that there was no evidence to suggest that wind turbines sited within a five mile radius of property had a negative impact on value. Property values appeared to exceed the regional average within the case study locations, actually having a positive impact. In other words, property in view of the wind farm rose more than properties that were not in view.

Valuation evidence within Australia to date has been limited to a single study prepared on the effect of the Crookwell Wind Farm in NSW Australia on local property values. In this valuation a total of 78 property sales surrounding the Crookwell Wind Farm were evaluated over a period of 15 years from 1990 to January 2006. Sales of properties in the view shed of the wind farm (within a 6km radius) were compared with sales of those not in the view shed. No reductions in property values for those properties in the view shed of the wind farm were found.

In 2004 a Panel inquiry was held into the Bald Hills Wind Farm in Victoria. A range of submissions from property professionals on the panel concluded 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. It therefore follows that it has not been demonstrated to the satisfaction of this Panel that significant value changes, transfers or inequities would result from the project proceeding."

Therefore there appeared to be a general consensus from the Panel inquiry that wind farm developments have no impact on the agricultural viability of land (Bald Hills Panel Report, 2004 and RICS, 2004). In their final conclusion on property values the panel commented that valuation effects from the wind farm development may occur, specifically devaluation of the amenity, lifestyle and non-agricultural development component of the surrounding land.

It is difficult to use the findings and research from previous wind farms as a clear indication as to what will occur at a potential site, such as the Kyoto Energy Park, however it does assist in providing a better understanding of the potential outcomes.

Overall there is no reliable consensus in international research that indicates wind turbines add a positive or negative value to property prices and agricultural land. The land surrounding the proposed Kyoto Energy Park is dominated by agricultural land, prominent horse studs, rural homesteads and lifestyle blocks, and some rural residential subdivisional developments. Given the nature of the land and the prominence of the wind farm component of the development on top of ridge lines, there may be a potential initial effect on the amenity, lifestyle and non-agricultural development component of land values in the area. As a worst case scenario there is some potential that properties with a highly impacted view of the Kyoto Energy Park may suffer a temporary reduction in value predicted to occur within the first 1-2 years of operation of the wind turbines. This suggests that the impact is perceived and not substantially related to adverse environmental factors experienced at the residence.

Bob Dupont Pty Ltd went on to summarise as follows:

> *"However, our experience and enquiries has shown that this reduction is more a consequence of the perception of negative effect than actual outcomes and once developments of this nature are in place, after a period of time (generally 1 to 2 years) the effect generally reduces to zero."*

In conclusion the report undertaken by Dupont's provides several examples of impacts on prices of properties, primarily in the US and UK, however, concludes that overall there is no reliable consensus in international research that indicates that wind turbines add a positive or negative value to property prices and agricultural land.

The results of the research has identified factors that may contribute to the impacts of wind farms have on property prices particularly within Australia. These impacts are likely to be noise and visual aspects. It also needs to be acknowledged that variables such as distance from the wind turbine, its visibility and local public perception are relevant and need to be considered in the proposal.

The Kyoto Energy Park proposal will achieve compliance with strict noise criteria in accordance with current prescribed regulations to ensure that the existing noise amenity of the area is conserved. Pamada will introduce measures identified in this report to reduce the overall visual impact of the proposal on properties most highly affected. Based on research and the summations of the Socio-Impact study the effects of property devaluation in the vicinity of the development should they occur would be expected to be temporary and recoverable within a short timeframe.

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7. Existing Environment

7.0 EXISTING ENVIRONMENT

7.1 Topography, Slope & Aspect

Middlebrook Station Site

The Middlebrook Station site is part of the Glen Range, and is a single ridgeline which runs approximately north-south. Middlebrook Station has an elevation between 580m and 620m. Terrain slopes around the Main Ridge can be described as complex in all other directions, as there are steep slopes present, particularly to the east and west. The ground cover is medium tree cover to 6-8m. The valleys surrounding the ridgeline are mainly open grassland, with occasional scattered trees to 8m.

Mountain Station

Mountain Station is in an area of escarpment and ridges, which form part of the western side of the Hunter Valley. The proposed energy park has been located on prominent ridgelines and associated escarpments including the Mount Moobi Plateau. The Mount Moobi ridgeline in the proposed location of the Kyoto Energy Park varies between elevations of 600-640m. Terrain on Mountain Station can be generally described as moderate to the west, steep in the east (as the escarpment moves down toward the Hunter Valley flood plain) and complex in all other directions.

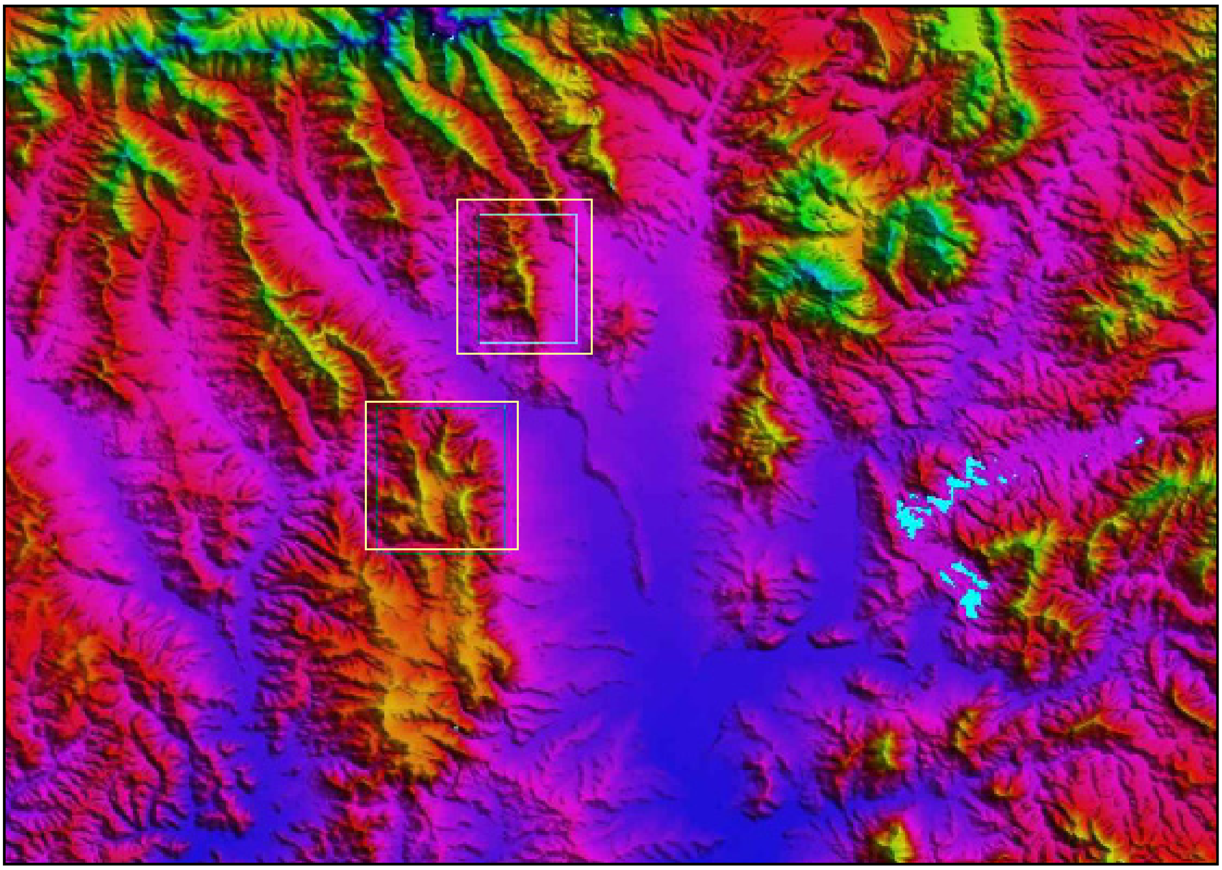


Figure 7.0 Surrounding Topography Mountain Station and Middlebrook Station sites

7.2 Temperature

Climatic conditions have been estimated based on data obtained from the Bureau of Meteorology for nearby weather stations located at Scone Airport, the Scone Soil Conservation Service (SCS) and Scone centre (Philip Street). Temperature data is relatively constant across the three monitoring stations. The mean annual air temperature at Scone varies between 10.0 and 24.1degrees Celsius.

Generally summer periods are hot and dry during the daytime with moderate to mild night time periods. Spring and autumn is pleasant sunny days with cool nights. Winter has very cool periods with morning frosts.

Average annual peak sunlight hours (PSA) for the site have been calculated at 5.58 hours per day.

7.3 Rainfall

Mean average rainfall has been taken from the Scone Airport with a yearly average 600 mm.

7.4 Snow

Snow or ice can be a problem in cold temperatures resulting in blade-fouling and reduced wind turbine efficiency. Snow falls in the area are rare and have not been considered as an impact upon solar modules and wind turbine blades.

7.5 Wind Data

Long term wind data has been logged on site from the two wind monitoring towers located at Mountain Station. Two wind monitoring stations have been installed on Mountain Station and have been used to determine wind data. Data from Wind Mast 1 is representative of long term wind speed and direction based on the 8 year period of collection by the CSIRO. Data from Wind Mast 2 has been used for predicting wind shear coefficients and wind speedups for the site.

Table 7.0 outlines details of Wind Mast 1 and Wind Mast 2.

Table 7.0 Wind Monitoring Mast details Mountain Station

Item	Wind Mast 1	Wind Mast 2
Site	Mountain Station	Mountain Station
Easting (WGS-84)	288790	287866
Northing (WGS-84)	6450231	6452681
Elevation	631	636
Zone	56	56
Anemometer Heights	45m	30,45,65m
Wind Vane Heights	45m	45,65m
Data logging commenced	January 2000	October 2006
Data logging intervals	10 min	10 min
Wind Speed (m/s)	6.5-7.5	6.5-7.5

7.6 Wind Direction

Dominant long term wind directions representative of both sites are predominantly from the south-east and also the west as illustrated in Figure 7.1 below.

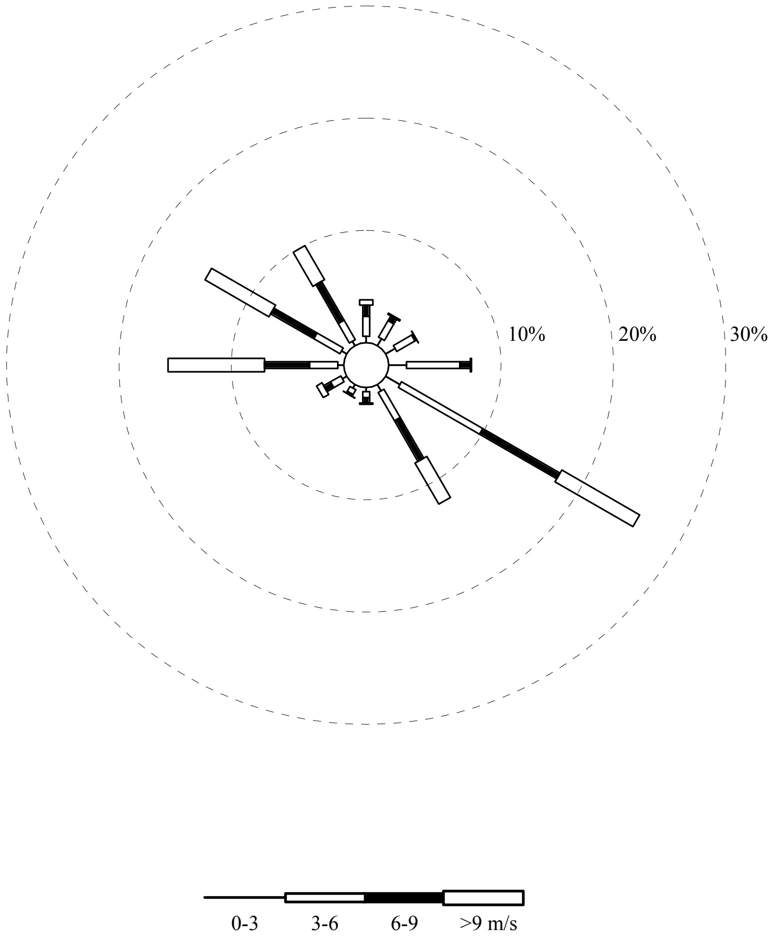


Figure 7.1 Long term wind rose at 45m (Mast 1 Mountain Station)

7.7 Air Quality

The Kyoto Energy Park will utilise renewable energy technologies that do not produce air pollutants as a by-product. Dust generated during operation of the Energy Park will be limited to usage of the internal access roads used by Park staff which would be minimal.

During the construction phase of the project exposed works areas will generally be limited to access roads and hardstand areas. Exposed works areas will generally increase the sites susceptibility to marginally increased dust levels within the vicinity of the Kyoto Energy Park on nearby residencies adjacent to the subject sites. The potential for impacts on local receivers from dust generation is expected to be negligible.

7.8 Existing Services

The surrounding area of Scone is serviced by major bus and train services operating in a northern and southern direction. Scone airport is located west of the Scone township along Bunnan road. Existing

services to the site are limited. Due to the sites isolated location, elevation and lack of previous development there is no connection to reticulated water or sewer.

7.9 Local Context and Tourism

The Hunter Valley, also known as the Hunter region, is an area in New South Wales, just over 200 kilometres north of Sydney and approximately 130 kilometres north-west of Newcastle. It is bordered by mountain ranges, all of which are part of the Hunter River system catchment.

The Upper Hunter (around Scone, Murrurundi and Merriwa) is undulating country transitioning into mountainous terrain to the north and Barrington Tops Mountain Range which is the closest World Heritage Listing to the proposal and the highest point within the greater region. The lower Hunter (Maitland, Cessnock, Singleton) is reasonably flat country which lies on the flood plains of the Hunter, Paterson and Williams Rivers.

The Scone area is distinctly rural with a relatively small urban centre and rural residential density development areas, agricultural production and open space. Agricultural landholdings contribute to about 70% of the former Scone and Murrurundi land area. The Scone area also has a significant equine industry home to Australia's thoroughbred industry and is also labelled as 'horse capital of Australia'.

Coal mining activity is concentrated south of Scone in the Muswellbrook area, however some mines are located within the Upper Hunter area including the Dartbrook and currently planned Bickham Coal mine to the North.

The Hunter Valley is also a world famous wine producing region. The majority of the wine vineyards are located in the Lower Hunter, however some private vineyards are scattered throughout the Upper Hunter region. The Hunter Valley region also supports a tourism base mainly generated from the wine industry and to a lesser extent from the equine industry. The Upper Hunter landscapes, open country areas rural villages remains a popular destination for vacationers and weekenders.

Residents in the area have a rural lifestyle which is a reflection of the rural landuses, clean air, open space and natural environment.

7.10 Existing landuses

The project is situated on two separate landholdings of 2032ha (Middlebrook Station) and 1995ha (Mountain Station). A small fraction of the two landholdings will be used for the Kyoto Energy Park footprint. Existing on-site activities will continue unaffected on the station properties with the exception of the private airstrip on Mt Moobi Plateau which will be replaced by the proposed Mt Moobi solar PV farm. The current dominant landuse is for grazing (sheep) with some tourist accommodation located on Middlebrook Station and rural site tours to both properties.

Existing landuse activities on both the Mountain Station and Middlebrook Station sites are outlined below.

Existing landuses - Mountain Station

The areas of Mountain Station proposed for the Kyoto Energy Park have undergone heavy clearing as a result of the historical and existing agricultural land use activity

Existing activities on site are described as follows:

- ***Pastoral/Agricultural -*** Grazing paddocks including holding pens, shearing sheds, dams for stock and water supply etc;
- ***Shearing sheds –*** shearing sheds are located near the entrance to Mountain Station, the sheds do not provide any accommodation.
- ***Private Airstrip –*** a makeshift grassed airstrip is located on the Mt Moobi Plateau at the location for the proposed solar photovoltaic plant. The landowner has agreed to discontinue the use of the airstrip.
- ***Aircraft Hazard lights –*** existing aircraft hazard lights are located on the eastern escarpment of Mountain Station. Both hazard lights are supplied by overhead 11kV powerlines located on the eastern escarpment of Mountain Station. No interruption, modification or removal of the hazard lights of power supply to them shall occur as a result of this proposal.
- ***4WD Tours –*** Existing activities include group bus tours to the shearing sheds and Mt Moobi Plateau

- ***Myall Trigonometric (Trig) Station –*** The Trig station is located in the southern portion of the Mountain Station site on Mt Moobi Plateau as shown in Figure 7.2. This Trig Station will not be affected by the proposal nor will any lines of sight from or to this Trig Station be affected by the proposal. The NSW Department of Lands have requested that they be consulted during final design stages of the project with to confirm final locations and dimensions of wind turbines and facilities. Further details are outlined in Section 7.11.

Existing landuse activities for the Mountain Station property are shown in Figure 7.2.

Existing landuses - Middlebrook Station

The relevant areas of Middlebrook Station have undergone significant clearing. There are signs of past fires, as much of the bushland is regrowth. No significant clearing will be required for the proposed works in this application. The existing 4WD track follows the existing ridgeline and shall be upgraded to a width of 5m to allow for construction vehicle and crane access.

Existing activities located on the Middlebrook Station property include:

- ***Road base Quarries -*** existing gravel and road base quarry, involving excavation, dryscreening and stockpiling operation. No washing or crushing facilities occur on site;
- ***Pastoral/Agricultural -*** Grazing paddocks including holding pens.
- ***Various homesteads –*** Middlebrook Station and several homesteads are located on the flats along the western side of Middlebrook road. A total of 8 residencies owned by the landowner are located on Middlebrook Station.
- ***Private Airstrip –*** Aircraft are used for agricultural activities on both sites. A private grassed airstrip is located adjacent to the Middlebrook Station homestead and used by the landowner (for tourism and aerial spraying), other aerial spraying operators and the Scone Aero Club on irregular occasions.
- ***Tourist accommodation –*** located within 300m of the Middlebrook Station homestead, Middlebrook Station Tourist Accommodation holds accommodation for typically tourists, groups and schools. Tourist activities include shearing demonstrations (Mountain Station), a conference/functions hall (Middlebrook Station), site tours and visits to Mt Moobi Plateau lookout (located on Mountain Station at location of Visitors and Education Centre)
- ***Aircraft Hazard light –*** existing aircraft hazard lights are located on Robertson's Knob in the south of Middlebrook Station. The hazard light is supplied by overhead 11kV powerline which would remain unaffected as a result of this proposal.
- ***Robertson's Knob Trigonometric (Trig) Station –*** The Trig station is located on Crown Land in the southern portion of the Middlebrook Station site away from any of the proposed works. This Trig Station will not be affected by the proposal nor will any line of sight from or to this Trig Station be affected by the proposal (see Section 7.11).

Existing landuse activities for the Middlebrook Station property are illustrated in Figure 7.3.

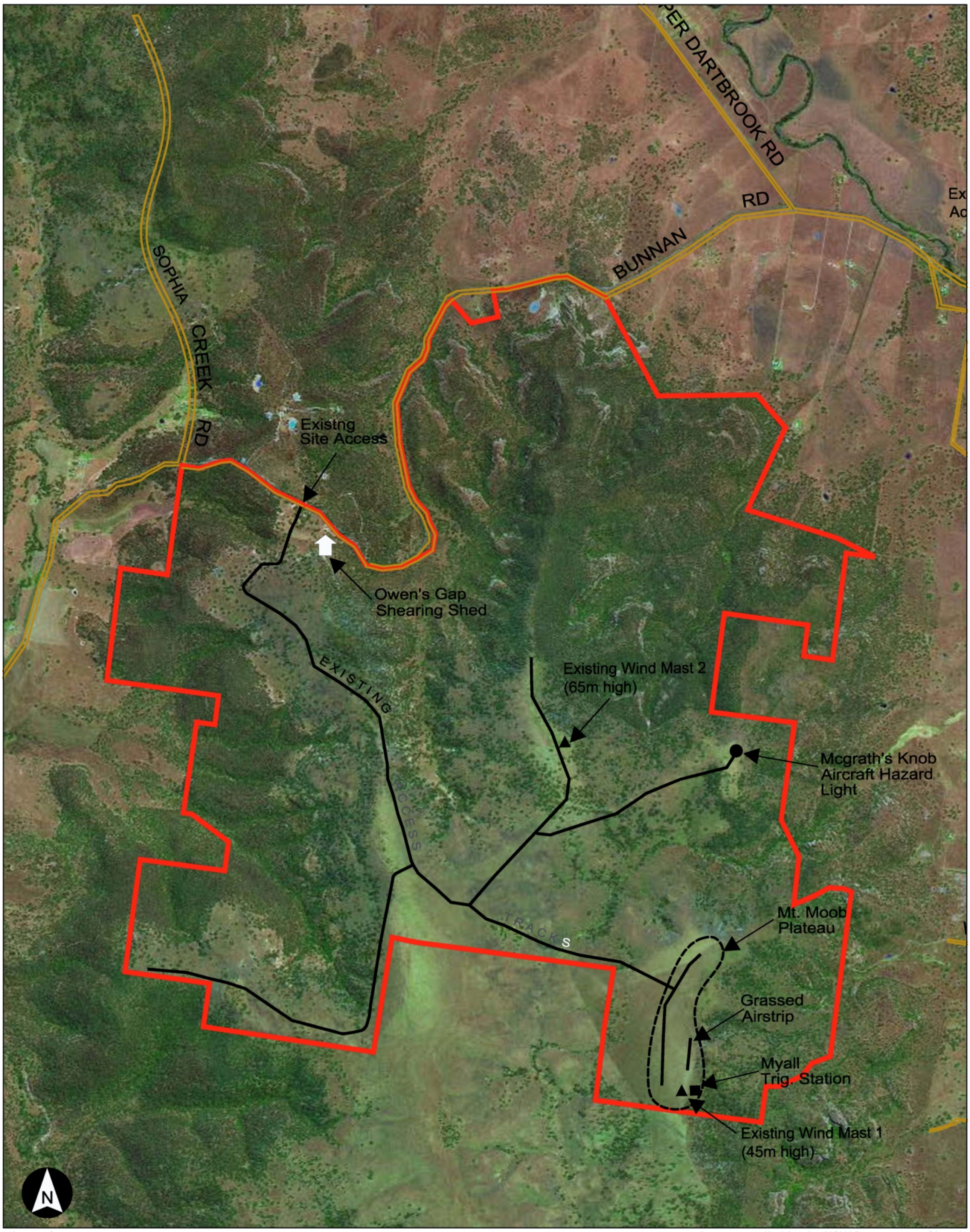
7.11 Trigonometric Stations

There is one trigonometric (Trig) station located on the Mountain Station (referred to as the 'Myall' trig station) and one on the Middlebrook Station property (referred to as 'Robertson's' trig station). Both 'Trig' stations are located on Crown Land Reserves, which are both accessed from existing separate entrances along Bunnan Road.

The Robertson's Knob 'Trig' located on Middlebrook Station is located at considerable distance from any of the proposed works and is not in the line of site of any proposed structures for both sites.

The 'Myall' Trig Station (MGA 56 Easting: 288,709.216 Northing: 6450018.872) is located at the south-eastern corner of Mountain Station property on the Mt Moobi Plateau. The 'Myall' Trig station is represented by a small reinforced concrete structure with black marker plate fixed on top. The existing 'Myall' trig is situated adjacent to the locations of the proposed wind turbines and solar PV plant on the Mount Moobi Plateau as shown in Figure 7.2.

The NSW Department of Lands were consulted in relation to potential affectation of survey marks from the Kyoto Energy Park proposal. Details of both Trig stations were investigated. The Department indicated that the Myall trig was a key station in the geodetic network. The Department supplied details of the Myall Trig station and also general requirements as well as guidelines for siting of wind turbines in relation to geodetic survey marks (*General Guidelines for positioning of and construction of Wind Turbines near Trigonometrical Stations).*



Legend:

Image supplied by the NSW Department of Lands

- Property Boundary
- Minor road
- Existing Quarry/4WD track

0 1 2

Kilometres

Kyoto energypark | ***Figure 7.2 - Existing Landuse (Mountain Station)*** | pamada | A4

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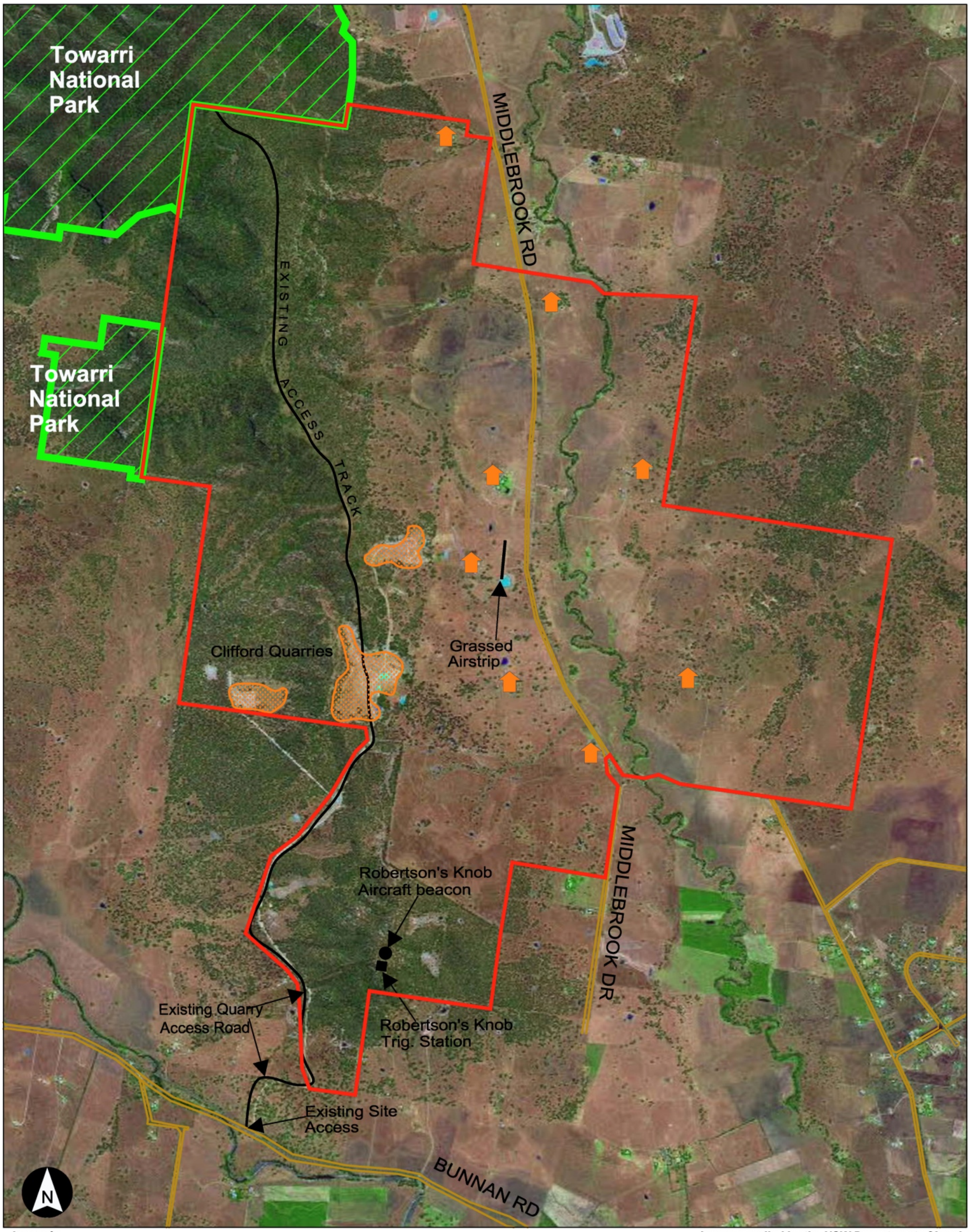

Legend:

Image supplied by the NSW Department of Lands

- Property Boundary
- National Park/Nature Reserve
- Minor road
- Landowner residencies
- Existing Quarries (Gravel)
- Existing Quarry/4WD track

0 1 2
Kilometres

Kyoto energypark | *Figure 7.3 - Existing Landuse (Middlebrook Station)* | pamada | A4

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The Department of Lands requested the following issues be considered in the placement of facilities in proximity to the Myall trig station summarised as follows:

- **Avoid line of sight to nearby population centres and to neighbouring Trigonometrical Stations, particularly to the close ones.**

Details including coordinates of the Myall Trig, line of sight to nearby Trig stations were supplied to Pamada by the Department of Lands. None of the proposed Kyoto Energy Park structures were found to interfere with any of the line of sights as supplied.

The Trig Station is located on the south eastern escarpment of Mount Moobi Plateau with uninterrupted line of sight to the north and south east.

- **Make every effort to position the structures as far as reasonably possible from the Trigonometrical Station.**

A rotating turbine represents an opaque surface to the GPS satellite receiver technology that is deployed to complete geodetic and control surveys. The surface area of the rotating blades, that is normal to the trigonometrical station, can obscure a proportion of the satellite signal.

The closest turbine to the Myall trig is approximately 230m away. The Department of Lands are satisfied that the rotating blades of the wind turbines at the Kyoto Energy Park will not interfere with GPS satellite. The turbines are not in the line of sight of surrounding survey marks as supplied.

- **Avoid disturbing the Trigonometrical Station and its eccentric marks during construction.**

The Construction Environmental Plan (CEMP) shall address measures for protection of the Myall Trig during construction works on Mt Moobi in accordance with the requirements of the Department of Lands.

- **Avoid sloping roofs of associated buildings towards the Trigonometrical Station.**

The proposed Visitor’s and Education Centre is located approximately 80 metres north of the ‘Myall’ Trig Station. The preliminary layout of the Visitors and Education Centre is illustrated in Figure 2.17. Roof slopes would be in a east to westerly direction. Final design plans for the Visitors and Education Centre will be sent to the Department of Lands for concurrence prior to construction.

- **The Department of Lands has requested that they be consulted on final location of the wind turbine towers.**

The Department were satisfied with the siting of facilities being outside the area of affectation of the Myall Trig Station. However the Department have requested that they be consulted during final design of the wind turbines and facilities. Pamada shall supply to the Department a diagram/plan showing location, dimensions for assessment of the impact of the final structure on survey activities.

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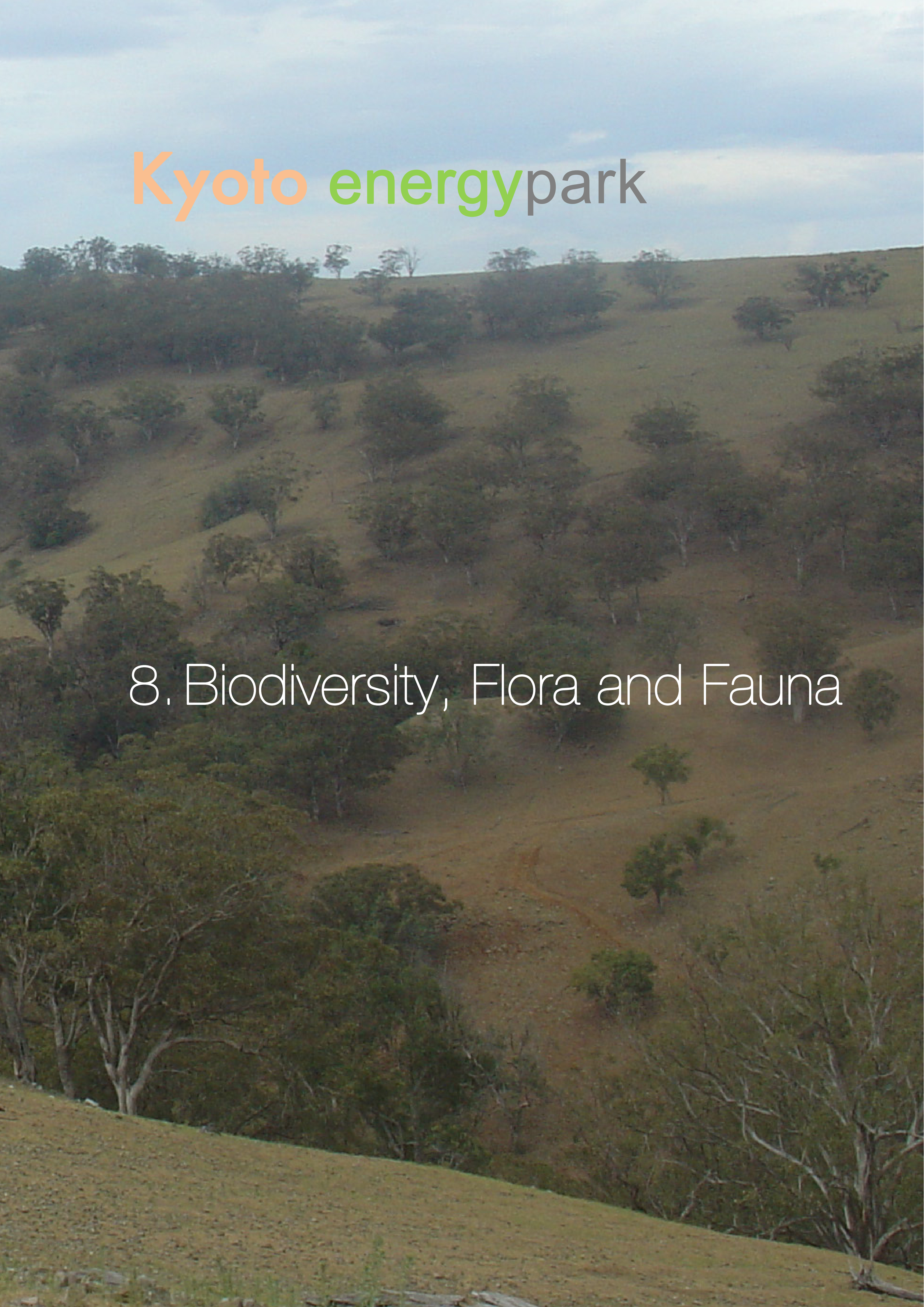

8. Biodiversity, Flora and Fauna

8.0 BIODIVERSITY, FLORA & FAUNA

8.1 Introduction

This section seeks to provide a summary of the ecological impacts of the proposal including discussion resulting from:

- Appendix A CEG Consult – *Ecological Site Assessment ESA (May 2008)*
- Appendix A(i*)* CEG Consult –
  - *Referral of Proposed Action to the Department of Environment, Water, Heritage and the Arts (DEWHA)*
  - *Notification of Referral Decision – Department of Environment, Water, Heritage and the Arts(DEWHA)*
- Appendix A(ii) CEG Consult – *Bird Impact Assessment (June 2008);*
- Appendix A(iii) CEG Consult – *Flora and Fauna Assessment Report (Dec 2007)*

The Flora and Fauna Assessment originally prepared for the site has been attached as Appendix 4. This provides full details of all flora and fauna survey methodologies and effort. Appendix 1 of the Ecological Site Assessment also includes details on flora and fauna survey methodologies and effort. This includes:

- Details of total survey effort
- Environmental conditions during surveys
- Habitat vegetation types surveyed
- Number of vegetation quadrats
- Details of timing of surveys – see amended survey times in flora survey details in Appendix 1 of the ESA

Both Mountain and Middlebrook Stations are located on high ground which forms an escarpment to the west and north-west of Scone, respectively. Past human land management practices have resulted in the subject sites (primarily Mountain Station), being heavily cleared for pastoral activities and modified native vegetation. The Towarri National Park is located adjacent to the Middlebrook Station northern and western border.

The following section provides an extension to this discussion offering specific information in relation to the effects of the proposed Kyoto Energy Park on the existing flora and fauna, and how such effects have been mitigated where required. This Flora and Fauna Assessment has been undertaken to address the various sections of the *Environmental Planning and Assessment Act 1979,* the *Director Generals Requirements (DGRs), the Threatened Species Conservations Act 1995,* the *Environment Protection and Biodiversity Conservation Act (1999)*, and the *Guidelines for Threatened Species Removal (2005)*.

The impact of the proposal as a consequence of bird and bat rotor impacts has been addressed in accordance with the *Guidelines for Threatened Species Assessment, Wind Farms and Birds: Interim Standards for Risk Assessment* (Auswind July 2005).

8.2 Flora

Flora observations where undertaken by *Conacher Travers* between April 2007 and February 2008 on both sites.

The report found that:

- No threatened flora species were observed within the subject landholdings;
- One ecologically endangered population was identified on the landholding *Cymbidium canaliculatum* or Tiger Orchid*.* Seven (7) isolated clumps were observed dispersed within the two landholdings, within the Box Woodland vegetation community. This endangered population is located in areas which will not be affected by the proposal, and it is considered that the proposal will not have an adverse affect on this species;
- One Endangered Ecological Community (EEC) was identified on the subject site. This was the White Box Yellow Box Blakely's Red Gum Woodland (WBYBBRW). Two variants to this community were

identified. These are the Box Woodland (grassy variant), and Box – Ironbark Grassy Woodland. This endangered ecological community occupies a total area of 649ha of the subject site (Middlebrook = 360ha Mountain = 289ha) and is listed on Schedule 1, Part 3 of the TSC Act (1995). This community also corresponds in part with the Upper Hunter White Box-Ironbark Grassy Woodland vegetation community mapped by Peak (2006) as occupying approximately 5687ha within the Upper Hunter region. This EEC is also known to be securely conserved, albeit poorly represented within the Goulbourn River and Towarri National Park Upper Hunter reserve system.

Based on preliminary site layout plans the proposal is likely to require the removal of a maximum of 5.9 hectares of White Box - Yellow Box - Blakely's Red Gum Woodland. This consists of 0.9% of the total 649Ha or approximately 3.6 hectares within Middlebrook Station and 2.3 hectares on Mountain Station of the Box Woodland Community within the limits of the site for the upgrading of the vehicle access tracks and construction of the wind turbines envelopes and components. Approximately 640 hectares of this endangered ecological community will be retained within the site.

This figure represents the maximum amount to be removed or disturbed and is likely to be significantly less based on selective removal procedures during construction. The majority of the Box Woodland vegetation that may be required for removal within the subject site is highly disturbed by current intensive grazing practices, exotic weed invasion and clearing.

It is expected that the amount of vegetation requiring removal for transmission line Options 2 and 4 will be low. The large majority of these routes occur along road reserves and current powerline easements and as such clearing will be minimal.

It is considered that the proposal will not impact upon the status, viability or habitat of this endangered ecological community within the local area or region.

The results of the flora assessment including coverage and location of vegetation assemblages, the EEC WBYBBRW and *Cymbidium canaliculatum* are shown in Figure 8.0 and Figure 8.1 below.

8.3 Fauna

Seven threatened fauna species as listed under the *Threatened Species Conservation Act 1995* where identified on the site. These include:

- the Glossy Black-Cockatoo
- Speckled Warbler
- Grey-crowned Babbler
- Grey-headed Flying-fox
- Yellow-bellied Sheath tailed-bat
- Common Bentwing-bat
- Eastern Cave Bat,

These species were observed within the subject site during surveys, including when airborne and otherwise.

A 7-part test was completed for the above species in accordance with Section 5A of the *Environmental Planning and Assessment Act* (1979) and the *Threatened Species Conservation Act 1995* (1995). The 7 Part Test was completed as part of the Flora and Fauna Assessment for all species with suitable habitat present on the site.

The 7-part test concluded that the proposed development was not likely to have a significant effect on threatened species, populations or ecological communities or their habitats. It was concluded that a Species Impact Statement would not be required for the proposal as discussed in the following section. In accordance with section *Threatened Species Conservation Act 199* a 7 Part test was undertaken for the listed species described above. The completed 7 Part Tests are included in Appendix A(iv) Conacher Environmental Group – *Flora and Fauna Assessment Report.*

An assessment of the subject site for Koala activity was undertaken. The assessment concluded that potential Koala habitat existed within the sites. This was in the form of White Box, Grey gum, and Forest

Red gum food tree species as listed in Schedule 2 of the SEPP. These species comprised more than 15% of site coverage. These vegetation types and the wider site were examined for Koala activity, evidence or habitation. Due to the lack of sightings or evidence of Koalas it was considered that the site did not form core Koala habitat and therefore the SEPP was not applicable.

No listed ground dwelling species where identified as being present on the subject site. Given the high level of disturbance on both sites, and the fact that the main habitat type if open grassland this is not unexpected. As the majority of the proposed impact will occur on land which has already been cleared the proposal is not expected to result in significant impact on species in the locality however particular attention needs to be given to flight capable species.

Despite these findings a detailed bird impact assessment was undertaken to determine the potential impact of the proposed wind farm on bird species from impact with the blade rotor of the wind turbine.

8.4 EPBC Referral

Where a proposed activity is located in an area identified to be of National Environmental Significance, or such that it is likely to significantly affect threatened species, ecological communities, migratory species or their habitats, the matter needs to be referred to the Department of Environment, Water, Heritage and the Arts (DEWHA).

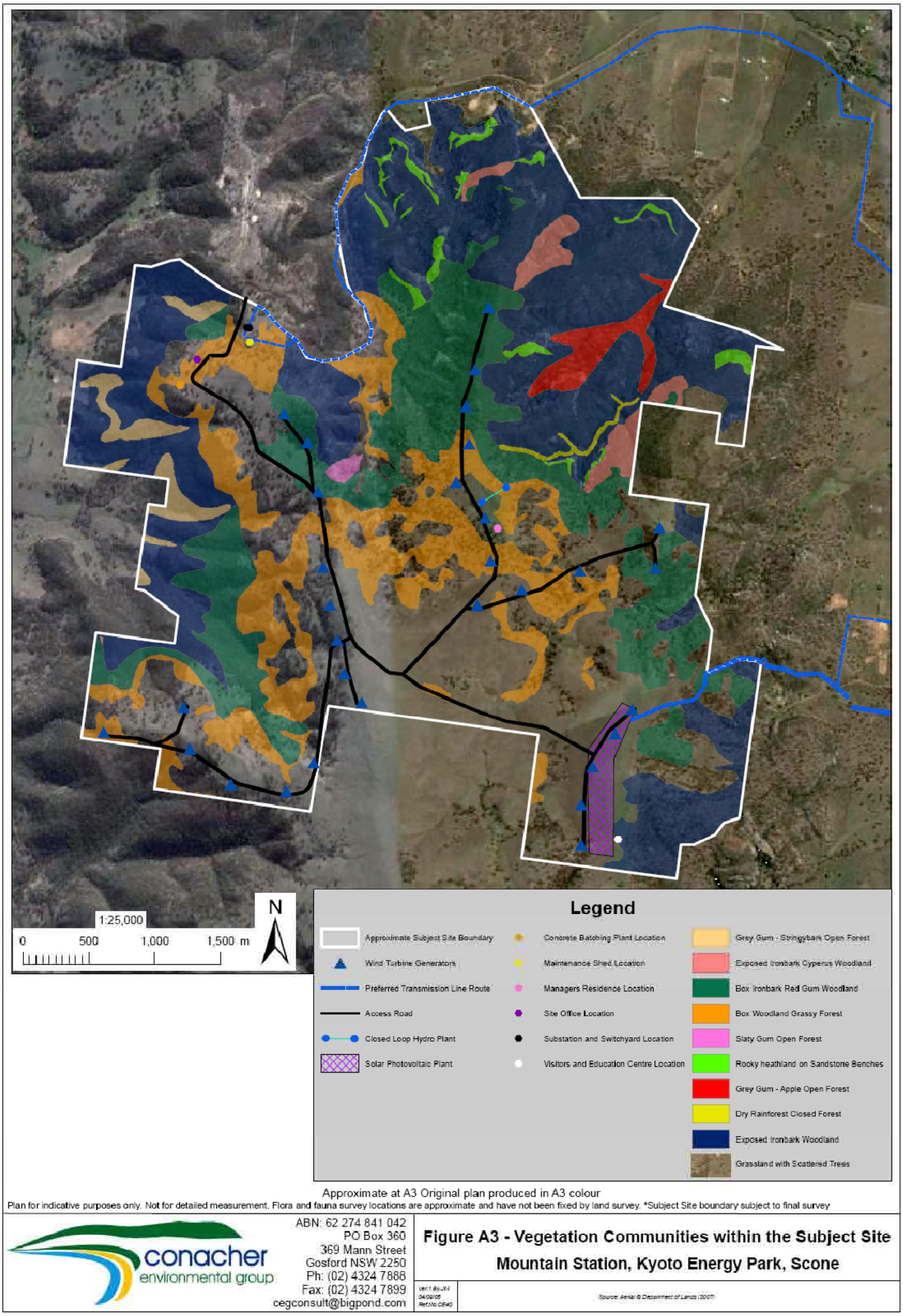

Figure 8.0 Mountain Station Vegetation Communities (Conacher Env Group 2008)

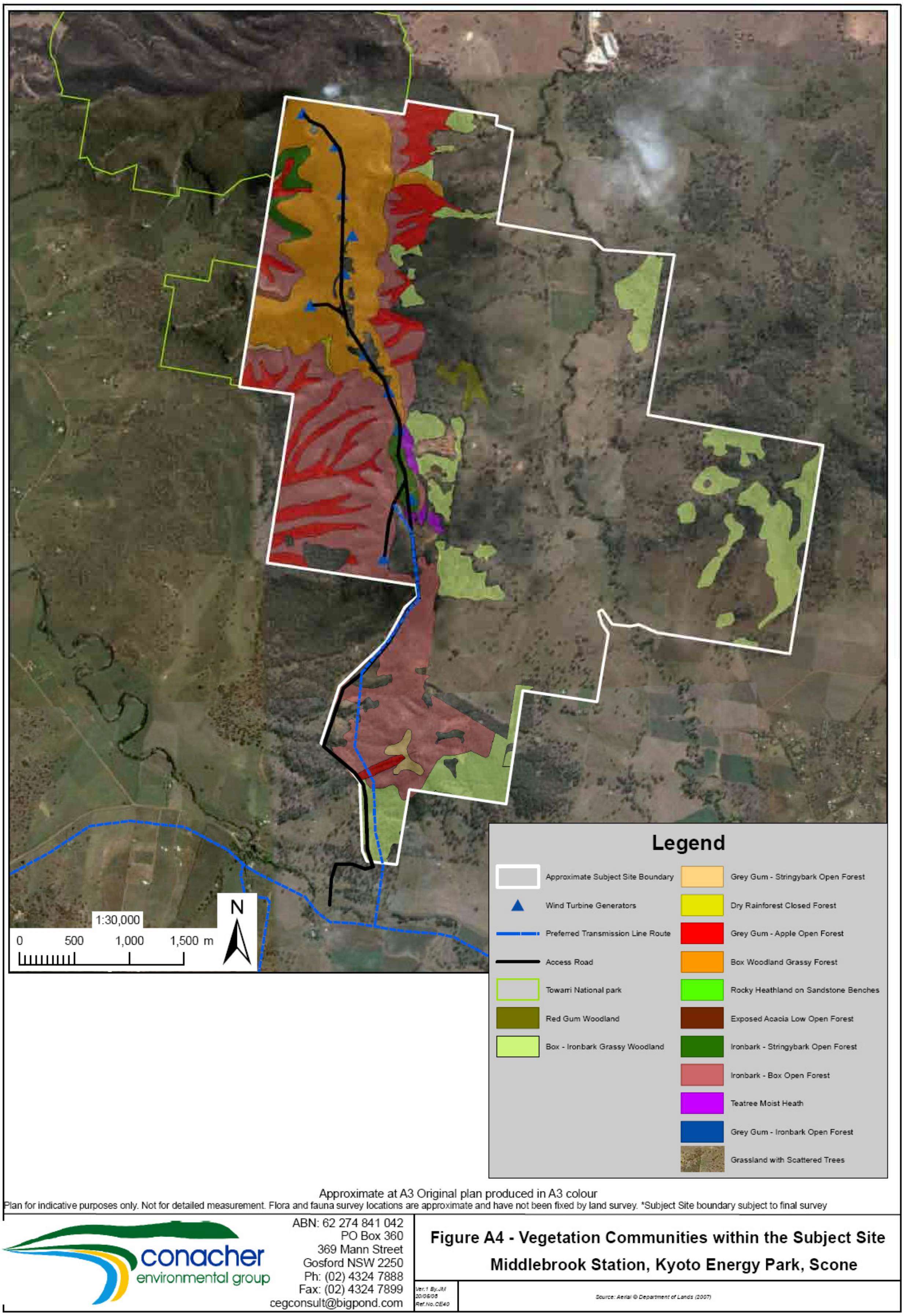

Figure 8.1 Middlebrook Station Vegetation Communities (Conacher Env Group 2008)

One Endangered Ecological Community, White Box-Yellow Box-Blakely's Redgum Grassy Woodlands and Derived Native Grasslands, as listed within the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act), was observed within the subject site. This endangered ecological community occupied approximately 649ha of the subject site and varied from highly disturbed isolated remnants to relatively undisturbed contiguous patches. No threatened flora species were observed within the subject site during surveys undertaken on the subject sites.

In relation to the EPBC Act one threatened fauna species the Grey-headed Flying-fox (Pteropus poliocephalus) was observed within the subject site during surveys.

A referral under the EPBC Act was lodged for the subject site on 22 January 2008 to the DEWHA. Additional information was supplied to the DEWHA on 28 February 2008.

On 18 March 2008 the DEWHA deemed this proposal to not be a controlled action. A copy of this correspondence is included in Appendix *A(ii) Notification of Referral Decision – Department of Environment, Water, Heritage and the Arts.*

8.5 Bird Impact Assessment

Conacher Environmental Group undertook a Bird Impact Assessment to quantify the potential impact to local avifauna. This assessment was completed in line with Auswind's *Wind farm's and Bird: interim Standards for Risk Assessment.* A copy of this Assessment is attached (see Appendix A(ii) Bird Impact Assessment (June 2008).

The systematic assessment undertaken examined the Middlebrook and Mountain Station sites in unison and concentrated on the impact of the wind turbines and there blades specifically. Using known and gathered information on local bird populations and their behaviour, a risk matrix was compiled to determine whether species are in low, medium or high likelihood of movement through the Rotor Swept Area (RSA) of the blades. 'Species of Concern' were then examined for the need for further assessment which was undertaken as required. This includes species listed within the TSC Act or EPBC Acts, and also species that exhibit behaviour that puts them at risk of regular collision with operating wind turbines (Auswind 2005).

Detailed surveys were carried out in April, May, June, August December 2007 and February 2008.

During surveys, there was no presence of any large bird concentrations within either the subject site or the surrounding areas. No wetlands or coastal habitats occur within either the subject site or the surrounding area that could support listed migratory species that may fly across the site. The cleared grazing lands that dominate the upper slopes offer only a limited resource for bird species such as cockatoos, magpies and raptors.

As a result of Level 1 and 2 investigations (in accordance with Auswind guidelines) it was determined that the Wedge-tailed eagle and the Nankeen Kestrel would require further management. Adaptive management was recommended for pre-operational and operational phases as outlined in Section 8.12.2.

8.6 Bat Impact Assessment

Potential Impacts

There were ten bat species recorded within the subject site during surveys. These were:

- Grey-headed Flying-fox (Macro)
- Freetail-bat
- White-striped Freetail-bat
- Goulds Wattled Bat;
- Eastern Bentwing-bat;
- Eastern Cave Bat;
- Yellow-bellied Sheathtail-bat;
- Long-eared Bat;

- Little Forest Bat;
- Eastern Horseshoe Bat.

Of this total four species (Grey-headed Flying-fox, Eastern Bentwing-bat, Eastern Cave Bat and Yellow-bellied Sheathtail-bat) are listed as threatened within the Threatened Species Conservation Act (1995). The Grey-headed Flying-fox is also listed on the Environment Protection and Biodiversity conservation Act (1999).

Macro (Megachiropteran) Bats

Grey-headed Flying-foxes congregate in large camps of up to 200,000 individuals, depending on availability of food. No camps are known within the vicinity of the subject site. Observations of this species within the subject site consisted of two individuals flying over the Glen Range (Middlebrook Station). Based on observation during surveys, low numbers of individual Grey-headed Flying-foxes are likely to fly through the subject site as part of foraging or nomadic movements. This species is also likely to forage periodically within the subject site on flowering tree species. The subject site is not likely to be in the regular flight path of any locally occurring colony or camp of Grey-headed flying-foxes. Any collisions are likely to be isolated individuals and, based on the small number of observations of this species, extremely rare.

Monitoring as part of ongoing environmental management will allow for data to be collected on the number and type of and the occurrence of any mortalities each year, should they occur. Full details of the environmental management program are included within Section 8.12.2 and listed in Section 20.6.3 *Draft Statement of Commitments*.

The overhead transmission lines for connection of the Energy Park to the grid, have the potential to impact upon the Grey-headed Flying-fox as this species is known to suffer mortality due to electrocution from power lines. Proposed power line routes for connection to the grid have utilized existing routes where feasible which will reduce potential collision impacts with new power lines. In addition concrete power pole configuration is proposed in preference to traditional cross arm configuration thereby increasing the clearance distant between wires. This will further reduce the impact of power lines on avifauna especially bats.

Micro (Microchiropteran) Bats

The subject site contains suitable habitat types for micro bat species including key habitat types such as tree hollows and caves for roosting and maternity sites. These key habitat types will not be removed as part of the proposal.

The major impact posed by the proposal to micro bat species is though collision with rotor blades. The species most at risk as a result of this proposal would be high flying species foraging upon insects on the ridge tops within the rotor sweep area.

Nine species of micro bat were recorded within the subject site during surveys.

Based on flight behaviour and foraging ecology information the species at most risk of collision are the White-striped Freetail-bat and Yellow-bellied Sheathtail-bat. Other species are of lesser collision and mortality risk. The risk posed and subsequent population effects is estimated to be low given the low expected incidence of collision and large amounts of suitable habitat available within the local area including Towarri National Park.

Monitoring as part of ongoing environmental management will allow for data to be collected on the number and type of mortalities each year. Full details of the environmental management plan are included within Section 8.12.2 and listed in Section 20.6.3 *Draft Statement of Commitments*.

8.7 Key Habitats and Corridors

Wildlife corridors are links between wildlife habitats, usually intact native vegetation, which link greater areas of vegetation or habitat. They are critical for maintaining ecological processes including the movement of animals and the continuation of viable populations.

The Department of Environment and Conservation (now Department of Environment and Climate Change) has mapped at a regional scale Key Habitats and Corridors in northern NSW to provide a framework of key fauna habitats and linking habitat corridors. There are no areas mapped as corridors present within the subject site. There are regional and sub-regional corridor areas to the east of the site within the ridgelands and rangelands associated with the Glenbawn Dam catchment.

No areas within the site were identified as key habitats within the DEC mapping. The nearest areas are to the east of the New England Highway and Scone.

Areas of the subject site are part of contiguous vegetation that is associated with the rangelands that extend to local National Parks and Nature Reserves. The vegetation within the site shows some connectivity to vegetation within Towarri National Park, adjacent to the northern boundary of Middlebrook Station. The ridgeline and rangeland vegetation also extends to the north to Wingen Maid Nature Reserve and Burning Mountain Nature Reserve.

8.8 Towarri National Park

Towarri National Park covers an area of 5,035 hectares. It borders the northern boundary of Middlebrook Station while a small section, separate from the main body of the park, is located adjacent to the western boundary of Middlebrook Station. There are seven turbines proposed on Middlebrook Station are located within 1km of the National Park, creating a proximity to bird and bat species, within the National Park. Further monitoring for potential impacts shall be included in the Environmental Management Plan for the site.

8.9 Hunter Central Rivers Catchment Action Plan

The Hunter Central River Catchment Action Plan outlines the most important natural resource issues in the region and provides guidelines on how natural resource management and investment should occur. The main threats to resources include:

Population pressure – The Assessment found that the proposal is not likely to result in any significant increase in relation to population pressure.

Lack of awareness and understanding of natural resource management issues – The proposal has been completed in accordance with strict resource management principles. The Kyoto Energy Park and use of renewable fuel sources is by nature a reaction to poor resource management in the past and use and over dependence on non-renewable fuel sources.

Climate change – There will be some use of fossil-fuel powered equipment during the construction phase. During the operational phase, no fossil-fuel powered technology, other than service vehicles will be used. The savings in carbon emissions and other air-borne pollutants will be significant during the operating life of the Kyoto Energy Park generator components (see Section 6.0). The Kyoto Energy Park will also displace the need for mining of fossil fuel derivatives such as oil and gas and associated carbon emissions.

Threats to the land – It is not expected that the proposal poses any significant threat to the land or soils within the subject site. A minimal amount of vegetation will be removed from during construction of the Kyoto Energy Park. Revegetation shall occur in areas around the facilities for visual screening and landscaping.

Threats to groundwater - The proposal is not likely to have any impacts upon groundwater. No groundwater will be removed or polluted as a result of the proposal. No groundwater dependent ecosystems have been identified within the subject site. The groundwater hydrology will not be altered as a result of the proposal.

Threats to rivers – The proposal does not require the removal of any riparian vegetation, construction of barriers to fish movement, damage to fish habitats or changes to river flows. There is a low level risk of pollution from sedimentation which can be managed through sediment control measures.

Threats to estuaries and lakes – There are no estuaries or lakes located within the subject site or local area. There are no potential threats to estuaries and lakes listed within the Catchment Action Plan.

Threats to coastal and marine areas – The subject site is not located in or near a coastal or marine area. The proposal therefore will not result in dune erosion, impact on rocky shelves, nor enhance weed and pest incursion in coastal or marine areas.

Threats to biodiversity Vegetation loss – there are opportunities to offset vegetation losses by improving the quality of retained vegetation or regenerating currently cleared areas around park facilities.

Limited capacity of landholders to protect and improve biodiversity on their land - The proposal is not expected to introduce any new threats to biodiversity, as it will not result in a significant change in the way that the land within the subject site will be managed.

Pests or feral animals - Several pest fauna species were observed within the subject site including the goat, rabbit, brown hare, red fox, dog, common myna and common starling. The proposal is not expected to increase the amount of pest fauna species within the subject site.

Weeds - A variety of weed species, particularly common pasture weeds, were observed within the subject site. The removal of vegetation may encourage the spread of weeds by disturbing soil and allowing more sunlight to reach the ground layer. However weed control programs can be implemented at this site, particularly within and adjacent to areas disturbed as part of the proposal.

8.10 Regional Conservation Implications

Because of its location within the Hunter River catchment, consideration of the *Hunter-Central Rivers Catchment Action Plan (CAP)* is required. The CAP provides guidance on the use, management and conservation of natural resources on a catchment scale. Among those issues addressed by the CAP and relating to the proposed Kyoto Energy Park are vegetation management issues and water and soils quality issues. Additionally climate change is addressed by the CAP and this is of particular importance to the subject site.

In regard to vegetation and soils management, clearing will be minimal and restoration of damaged areas post construction will ensure any disturbance is rectified. Towarri National Park adjoins Middlebrook Station to the North and to the western boundary. Middlebrook Station is the northernmost of the two Kyoto Energy Park sites and it is proposed to contain only 11 of the 42 proposed turbines and no ancillary buildings or significant structures. Use of the existing track network on Middlebrook Station will be used to access the turbine sites and therefore reduce the need for additional impacts. Turbine sites have also where possible located in cleared areas. As such only vegetation and habitat disturbance will be minimal on this site.

A review of the NSW Department of Environment and Climate Change's key habitat corridor mapping identified no regional or sub-regional corridors being present within the subject site.

To protect local stream integrity a range of sediment and erosion controls is proposed where earthworks and disturbance is anticipated. Sediment and erosion control plans will form part of the Environmental Management Plan (EMP) which will also include details such as emergency procedures for events such as accidental fuel spills. These safeguards will ensure the site and the wider catchment are protected during the construction and operational phases.

In relation to climate change the proposed Kyoto Energy Park will play a major role in moving away from fossil fuel dependent energy generation, not only in the Hunter Valley (reknown for its coal fields) but in Australia generally by supporting the adoption of similar technologies on a global scale.

The proposed Kyoto Energy Park represents an important move towards renewable energy and meeting the objectives of the CAP.

Post construction there will be no ongoing disturbance of vegetation or habitat on this site and vehicle access will be limited to a small number of staff and periodic maintenance staff. During construction and in its operating state the energy park will have a negligible impact on the National Park.

8.11 Conclusion

The following conclusions are made.

In relation to the Threatened Species Conservation Act (1995):

- One threatened flora population, Cymbidium canaliculatum, was observed within the subject site.
- Seven threatened fauna species, the Glossy Black-Cockatoo, Grey-crowned Babbler, Spectacled Warbler, Grey-headed Flying-fox, Yellow-bellied Sheathtail-bat, Eastern Bentwing-bat and Eastern Cave Bat, were observed within the subject site.
- One Endangered Ecological Community, White Box - Yellow Box - Blakely's Red Gum Woodland, was observed within the subject site. The proposal is likely to require the removal of a maximum of approximately 5.9ha (3.6 ha Middlebrook Station, 2.3 ha Mountain Station) or 0.7% of the community within the sites for the upgrading of the vehicle access tracks and construction of the wind turbines envelopes and components.
- A 7-part test completed for the proposal in accordance with the Threatened Species Conservation Act (1995) and Section 5A of the Environmental Planning and Assessment Act (1979) concluded that the proposed development was not likely to have a significant impact upon threatened species, endangered populations or endangered ecological communities and a Species Impact Statement should not be required for the proposal.

In relation to the Environment Protection and Biodiversity Conservation Act (1999):

- One threatened fauna species, the Grey-headed Flying-fox, was observed within the subject site. This endangered population will not be affected by the proposal, and therefore it is considered that the proposal will not have an adverse affect on this species;
- One Endangered Ecological Community, White Box-Yellow Box-Blakely's Redgum Grassy Woodlands and Derived Native Grasslands, was observed within the subject site.
- The proposal was referred to the Department of Environment, Water, Heritage and the Arts in accordance with the Environmental Planning and Assessment Act (1999). The department deemed the proposal to not be a controlled action on 18 March 2008.
- The proposal will include an Environmental Management Plan during the construction and operation phases of the development. A key feature of the Environmental Management Plan will be an Adaptive Management Program for the Wedge-tailed Eagle and Nankeen Kestrel. Monitoring of bird and bat species will also be undertaken for bird and bat species during operation of the Energy Park.

8.12 Environmental Management Plan

An Environmental Management Plan is to be prepared for the site will include:

8.12.1 EEC Vegetation Offset Strategy

A Vegetation Offset Strategy will be prepared to compensate for removal of the Endangered Ecological Community (EEC) within the limits of the site for the upgrading of the vehicle access tracks and construction of the wind turbines envelopes and other facilities during access and construction.

Areas of the endangered ecological community (EEC) shall be protected and retained during construction and operation phases of the project. Preparation of an EEC vegetation offset strategy which will be addressed within the EMP. Based on preliminary site layout plans the proposal is likely to require the removal of a maximum of 5.9 hectares of White Box - Yellow Box - Blakely's Red Gum Woodland. This consists of a maximum of 3.6 hectares within Middlebrook Station and 2.3 hectares on Mountain Station of the Box Woodland Community. Approximately 640 hectares of this endangered ecological community will be retained within the site.

The size of the offset area shall be 200% of the total area of removed or disturbed EEC vegetation during stages of construction, up until a maximum area of 5.9 Ha. Given the large size of the site there are more than adequate opportunities for offsetting within the site.

Existing access tracks are to be upgraded and shall be used to minimise vegetation removal.

A sedimentation and Erosion Control Plan shall be used to minimize soil erosion and sedimentation risk.

Weed control programs can be implemented at this site, particularly within and adjacent to areas disturbed as part of the proposal.

8.12.2 Bird and Bat Adaptive Management Plan

Adaptive management is a management style that allows actions to be responsive to monitoring outcomes. An adaptive management program will be implemented for the Kyoto Energy Park. The management program for the subject site is briefly outlined in this section, and will be described in detail in the Operational Environmental Management Plan (OEMP) to be prepared for the site. Ecological management for the proposed development will occur in two stages:

1. Pre-operational
2. Operational

Pre-operational and operational phases of the development must meet Best Practice Guidelines for wind Energy projects (AusWEA 2002).

Stage 1 - Pre Operational

Ecological management during the pre-operational phase will further involve a Level 3 assessment of direct and indirect bird impacts in accordance with Auswind guidelines (Auswind 2005), including:

- analysis of population viability for impacted species;
- Estimates of the level of risk of significant bird impacts;
- Baseline data for use in operational phase monitoring of impacts;
- Information for use in the design of risk mitigation measures

Stage 2 – Operational

Ecological management during the operational phase will aim will to continually assess the impact of wind turbines on aerial fauna through monitoring as per Auswind guidelines (Auswind 2005). Species of Concern identified in the Pre-operational Management Phase will be targeted. Monitoring will involve dead bird and bat searches (should they occur), indirect disturbance impact assessment and avoidance behaviour studies.

Operational phase assessment will be conducted in a BACI (Before-After-Control-Impact) experimental style. Assessment aims will be to:

- Determine the difference in bird and bat fauna abundance and diversity within the subject site before and after installation of wind turbines;
- Determine the difference in bird and bat fauna utilisation of the subject site before and after installation of wind turbines;
- Assess population viability of impacted species.

Other measures which will be adopted as part of the OEMP include mitigation measures to reduce impacts to avifauna such as:

- Stopping any visitors feeding bird within the Park;
- Any screening and landscaping in close proximity to wind turbines will not include specific habitat of feed species;
- Any grain feeding of stock will be well away from wind turbines on flats;
- Control of vermin (e.g. rabbits) on site will reduce attractiveness to birds of prey,
- Balls and/or flags will be used on overhead wires;

pamada HDB TownPlanning&Design

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Kyoto energypark

9. Heritage

9.0 HERITAGE

9.1 Indigenous Heritage

Myall Coast Archaeological Services undertook an extensive Aboriginal Heritage consultation and assessment for the Kyoto Energy Park proposal. The Aboriginal Assessment is attached as *Appendix H - Myall Coast Archaeological Services Pty Ltd – Aboriginal Heritage Assessment (16 September 2008)*.

Both Mountain Station and Middlebrook Station sites are located within the traditional country of the Woonarua people. During the assessment Myall Coast identified other Aboriginal stakeholders through advertisement and written letters. Extensive consultation was undertaken with the all identified stakeholders from the Aboriginal community throughout the assessment process. The development corridor was assessed by the identified stakeholders and their representatives who provided written comment regarding potential impact.

The Aboriginal Heritage Assessment was undertaken in four broad stages including:

- **Research and analysis** – Researching AHIMS databases and background information, analysis of known deposits and Aboriginal Heritage Values in the study area;
- **Consultation** - Identification of Aboriginal Stakeholders, advertisement in local newspaper to participate in assessment process (Scone Advocate), letter of invitation to take part in Cultural assessment, introduction and formal presentation of the Kyoto Energy Park to stakeholders;
- **Site Inspections and Detailed Survey** – A preliminary site visit and a separate detailed site inspection (GPS) undertaken by Aboriginal community members, stakeholders, Pamada representatives and Myall Coast representatives. A separate archaeological survey was undertaken by Myall Coast representatives for line route connection to the electricity grid.
- **Recommendations** made by stakeholders and Aboriginal Heritage consultant

The assessment has met the Director General requirements for Aboriginal Cultural Assessment.

9.2 Cultural Assessment methodology

In order to determine the appropriate knowledge holders within the community, the Department of Environment and Conservation (DECC) Guidelines, (NPWS Guidelines for Aboriginal Heritage Impact Assessment in the Exploration and Mining Industries 1997) were followed. As the project is to be assessed under Part 3A of the Environmental and Assessment Act 1979, the consent authority is the Minister for Planning.

The DECC Guidelines for identifying Aboriginal people who may be knowledge holders were also followed during the assessment. This was to ensure that the appropriate and relevant Aboriginal communities were not only consulted about the project but were included in assessing possible impact upon their culture.

The Director Generals Requirements (DGRs) also states that the Environmental Assessment must include an Archaeological Assessment, Methodology and Research Design for any proposed archaeological monitoring, in consultation with the NSW Heritage Office, Aboriginal Community and DECC. This is to be undertaken in accordance with the *Department of Environment and Conservation's draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation.*

The DGR basically defined the brief as preliminary assessment in conjunction with the Aboriginal community, identification of any impacts on Aboriginal Objects or Places and appropriate permits obtained for that impact or research. The DECC draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation, apply only when a research (monitoring) or destruction permit for an Aboriginal object or place is required, and was therefore not triggered in this assessment.

In summary, the process requires consultation with the Aboriginal community, determining potential impact of the project on Aboriginal heritage and identification of landscape that may have potential for containing Aboriginal Objects or archaeological evidence of Aboriginal occupation.

9.2.1 Background Research

Preliminary Desktop research was undertaken by Myall Archaeological Services and involving the review of existing primary and secondary written material, maps, plans, AHIMS database and other reports as well as discussion with Aboriginal Community representatives.

Analysis of the research was then completed to produce a model of potential archaeological deposits within the study area. All aspects of the subject 'corridor' were examined including Aboriginal heritage values, landscape and soils, geological features, existing archaeological records, previous studies, past land use, community consultation and identification of impacts of the proposed development on Aboriginal objects and archaeological potential.

The Aboriginal Cultural Assessment was undertaken by knowledge holders of country (The registered stakeholders) as identified.

9.2.2 Identification of Aboriginal Stakeholders

The Mountain Station and Middlebrook Station sites are fully contained within the Wannarua Local Aboriginal Land Council area. The Wannarua People have been recognised by the Native Title process and are registered Native Title Claimants.

An advertisement as per the DECC (Part 6) guidelines was placed in the local Scone Advocate newspaper on the 28 June 2007 on Page 20. In addition letters were sent out to known Aboriginal stakeholders, individuals and organisations that had previously been identified through other assessments within the region.

Table 9.0 lists the Aboriginal Organisations/Individuals who responded and were registered as Aboriginal stakeholders for the Kyoto Energy Park project. These members were then consulted about all aspects of the project before producing an independent preliminary Aboriginal Cultural Assessment. Some organisations had several representatives attend various meetings.

Table 9.0 – Kyoto Energy Park Aboriginal Stakeholders

Aboriginal Stakeholder/Group/Organisation	Stakeholder Address
Hunter Valley Aboriginal Corporation	180-182 Bridge Street Muswellbrook 2333
Hunter Valley Cultural Consultants	
Upper Hunter Heritage Consultants	160 Sydney Street Muswellbrook 2333
Giwiirr Consultants	8 Fitzgerald Ave, Muswellbrook 2333
Aboriginal Native Title Consultants	69 Toobruk Ave, Muswellbrook 2333
Ungooroo Cultural and Community Services	8 Blaxland Ave Singleton 2330
Wanaruah Local Aboriginal Land Council	17-19 Maitland St Muswellbrook NSW 2333
Tracey Skene	7 Crawford place Millfield, 2325
Wannaruah People	PO Box 3043 Singleton 2330

9.2.3 Consultation with Aboriginal Stakeholders and Community

Presentation of the project to Aboriginal Stakeholders (30 July 2007)
All Aboriginal Stakeholders identified in the project were invited to attend a presentation of the Kyoto Energy Park project which was held on 30 July 2007 at the Wannarua Land Council in Muswellbrook. Presentation of material was made by Len Roberts of Myall Coast Archaeological Services who outlined the statutory framework and considerations for attendees relevant to the project. A presentation of the project proposal was made by Pamada (the proponent) as an explanation of the project and technology involved prior to a preliminary site inspection.

The presentation by the proponent outlined:

- General introduction and Project location;
- Introduction to Renewable Energy technology and components proposed;
- Ancillary facilities proposed;
- Background studies completed;
- Environmental Considerations and progress.

Preliminary Site Inspection (August 2007)

A preliminary inspection of the project sites was undertaken by Aboriginal Stakeholders, Pamada and Myall Coast Archaeologists on 13 August 2007. The purpose of the preliminary inspection was to gain an overall understanding of the size and location of the project as well as determining the terms of reference for the field survey.

An inspection of both sites and a field survey and examination of each location of proposed facility and its surrounds was undertaken by those nominated representatives in attendance. Senior Myall Coast Archaeologists and Pamada representatives provided expertise and experience in site assessment. Detailed maps and project plans were distributed and used as a basis for discussion.

Detailed Site Inspection (August 2007)

Following the preliminary site inspection, a final Aboriginal site inspection and survey was undertaken at the both sites with representatives of the Aboriginal Stakeholders, Myall Coast Archaeologists and Pamada representatives on the 30th August 2007. A detailed inspection of the proposed location of all facilities and inspection of each site was accessed by 4WD vehicles and inspected on foot.

Positions of turbines and locations of other proposed facilities were marked with a GPS instrument. Survey markers were used to identify locations of all facilities in preparation for visual inspections. Attendees were driven to each location by 4WDs and inspections on foot were carried out under supervision by Pamada representatives and Myall Coast Archaeologists.

During the inspection the locations of the proposed facilities and surrounding areas were inspected. These areas included:

- Wind turbine locations on Mountain and Middlebrook Station
- Location of propose Solar PV Plant on Mt Moobi, Mountain Station
- Visitor's and Education Centre, Mt Moobi
- Manager's residence
- Maintenance Shed
- Site Substation.
- Site Access Tracks for access to Wind Turbine Structures
- Proposed Transmission line routes internal to the sites
- Locations for proposed construction facilities including, Site offices and Concrete Batching Plant near the Mountain Station site entry.

Detailed maps were provided to all attendees of proposed locations of facilities and transmission line routes (including external routes to grid connection points). Transmission line routes internal to the sites were inspected by Aboriginal Stakeholders. Explanations of all works were described and presented to attendees. No inspection of external transmission line routes to grid connection points were made or recommended by Myall Coast representatives.

The relative coordinates of proposed site facilities (as marked) were recorded by Myall Coast Archaeologists, using a hand held GPS unit. GPS coordinates of all facilities inspected during the day are listed in *Appendix H - Myall Coast Archaeological Services Pty Ltd – Aboriginal Heritage Assessment (16 September 2008)*. Site conditions, soil and landscape variables, and findings for each area, were also recorded on site for each location. The weather was conducive to inspection and the overall visibility was good.

During the site inspection and site survey no Aboriginal objects were found on both the Mountain and Middlebrook Station sites. Furthermore Aboriginal Stakeholders stated that it was certain that the project was not going to impact upon known Aboriginal objects and places.

Archaeological Assessment of Transmission Lines (September 2007)
An inspection of the proposed transmission line route options external to the sites was undertaken by the Myall Coast Archaeologists in September 2007. All four (4) route options were investigated for archaeological significance. All routes were found to traverse disturbed ground or consisted of works requiring the upgrading of existing lines within road reserves. No Aboriginal artefacts or objects were observed within the proposed transmission line corridors. The potential for Aboriginal objects or artefacts to occur along these routes were assessed to be unlikely considered the level of disturbance along the routes or within the road reserves.

Following the survey undertaken by Myall Coast Archaeologists discussions and recommendations were made to the Aboriginal Stakeholders.

Final Consultation with Stakeholders (September 2007)
Following the initial Aboriginal consultation process and subsequent site inspection and survey investigations, a meeting was held on the 18th September 2007at the Wannarua Land Council in Muswellbrook to discuss findings and potential outcomes. Aboriginal stakeholders and Myall Coast representatives were in attendance.

Outcomes of the meeting included:

- Summary of previous discussions
- Discussion regarding the outcomes of site inspections and surveys and cultural significance of the corridor;
- Potential impacts to cultural significance of the corridor from the proposal;
- Archaeological significance of transmission line route options for connection to the grid, and recommendations from the Aboriginal Stakeholders;
- Conclusion and final recommendations from Aboriginal Stakeholders.
- Preparation of a Certificate from Aboriginal Stakeholders describing outcomes.

Recommendations from the meeting are described in *Appendix H - Myall Coast Archaeological Services Pty Ltd – Aboriginal Heritage Assessment (16 September 2008)*, and summarised in Section 9.2.5.

Community Presentation and Feedback (30 July 2007)
Myall Coast Archaeological attended the Community Information Day held on 16th February 2008. Representatives from Myall Coast were in attendance to answer questions from residents and gain feedback.

Information on the Aboriginal Heritage Assessment was presented and displayed on the day including a presentation and display on the Aboriginal Heritage within the area, the assessment methodology, outcomes and findings.

9.2.5 Recommendations from Indigenous Stakeholders

The Aboriginal Cultural Assessment was undertaken in close consultation with the Aboriginal knowledge holders of the land (identified Aboriginal stakeholders) to identify impacts of the project on the corridor and other areas of sensitivity. Whilst there was found to be no impact to Aboriginal objects, artefacts or

Cultural heritage, the project would nonetheless alter the traditional Aboriginal landscape however this will be minor.

Following consultation with the stakeholders Myall Coast recommended that Pamada enters into a binding agreement with the registered Aboriginal communities prior to construction regarding Aboriginal Cultural heritage and enhancement of Aboriginal Cultural value in the area.

The parameters of the agreement have not been finalised and will be further discussed with Aboriginal Stakeholders subject to approval for the project. Taking the above into account, the assessment advised that the proposal meets the Director General's requirements for Aboriginal Cultural assessment.

9.2.6 Conclusions

The building of the infrastructure and development of the project will not alter the geological or cultural landscape. There is no intention to irrevocably destroy the existing country side. There may be impact upon the study area as a backdrop from the valley floor some distance away, however such an impact is not one that will destroy deface or damage an Aboriginal Object or place.

The process for this assessment enabled known objects and culturally sensitive landscape to be identified. Extensive consultation with the Aboriginal stakeholders was held and more importantly the development corridor was assessed by the Aboriginal community who provided written comments regarding the impact.

The two sites (Middlebrook and Mountain Station) were examined for cultural sensitivity and significance based on natural landscape, known artefact distribution and predictive modelling.

The assessment included extensive consultation and site surveys with Aboriginal Stakeholders and knowledge holders as identified in the area. Aboriginal stakeholders and interested parties were invited to comment on the proposal and attend a formal presentation of the project at Muswellbrook. Following this all respondents were invited to attend a guided site inspection for familiarisation of the site and the scope of the proposal. Following this a further detailed site survey of the sites was undertaken and inspections made at the locations of each component and facility.

The study concluded that the study area was likely in the pre-colonial past by the Aboriginal community. The assessment report indicates that the probable use of the area was based on the views and connectivity it provided including the possible use for song trails, connectivity to special and ceremonial places and as a lookout and signalling area.

No Aboriginal objects were found on site during site inspections and detailed surveys of works areas. Aboriginal Stakeholders also stated that the project was unlikely to impact upon known Aboriginal objects and places and that no further assessment or inspections were required.

Areas which were likely to contain evidence of habitation were not identified. The assessment level of sensitivity was based on landscape, known artefact distribution and predictive modelling and discussion with aboriginal stakeholders.

The report concluded that the development will not impact on known Aboriginal objects and places. The Aboriginal Community recommended that there would be no impact to Aboriginal objects and places within the development. Some impact may occur on the study area as a backdrop from the valley floor some distance away, however, this impact will not destroy, deface or damage an Aboriginal object or place.

9.3 European Heritage

Myall Coast Archaeological Services were engaged to undertake a European Heritage assessment for the Kyoto Energy Park proposal. The European Heritage Assessment is attached *Appendix I- Myall Coast Archaeological Services Pty Ltd – European Heritage Assessment (15 September 2008).*

9.3.1 Study methodology

The European Heritage assessment was undertaken using a two fold approach. Firstly, the Middlebrook and Mountain Station sites were assessed for heritage characteristics and secondly, "Known Items" (existing or potential heritage object or property) were assessed for impact by the proposal. This was particularly relevant for the transmission line infrastructure as it may pass known heritage items.

The study methodology was based on data research, field survey of the site and report compilation. Data research included maps and plans, historic and scientific literature, consultation with local government officers, consultation with the Local Historical Society and analysis of Heritage lists.

The potential for heritage value of the sites was undertaken by Myall Coast Archaeologists in accordance with the assessment criteria specified in the Heritage Manual 2000. Myall Coast Archaeology also undertook a field inspection of study sites prior to completing the assessment and recommendations.

9.3.2 Site History

The first European settler to the area was Henry Danger who gave a favourable report of the area which led to further European settlement. The subject site was subdivided, consolidated, cleared and subdivided over time. Further details of the history of the Scone area are available in the European Heritage Assessment – Appendix I.

The current property was part of the original land grant in 1825 of Invermien and Satur. The properties underwent changes, subdivision and amalgamations. In 1929 the property was sold to Isabella Henderson family of the current owners.

The subject sites are currently in single ownership and are two distinct adjacent properties of approximately 2000 hectares each. There are several buildings on the properties, none of which have any local state of federal heritage significance or are located on any heritage registers.

9.3.3 Site Heritage Impacts

The sites are neither adjacent to nor likely to affect any known heritage items. A site inspection of the existing properties and discussion with the Local Historical Society did not reveal any likely heritage items that may be impacted upon by the proposal.

Middlebrook Station is adjacent to and overlooks the Castle Rock formation (located 1.3 km from the closest turbine on Middlebrook Station), however there will not be any physical affect to Castle Rock from the development. The proposal will not cause overshadowing, loss of sunlight or pollution issues on any heritage item.

The heritage investigation areas considered potential impacts arising from all components of the development, including the transmission lines.

9.3.4 Impact on European Heritage from Transmission Lines

Overhead transmission line infrastructure will be upgraded along existing transmission corridors and new corridors for connection to the local electricity grid. As assessment of the impacts of the proposed transmission line upgrade to known items of heritage has been assessed with recommendations in Section 19.4.3 of this report.

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10. Noise Impact

10.0 NOISE IMPACT

Wilkinson Murray Acoustics were engaged to undertake a Noise Impact assessment for the Kyoto Energy Park proposal The noise assessment is attached in *Appendix D Wilkinson Murray – Noise Assessment (August 2008)*. The findings of this assessment and recommendations are discussed in this Section.

10.1 Noise Assessment criteria

There are no specific guidelines relating to the noise assessment of wind farms prepared by the NSW Government. However, the guidelines for assessment of noise from industrial facilities are managed within the NSW Department of Environment & Climate Change (DECC) Industrial Noise Policy (INP).

Additionally, the DECC have adopted the South Australian guidelines "Wind Farm Environmental Noise Guidelines" (February 2003). The draft Australian Standard (EV16) has also been considered in the report by Wilkinson Murray. The report also considered the effect of temperature inversions on noise levels referred to as the 'Van den Burg Effect'.

10.2 Neighbouring residencies

Rural properties and homesteads are scattered around the Mountain and Middlebrook Station sites mainly to the east towards the Scone urban centre.

Mountain Station

Rural residencies and homesteads are scattered to the east, west, and north of the Mountain Station site, mainly along roadways. No residencies were located directly south of the Mountain Station property which is covered by the Cuan Pastoral landholdings. The closest private residence to wind turbines on Mountain Station is the *'Peakhill'* residence located at a distance of 1.2 km.

The closest residencies in relation to Mountain Station are represented in Figure 10.0 Nearest residencies

Middlebrook Station

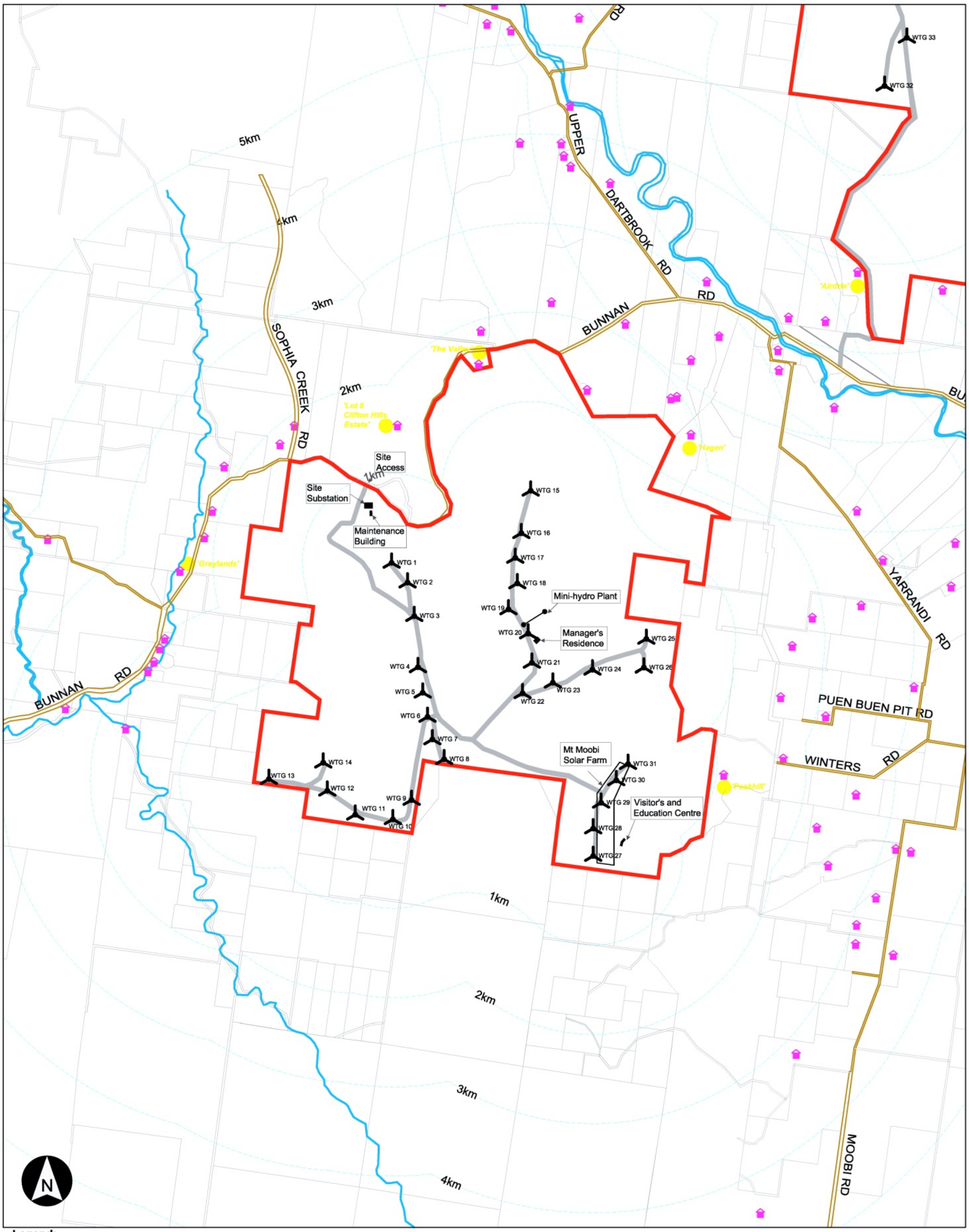
Residences surrounding Middlebrook Station are located to the east, south and west of the site. No residencies were located directly north of Middlebrook Station which area is covered by the Towarri National Park and mountainous regions.

There are eight houses which are located on the Middlebrook Station property east of the proposed turbines on the Glen Range ridge. These homesteads are fully owned by the landowner, some of which are leased out to third parties. The closest residence to the Middlebrook Station turbines is Middlebrook Station Accommodation, which is owned by the landowner and is located approximately 1 km away from the nearest turbine.

The closest residencies in relation to Middlebrook Station are represented in Figure 10.1 Nearest residencies.

Background Noise Measurements

Background noise measurements were undertaken on two separate occasions in May/June 2007 and in September/October 2007 by Wilkinson Murray. Background noise loggers were located at ten (10) residential locations as shown in the Figure 10.0 and Figure 10.1. Two of these locations were repeated in the second round of measurements representing the closest residencies to Mountain and Middlebrook Station sites.



Legend:

Property Boundary	Existing Residencies (Non Landowner)	Radial Distance from Wind Turbine
Natural Drainage	Backround Noise Logger	Property Boundary

0 1.5 3.0
Kilometres

Kyoto energypark | *Figure 10.0 - Nearest residencies (Mountain Station)* | pamada | A4

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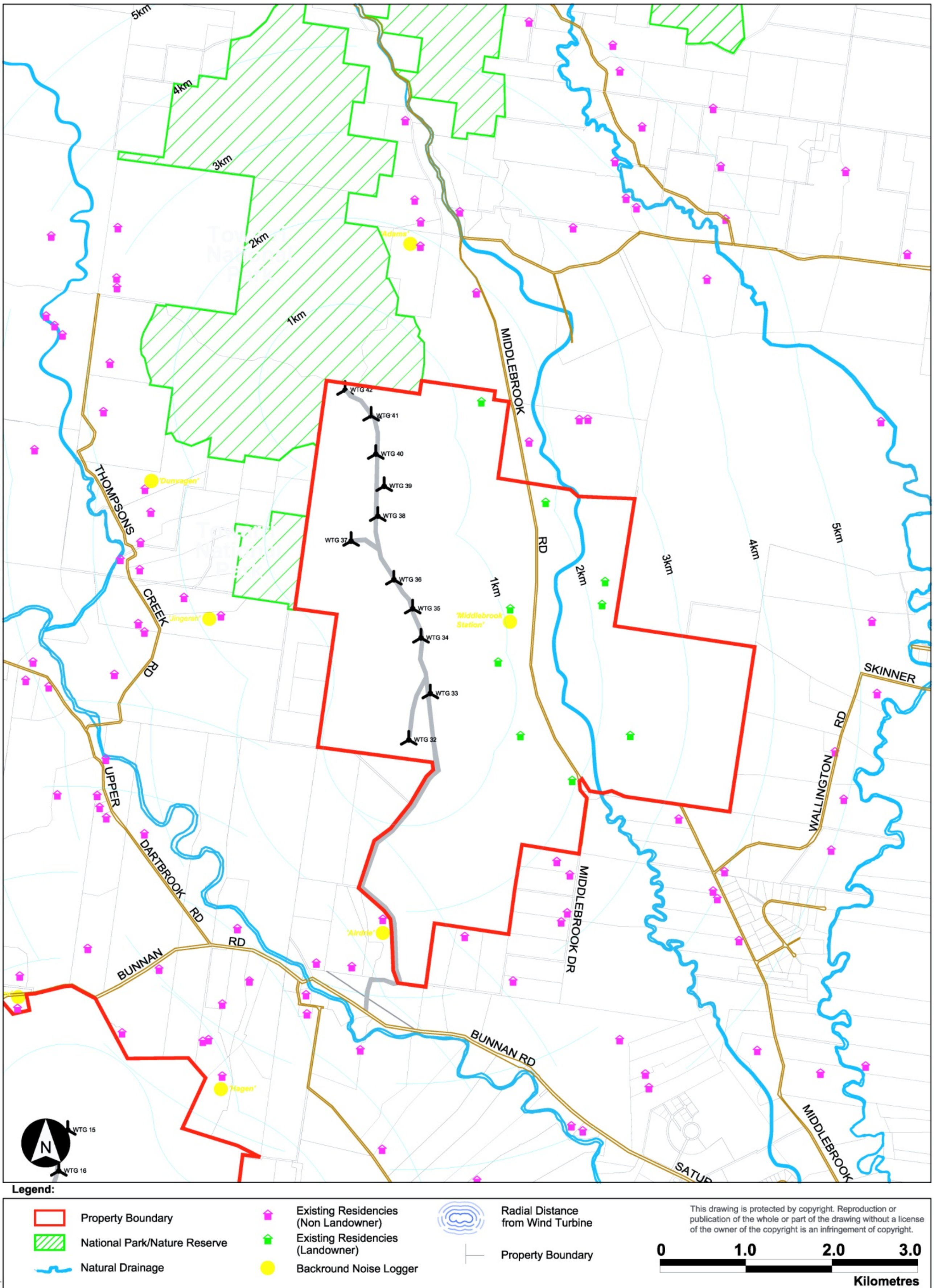

Kyoto energypark *Figure 10.1 - Nearest residencies (Middlebrook Station)* pamada A4

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10.3 Noise emissions

10.3.1 Wind Turbine Generators

Four different wind turbine models are under consideration and were considered in the noise assessment undertaken by Wilkinson Murray Acoustics. These turbine configurations are presented in Table 2.1 of this report. The assessment modelled the 'worst case' choice of turbine at the time of the assessment being the Suzlon Energy A/S S88-2.1 MW, V3 turbines which have a maximum sound power level (SPL) of 104.3dBA. If an alternate turbine is chosen noise levels will not be higher than an SPL of 104.3 dBA.

Three (3) non-landowner residences were identified at locations where the noise criteria was potentially exceeded. Of these 3, exceedances at one (1) non-landowner residence were considered to be negligible as they would occur less than 1% of the time throughout the year.

The Clifton Hills Estate is a 15 lot rural subdivision located immediately to the north east of the Mountain Station site. There is currently one household residence constructed on Lot 6 of the estate. The exceedances at the Clifton Hills Estate are predicted at night time only and up to 13% of the night time during summer periods. These levels were considered by Wilkinson Murray as marginal and no amelioration measures recommended. Subject to approval, operational noise levels would be modelled at this location for compliance with noise criteria.

Noise levels at the *'Peakhill'* residence (the closest non-landowner residence at 1.2km from the closest turbine) located directly east of Mountain Station were considered more significant and sector management of the closest turbines required. Sector management would be considered for Wind turbines numbers 27,28,29,30,31 (the subject turbines) to be addressed in the Operational Environmental Management Plan (OEMP) for the Kyoto Energy Park.

Noise level exceedances at the Peakhill residence were predicted to occur for short periods in Winter during the nighttime, at the exterior of the residence (i.e. outside as opposed to inside the residence). It would therefore be expected that during winter exterior windows would be closed and noise levels experienced inside the residence would be acceptable. Further conditional noise monitoring would be undertaken during the operational phase of the Kyoto Energy Park at the Peakhill residence to confirm predictions.

There are eight (8) landowner residencies located on Middlebrook Station which are owned by the landowner. Noise exceedances at two of these residencies were predicted to occur during winter nights, however it would be expected that closing windows during this time would reduce impact. An informed agreement with Pamada and the landowner has been signed with respect to noise exceedances at these properties on Middlebrook Station.

10.3.2 Ancillary Components

The noise assessment concluded that the contribution of the other components (mini hydro plant, Solar PV plant (all options) and site substation) under adverse conditions and full operation generate minor and insignificant noise in accordance with the Industrial Noise Policy (INP). The assessment modelled the 'worst case scenario' choice of turbine, the Suzlon Energy A/S S88-2.1 MW, V3 turbines which have a maximum sound power level of 104.3dBA.

Noise modelling of the solar PV plant has considered noise from tracking motors for all options base on manufacturers specifications for motor sizes. Up to 1000AC motors at 3m above ground have been used as a worst case scenario. Cumulative noise impacts are expected to be inaudible at nearest receivers. Topographic shielding of arrays from nearest receivers would also increase shielding effects.

The site substation is located at a distance of more than 1 km from Lot 6 Clifton Hills Estate. Noise emitted from the substation is a function of total electrical power output which has been estimated in accordance with *AS 2374-6 Power transformer Noise Levels*. The cumulative noise contribution from the substation modelled under worst case conditions was found not to contribute to a measurable increase in noise levels at nearest receivers. Additional shielding towards Clifton Hills Estate would be provided by a 4m high bund wall placed around the north-eastern edge of the substation as shown in Figure 2.15.

A Land Owners Agreement has been obtained for residencies located on the Middlebrook and Mountain Station properties (landowner). Noise levels at the proposed Managers Residence have not been considered in the noise assessment as the building. Noise exceedances at the residence shall be subject to testing during operations and managed in accordance with the site OH&S Plan.

10.3.3 Construction Noise Levels

The assessment of construction is dependent on the duration of construction in the vicinity of the potentially affected residential receiver in accordance with the *Environmental Noise Control Manual* (ENCM) by the DECC.

Construction activities have been split into three main construction phases which are representative of the noisiest activities:

- Earthworks (Site Establishment, construction of access tracks, hardstand areas)
- Foundation works (Concrete footings and foundations)
- Superstructure (Turbines/Substation/transmission lines/Mini-Hydro/Solar-PV/Buildings erection)

Allowing for worst case cumulative impacts associated with internal construction activities during the construction phase, overall noise level criteria would not be exceeded.

10.3.4 Traffic Noise Levels

Traffic volumes during the construction period would average 9 heavy vehicle movements per day (18movements). On peak days during deliveries prior to concrete pours this could increase to 20 heavy vehicles per day (i.e. 40 movements) for a short period. During site preparation trucks will assumed to be coming from the existing quarry on the Middlebrook Station site, which would occur for an estimated period of 2 months duration. Traffic noise levels have been estimated at critical locations along the direct route during peak periods and are considered within criteria.

Site access for both sites during operation is via Liverpool St, Satur and Bunnan Road. Traffic noise impacts were assessed along this route based on 'worst case' combination of employee traffic, additional tourism associated with the Visitors and Education Centre and Kyoto Energy Park scheduled maintenance activities. Traffic noise levels during operation would therefore be intermittent and would be negligible based on peak traffic regimes.

10.3.5 Transmission Line Construction

The construction of the overhead transmission line connection to the local electricity grid would require line construction works along proposed routes. The preferred option has not been determined at this stage. From a construction noise perspective there is a requirement to provide power poles along the alignment, requiring works in the same location for only a few days to provide foundations and erect the power pole and hang the transmission lines. These mostly follow existing road alignments.

This will require use of small excavation plant such as a mini excavator and bobcat, a small concrete pour for foundations and a crane and cherry picker to mount the pole and undertake the electrical fixing.

Noise levels are predicted to exceed criteria for a few days at residences within 200m of the alignment.

10.3.6 Van Den Burg Effect

The Van Den Burg effect is concerned about the possibility that there is sufficient wind energy at hub height to drive wind turbine generators, whilst wind speeds at the residences in the lower lying areas surrounding the ridge are much lower. Due to atmospheric instability at night this potentially results in background noise levels being much lower than the best fit regression of the all the background noise data at night time.

Previously this aspect was considered an issue where all wind data was referenced to a 10m height (i.e. 10m agl). Background noise levels were required to be plotted against wind speed at 10mAGL. In addition, historically the manufacturer's turbine SWL data was based on an assumed wind shear between 10m and hub height at the turbine test site, whilst measurements were undertaken.

If wind shear differences both between day and night and the wind farm site and turbine test site were not properly understood, noise levels could be under predicted under certain conditions because it is possible that higher wind speeds (therefore greater turbine SWL) exist at actual hub height in relation to the hub height wind speed estimated from 10m AGL using a wind shear coefficient. More recent turbine SWL data is now provided based on hub height wind speeds, eliminating this uncertainty.

On site wind speed and direction has been measured at Wind Mast 2 since January 2007 with data collected at three heights (30m, 45m and 65m). Sufficient data was collected from these heights to determine the wind shear coefficients (speedups) with height and to look at this data for the different months and daytime and night time periods.

The data concludes that the wind shear at night time is steeper than during the daytime and some months it is steeper than others. However in all cases the speedups result in a relatively small change in noise emissions (Sound Power Levels) from the generator with change in wind speed. Therefore potential for aspects of the Van den Burg effect at the site are considered low.

Blade Modulation and Temperature Inversions

Van den Berg is also concerned about the potential for modulation in turbulent noise levels from the blades which can occur if the wind speed across the blades at the top of the swept path is sufficiently different to the wind speed at the bottom. This is more likely to occur also at night where the atmosphere can be more stable with a steeper wind speed gradient above the ground. Modulation can be exacerbated if two turbines experience this modulation and are in phase when perceived from a particular residence.

The table below shows modulation factors in relation to atmospheric stability classes as determined by Van den Burg (Van den Burg 2003) In relation to modulation, if the wind shear (m) is less than 0.2, then Van den Berg considers the atmosphere would be unstable enough that modulation is unlikely to be considered a significant enough feature of the proposed windfarm to warrant consideration.

Table 10.0 – Modulation Classes for determination of Atmospheric Stability (Van Den Burg)

Pasquill Class	Name	m
A	Unstable	0.09
B	Moderately unstable	0.20
C	Neutral	0.22
D	Slightly stable	0.28
E	Moderately stable	0.37
F	(Very) Stable	0.41

Table 2 Atmospheric Stability Classes

Wind shear data taken for the Kyoto Energy Park at Mast 2 (Mountain Station) indicates that 'm' varies between nighttime and daytime but is generally higher during the first half of the day where it falls between 0.15 and 0.24 between hub height speeds of approximately 4-10m/s (see Figure 10.2). This falls into the neutral to slightly stable range, such that some degree of modulation may occur at times.

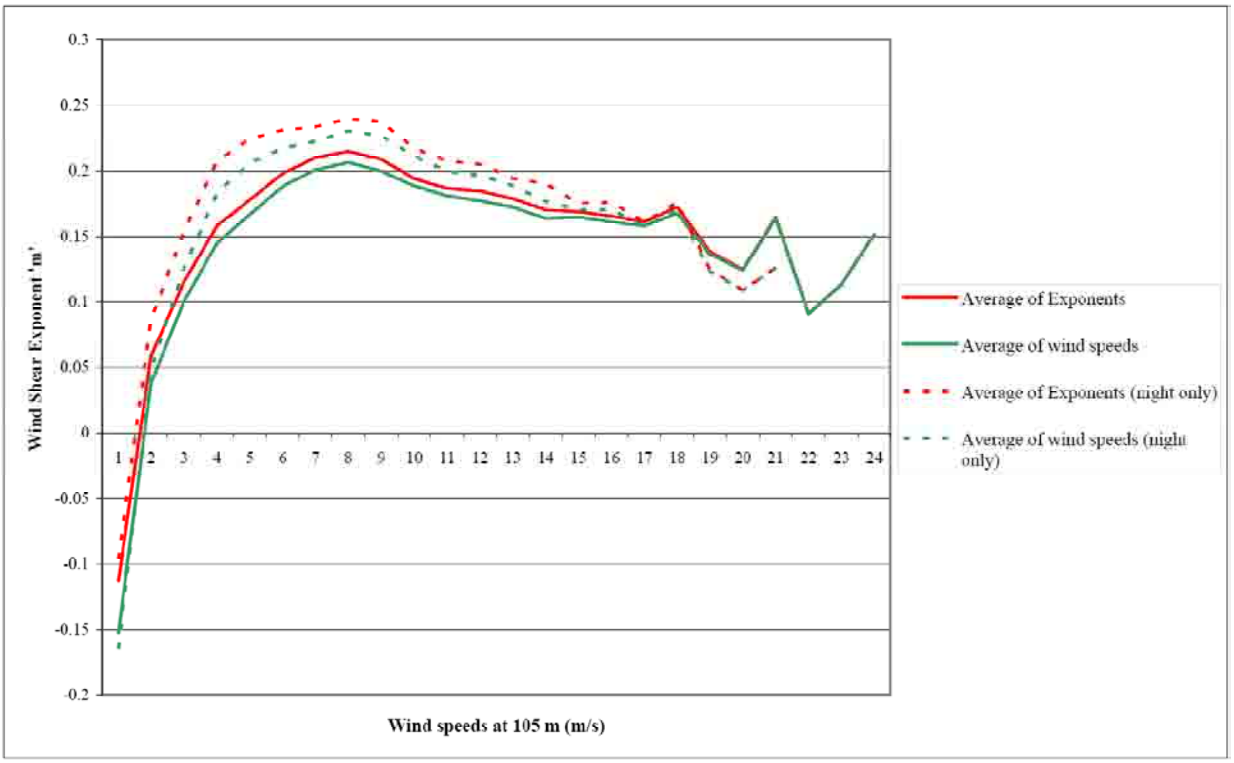

Figure 10.2 Variation of Average Wind Shear Exponent vs hub height wind speed

It will be necessary to review the likelihood of modulation during operations to understand whether controlling of wind turbines is required to eliminate high degrees of modulation under certain stable atmospheric conditions.

The site data also indicates that at ridge heights and above, temperature inversions are unlikely to occur at the hub height wind speeds capable of operating the turbines. Temperature inversions can cause an increase in noise level from ground-level sources because sound energy that would otherwise be directed upward is “bent” back down to earth. However, this effect is much less prominent if the source is located above the inversion layer, due to the effect of “bending” both above and below the layer. In this case it is likely that if turbines are rotating, they would be above the inversion layer, as within an inversion layer wind speeds are typically restricted to “drainage flow” of a few metres per second. Hence, it is not considered necessary to include the effect of temperature inversions in calculating noise levels from wind turbines.

10.4 Conclusion

With the exception of some minor exceedances that can be addressed with appropriate mitigation measures:

- The noise generated from on-site activities is predicted to meet NSW Department of Environment & Climate Change (DECC) criteria and Draft Australian Standard EV16 during operation of the Kyoto Energy Park;
- Noise levels at nearest receivers during construction periods is expected to be within DECC criteria;
- Traffic noise during construction and operation of the Kyoto Energy Park is expected to be negligible based on worst case scenarios achievable along the access route. The Visitor’s and Education Centre is not to be opened full time to the public, and traffic flow would be intermittent. The specifications within the Environmental Criteria for Road Traffic Noise (ECRTN) will be complied with.
- An agreement in relation to noise levels at the Middlebrook Station residencies (landowner properties) between Pamada and the landowner has been made.

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11. Visual Assessment

11.0 VISUAL ASSESSMENT

Integral Landscape Architecture and Visual Planning were engaged to undertake a Visual Impact assessment for the Kyoto Energy Park proposal. The Visual Assessment contains three (3) volumes as follows:

- *Appendix B- Integral Landscape Architecture and Visual Planning Visual Assessment Study Volume 1 - Main Report (May 2008)*
- *Appendix B(i)- Integral Landscape Architecture and Visual Planning Visual Assessment Study Volume 2 - Figures (May 2008)*
- *Appendix B(ii)- Integral Landscape Architecture and Visual Planning Visual Assessment Study Volume 3 - Photomontage (May 2008)*

The completed Visual Assessment Report meets the Director General's Requirements for the visual amenity impacts of this development. The findings of this assessment are discussed below.

11.1 Methodology

The visual impact of the components of the Kyoto Energy Park was determined by assessing the:

- significance of the existing **Visual Setting** **(see Section 11.1.1)**;
- **Viewing Locations** **(see Section 11.1.2)**;
- **Visual character** of the development **(see Section 11.1.3)**;
- **Statutory Framework** **(see Section 11.1.4)**.

These factors and considerations were then analysed to determine both the **Visual Effect (Section 11.2)** and the **Visual Sensitivity (Section 11.4)** of the project. The Visual Effect is in itself a combination of the area of the Primary view zone occupied by the turbines and the visibility of the turbines which is represented by the **Zone of Visual Influence** or **ZVI (Section 11.3)**. Both the Visual Effect and the Visual Sensitivity are then used to determine the overall **Visual Impact (Section 11.5)** of the project. Critical locations have been selected for visual reproduction of visual impact using **Photomontages (Section 11.6)**. **Recommendations and Visual Mitigation (Section 11.10)** for visual screening and mitigation have been made based on overall Visual Impact.

11.1.1 Visual Setting of the Kyoto Energy Park

The primary visual catchment is defined by the mountain range to the north, the hills to the east of Scone, the Hunter Valley to Muswellbrook and the hills to the east of Bunnan. Visual impacts outside the primary visual catchment are not considered to be significant when compared to those in much closer proximity within it.

A number of landscape units were identified within this primary visual catchment referred to as landscape units as shown in Figure 11.0. These include:

- Townships & Villages
- Broad Valleys
- Enclosed Valleys
- Wooded Hills
- Northern Hills and mountains

The landscape units within the primary visual catchment and visual settings of the Kyoto Energy Park sites on Mountain Station and Middlebrook collectively exhibit great visual diversity. The significance of these units was used in determining the special visual value is derived from the rock formations in both wooded hills to the west of Scone and the Northern Hills and Mountains.

Visual quality of a landscape unit has little influence on visual effect, nor does it of itself define the visual qualities of visual settings that include more than one landscape unit but it does give an indication of the distinctive landscapes in the locality and the relative values of the visual quality of the various landscape units.

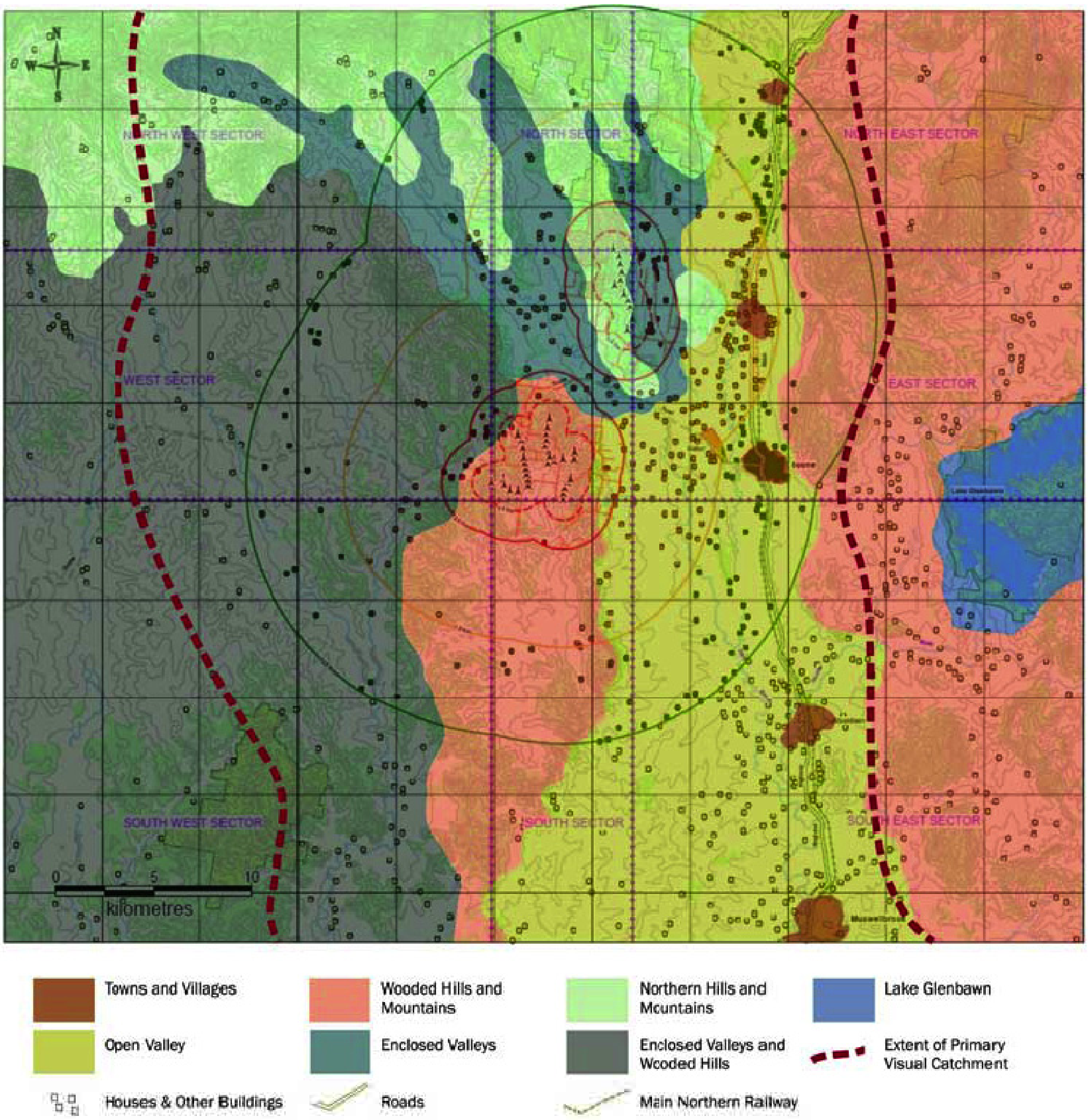

Figure 11.0 Landscape Units surrounding the Kyoto Energy Park

11.1.2 Viewing Locations

An evaluation of land use maps, aerial photographs and field investigations illustrated the character of land use and the viewing locations and distance from the wind farm site. Land use around the Kyoto Energy Park includes rural residential and small rural land, broad acre agricultural lands, recreation areas, conservation lands, major roads, minor roads and urban areas. These uses all have different visual expectations of the landscape, with some having a higher demand for visual amenity than others.

Distance of viewing location from the wind farm is important to visual effect of the Kyoto Energy Park structures. The closer the viewing area is, the larger the portion of the view as a whole and the primary view zone that will be occupied by the Kyoto Energy Park elements and therefore the higher the Visual Effect. The converse being the further away the smaller and less significant the area of the view and the primary view zone is occupied by the Kyoto Energy Park resulting in a lower visual effect.

Distance of a viewing location from the wind farm elements is also important to visual sensitivity. With an increase in distance to an undesirable development element it is likely that sensitivity to it will also decrease.

11.1.3 Visual Character of the project

All components of the Kyoto Energy Park together comprise the visual character of the development. The visual effect of the Kyoto Energy Park reduces the further the viewer moves away from it. It is also dependant on how much of the primary view the components will occupy. It is also affected by foreground screening, distance and community perception. The contribution of each component to the visual character is outlined below:

Wind Turbines

Wind turbines will be the major visual element of the Kyoto Energy Park project. The height and visual spread of the turbines creates a large area that would be impacted on by them. These elements will contrast strongly with the landscape surrounding them. Those turbines located on the ridge line are the major visual element as the strong line created by them. This will be added to by the movement of the blades.

Access Tracks

Site access tracks will generally be upgraded along existing routes. Some areas of minor cuts and fills on side slopes adjacent to the ridge top would also be required along with sedimentation and erosion control measures. Many of the existing access tracks are already formed and therefore only selective tree clearing will be required along existing routes. This will not create a distinctive line and colour contrast in the landscape as a result of vegetation clearing and earth works. Any minor visual effect created by these works will be decrease with time as rehabilitation of the road batters has occurred.

Managers Residence, Visitor's and Education Centre

These elements will have a low visual effect due to their limited vertical scale and location from the adjoining viewing locations. Further landscape treatments will ensure that they are successfully screened.

Mt Moobi Solar PV Farm

There are two distinct visual components being considered. The first is a solar panel array in rows and the second is a parabolic dish type structure. The solar panel arrays would be arranged in rows with orientation towards the north. The visual effect of the siting of these elements can be mitigated with low tree planting. The Parabolic collectors will require large tree plantings for screening purposes as they are taller than the banks of panels. It is also proposed to relocate the collectors away from the ridgeline dependent on the height of the structure.

Mini hydro plant (Closed-loop)

The low visual effect of the mini hydro plant can be easily mitigated by screening. Additionally, any effect is further softened by the existing topography and vegetation of the location of the plant.

Maintenance Shed

This element would be located adjacent to the access road on Mountain Station. Therefore due to their limited vertical scale and location within woodland they would be screened from the adjoining viewing locations. Further landscape treatments will ensure that they are successfully screened.

Site Substation

The site substation has a relatively low visual effect due to its location area of occupation and the fact that it well shielded from view.

Transmission Lines

Two (2) transmission line routes have been selected as preferred options in this report. The final route would be selected mainly on the final overall capacity of the Kyoto Energy Park, in consultation with Energy Australia (see Section 19.10 Preferred Connection Option).

Transmission line routes were identified in consultation with Energy Australia, the network distributor for the area. Proposed transmission line route have been selected to reduce visual effect by:

- locating poles away from built up areas and rural residential zones as much as possible;
- locating poles in existing road reserves

- replacing old poles to reduce cluttering
- providing options for line routes over private land subject to negotiation

The replaced poles and lines will be larger in scale than existing and the configuration will depend on the need to accommodate one or two high voltage circuits. The preferred pole type is concrete as shown in Figure 19.9. Overall pole height will vary with application (terminal pole, intermediate pole) and final design considerations. from location to location and will vary from rural to urban situations. Distribution lines would be accommodated on the new transmission pole.

In most situations the visual effect should be moderate given the location of the existing distribution lines along the routes.

11.1.4 Statutory Framework

The Kyoto Energy Park falls under Part 3A of the Environmental Planning and Assessment Act (EPAA) The Visual Assessment has considered statutory requirements for the project under a Part 3A application. Other guidelines used in the visual assessment and methodology included:

- Considerations of Director Generals Requirements
- Major Projects SEPP
- Scone Local Environmental Plan (LEP) 1986
- Amendment to Scone LEP (No 64)
- Upper Hunter Land Use Strategy
- Wind Farms and Landscape Values – National Assessment Framework.

Wind Farms and Landscape Values, National Assessment Framework

The Wind Farms and Landscape Values National Assessment Framework is intended to provide a rigorous and transparent method for assessing, evaluating and managing the impact of wind farms on landscape values. This framework was based upon findings developed through a stringent research and consultation process, ensuring best-practice is used.

The National Assessment Framework highlights the importance of community involvement and consultation throughout the assessment process stating "successful implementation of this framework relies on the use of a range of professional skills including, but not limited to, natural and cultural heritage, community consultation and facilitation, visual assessment, and development modelling and computer graphics. Table 11.0 below presents the key steps outlined within the National Assessment Framework process.

Table 11.0 Compliance with Wind Farms and Landscape Values National Assessment Framework

Step	Requirements	Outcomes
<u>Step 1</u> Assess the landscape values	• Establish the landscape values of the wind farm site and surrounding areas. • Undertake a preliminary landscape assessment, pre feasibility through documenting the level of existing knowledge and identification of communities who hold value of the wind farm site. Tasks include: - Desktop Review - Seek information from local authority - Identify potential community and stakeholder interests - Site survey - Preliminary assessment of landscape values • Document the landscape values associated with the wind farm site and surrounding area, and to evaluate the significance of the values. Tasks include: - Define the study area for assessment, including the ZVI	Landscape values and visual settings were described in Section 11.1.1 Extensive research was undertaken by Integral Pty Ltd in 2007/2008 Stakeholder interests were determined during early stages of the project and the attendance at a Community Information Day See Section 5.0 Landscape values have been assessed and summarised in Section 11.1.1 The ZVI is contained in Section

Step	Requirements	Outcomes
	- Landscape character analysis - Natural and cultural values analysis - Involve communities and stakeholders in identifying landscape values	11.3 Visual Landscape Character 11.1.3
Step 2 Describe and model the wind farm in the landscape	Provide reliable, objective data (including visual assessment) that can inform assessment of impacts in Step 3 and assist communities to understand the development and its potential impacts on landscape values. Tasks include: - Describe the development - Model the development - Prepare a visual assessment report	Detailed land information data was supplied by local government and other authorities and was used as a basis for computer modelling of visual impacts as contained in Appendix B
Step 3 Assess the impacts of the windfarm on landscape values	Assess, in a rigorous and transparent manner, the likely impacts of the proposed wind farm on the identified landscape values. Tasks include: - Seek community input to potential impacts - Identify and describe impacts - Identify potential cumulative impacts - Identify other relevant factors - Evaluate impacts	Direct community participation was sought from Pamada and Integral. In addition a Community Information Day was attended by Integral and Pamada representatives with independent feedback used in the analysis.
Step 4 Factors for consideration	Develop and test measures to respond to the identified negative impacts of the wind farm on landscape values. Tasks include: - Changes to location or sitting of the wind farm or ancillary infrastructure - Layout and design considerations - Minor changes and mitigation measures - Recommend changes to the development	A revised layout included the removal of 5 turbines to reduce visual impacts and visual cluttering. Design strategies and visual treatments to reduce the visual effect of turbines and ancillary components are summarised in Section 11.10

11.2 Visual Effect

The Visual Effect is a measure of the contrast and visual integration into the setting. A number of factors influence the visual effect of the elements including visibility, distance of a viewing area from the wind farm elements, scale of the structures, visual expression factors of elements, components of the landscape, and components of landscape affected by project structures.

A consideration of both the number of the wind turbines that would be seen (ZVI) and a calculation of the percentage of the Primary View Zone occupied by it, determines the Visual Effect.

11.3 Zones of Visual Influence (ZVI)

The ZVI diagram was based on visibility of wind turbine structures at 150m above ground level. The ZVI is important and a good indication to likely visibility of the wind farm component based on topography alone. Visibility categories have been split into 20%, 40%, 60%, 80% and 100%. For a visual impact to occur, the wind farm elements have to be visible. The ZVI represents the percentage visibility of the wind turbines at a particular location based on topography alone

In many locations visibility is further screened or restricted due to the presence of foreground vegetation and or built elements. For example the wind turbines are visible from Scone’s main street as accurately suggested by the ZVI however buildings along the street screen it from view except at intersections where roadways crossing the main road create view corridors to wind turbines elements on Mountain Station.

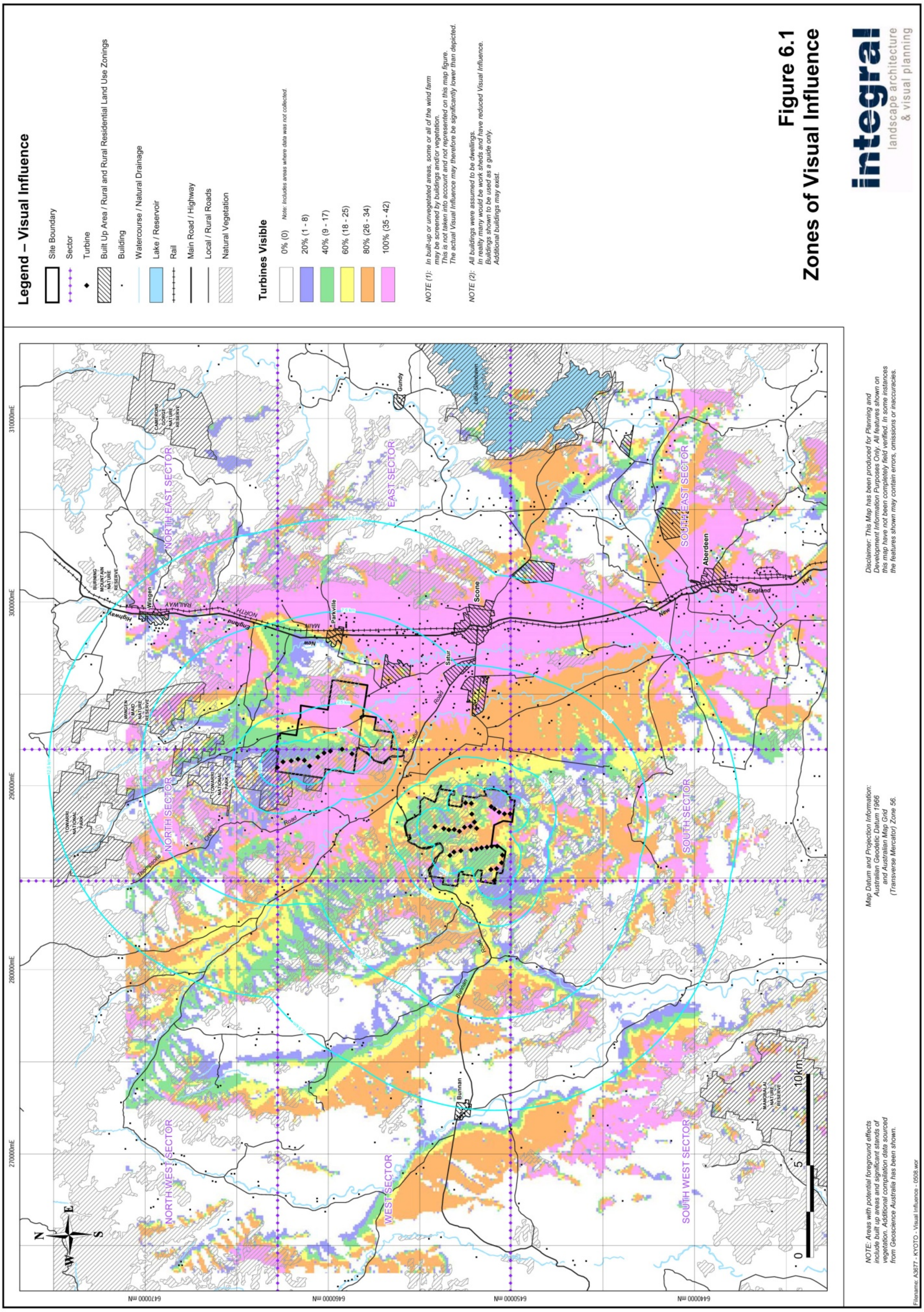

Figure 11.1 Kyoto Energy Park – Zones of Visual Influence (ZVI) Map (Integral 2008)

11.4 Visual Sensitivity

The Visual Sensitivity is affected by community perceptions, visibility of the structures, and whether the components are being viewed from high sensitivity locations, moderate sensitivity locations, or low sensitivity locations. Visual Sensitivity is used to define how critical a change to the landscape will be perceived by those viewing the landscape.

Visual Sensitivity was therefore considered mainly in terms of landuse activity from the viewing location, which gives a good indication of the importance of views, and distance, which affects scale and visibility. These factors were able to be mapped to determine sensitivity based on location and distance from the Kyoto Energy Park components.

11.5 Visual Impact

The visual impact of the Kyoto Energy Park is for the greater part created by the wind turbines as a result of the scale and location of the structures. The visual impact assessment therefore focused on this development component of the Kyoto Energy Park.

Other components of the Kyoto Energy Park have been assessed in the context of the visual values of the landscape and visual effect for each element. The impact of the transmission line will be moderate to low, given its alignment along and replacement of an existing power line with resultant moderate to low visual effects and impacts. Internal power reticulation between turbines and other generators will consist of buried cables with no visual impact.

For areas that have visibility to the Kyoto Energy Park sites, a visual impact will be experienced. The visual impact is the final measure of the environmental impact of the Kyoto Energy Park in relation to visual values for the area. Visual Impact is dependant on two sets of factors, Visual Effect and Visual Sensitivity as described above. The wind farm turbines will always have a Visual Effect, however if it is not seen from a particular situation, there will be no Visual Impact on that locality.

To calculate the preliminary visual impact in a the surrounding areas a detailed ‘Visual Impact’ map was produced to highlight areas that may require further consideration or detailed investigation. These areas represented as ‘High Visual Impact’ are shown in Figure 11.4 of the main report (referred to as Figure 8.1 Integral Oct 2008), which illustrates the overall Visual Impact of the wind farm component on the Kyoto Energy Park.

Calculation of visual impact has been conservatively estimated for the following reasons:

- When calculating the area of the primary view zone occupied by the wind farm components at a given distance (for calculation of visual effect), calculations assume that the wind turbines occupy a rectangular cross sectional area (i.e. similar to a solid wall of 150m in height across the width of the wind farm view area). This exaggerates the area taken up by the turbines in the primary view and thereby increases the area of visual impact represented in the maps.
- Also wind turbine visibility at a specific point on the landscape has ignored screening effects from buildings, vegetation and other structures.
- It has been assumed that wind turbines on both sites (Middlebrook and Mountain Station) are visible from locations as represented in the ZVI. While the turbines may be visible from that location (mainly in between the two sites) as represented in the ZVI, in actual fact some may not be able to be viewed at the same time, for example at locations along Bunnan Road and from Clifton Hills Estate. Thereby the visibility as represented in the ZVI and hence the Visual Impact of the wind turbines when viewed from these locations (generally between the two sites) has been exaggerated.
- Residence locations have been identified mainly using aerial photos and have therefore conservatively assumed to be all residential dwellings. Non residential premises such as farm and machinery sheds, factories, agri-businesses etc. would be identified during the Visual Impact Assessment and would generally not require landscaping or other treatments.

  There were no residencies located within a 0-1km radius of wind turbines on both sites. Approximately 23 and 13 buildings were identified within a 1.0 - 2.5km radius of Mountain Station and Middlebrook Station respectively. There are a large number of non-residential buildings located within a 2.5 - 7.5km radius of the wind turbines on each site. The proportion of residencies within this range is difficult to determine and would be verified during the Visual Impact Assessment within the defined areas.

The Visual Impact Map conservatively represents the area of affectation for the visual impact of turbines. The map illustrates areas (defined as potential for high visual impact) that will require further detailed investigation for determination if mitigation treatments at residencies is required. To achieve this a Visual Impact Assessment shall be undertaken within 6 months of commencement of operations as described in Section 11.7 below.

11.6 Photomontage images

Photomontage images have been used at 7 selected locations surrounding the Kyoto Energy Park sites. Photomontages have been used to illustrate the visual relationship of the wind farm components to the various foreground, middle ground and background components of the landscape as seen from various locations around the sites. Photomontage images are attached in Appendix B(ii) Volume 3. Examples of these photomontage images are reproduced below in Figure 11.2 and 11.3 below. These reproductions have been copied are not to scale.

11.7 Visual Impact Assessment

The Visual Impact Map is shown in Figure 8.1 (Integral Oct 2008), which identifies the area of potential high visual impact for land surrounding the Kyoto Energy Park proposal. To determine the degree of impact within these areas and whether treatments at residencies within these areas are required a further assessment upon commencement of operations will be undertaken.

Within 6 months of commencement of operations a preliminary assessment of homesteads will be undertaken by a specialist visual consultant to determine if visual treatments such as screen planting and integration are warranted.

Integration and/or screen planting at homesteads that have a primary view impacted and that experience high visual impact will be provided. Areas for consideration are:

- residencies in the Thompson's Creek Rd, Lower Sparkes Creek Rd, Dart Brook Rd and Middlebrook Rd and;

and to a lesser extent areas affected in vicinity of Moobi Rds and areas east of Mountain Station.

These areas are within highly impacted areas as defined by Figure 8.1 Visual Impact Map Appendix B(i) Integral Visual Assessment Study Volume 2.

Technical assistance through community workshops may be required with planting in highly impacted properties. Some compensatory landscape treatments will be provided for households that are worst affected generally in Thompson's Creek Rd, Lower Sparkes Creek Rd, Dart Brook Rd and Middlebrook Rd, and Moobi (and adjacent) Rds, within highly impacted areas as defined by Figure 8.1 (Integral Oct 2008).

Note: This photomontage is a reproduction of the original having been reduced to fit on the paper and therefore does not represent a true scale or representation of the correct eye view approximation.

Figure 6.16 | View from Clifton Gardens on to the western side of Mountain Station from approximately 1.5km away.

Note: This photomontage is a reproduction of the original having been reduced to fit on the paper and therefore does not represent a true scale or representation of the correct eye view approximation.

Figure 6.11 | View from Halcolm Hill shows wind turbines on both Mountain Station and Middlebrook Station. The nearest turbine is approximately 12.5 km away.

Total montage image is at a reduced scale to enable the extent of the wind farm to be captured on an A3 page, top image.

The existing view in terms of actual magnification is illustrated in the before shot, shown bottom left.

The segment of the photomontage within the same section is then magnified to achieve 'actual' eye size for windfarm elements, shown bottom right. All photomontages are illustrated in this way.

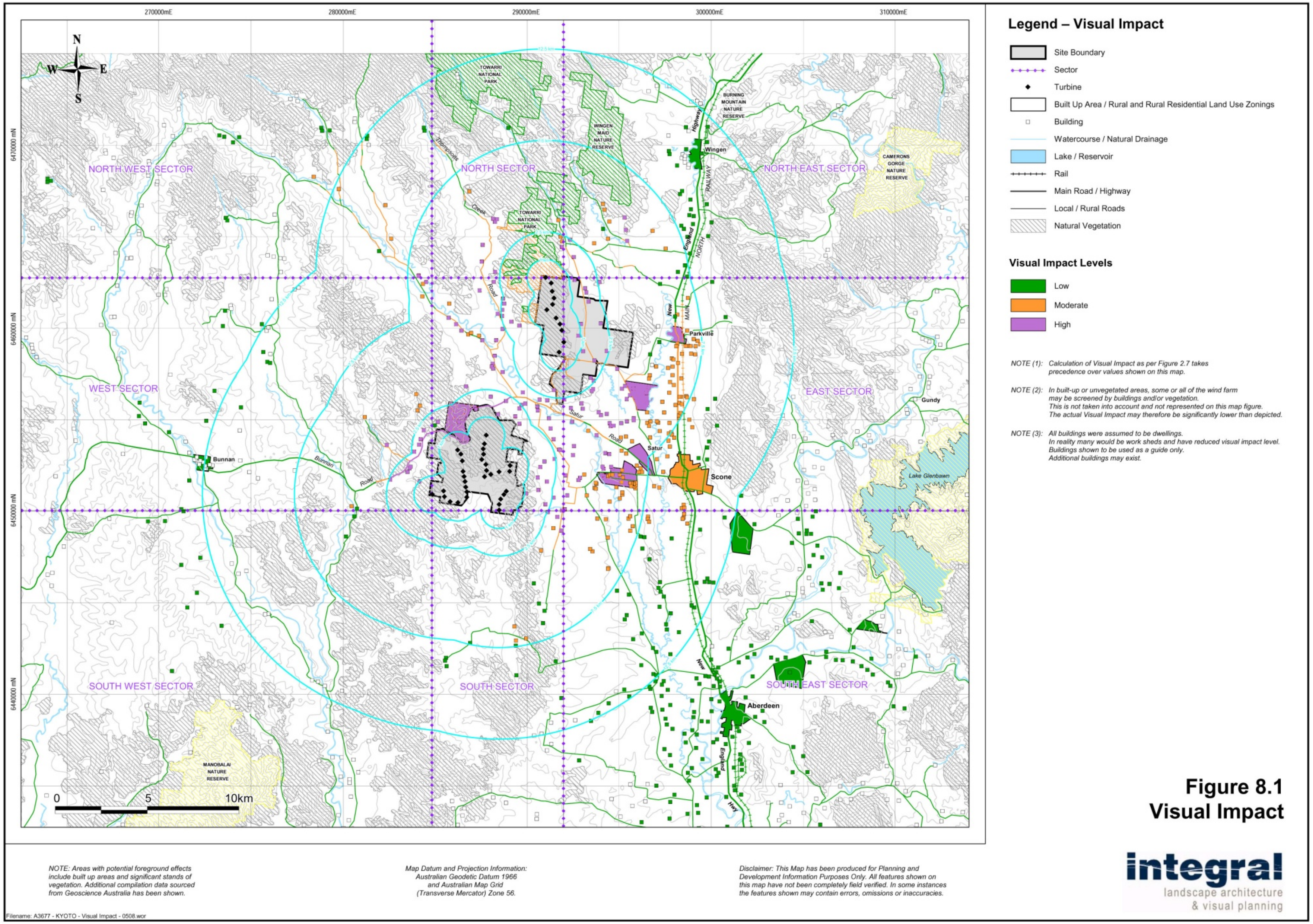

Figure 8.1
Visual Impact

The wind turbines create a strong contrast and lack visual integration creating strong visual effects. All other components generally have low visual impacts. This is due to the limited vertical scale and the ability of the existing landscape and any subsequent planting to screen or visually integrate these elements into the landscape.

The Middlebrook Station turbines are within a range of visual settings that include Castle Rock (local heritage item), is within a 7(a) (Environmental Protection "A" – Scenic Zone) zoning and has distinctive landscape character values. The original turbine layout was for 47 wind turbine in total. A revised layout for 42 turbines was made which included removal of the turbine closest to Castle Rock and relocation of the second closest turbine further away based on visual recommendations. In addition a total of 4 turbines were removed from the Mountain Station site along the Mt Moobi Plateau to reduce visual cluttering and visual layering effects from an easterly perspective.

Some of the components including Maintenance shed and site substation are located in the north-eastern portion of Mountain Station property, at low elevation and well shielded from the road. Visual impacts for these elements are negligible.

Construction facilities would be located on site for approximately 20 months duration. These facilities will have low visibility and are located at low elevation.

The most highly impacted view locations are the rural residences in close proximity and those that are within small scale landscape and visual settings. This visual condition is created in locations such as Thompson's Creek Road and to a lesser extent along Parts of Middlebrook Road. Here intimate valley views are to varying extents dominated by ridge top wind farm components. Visual treatments for these locations are discussed in Section 11.10.2.

Visual impact was found to be lower for rural residencies located to the east of Mountain Station where there is a much broader valley and the scale of visual settings is much greater. Also the visual orientation of households is less likely to be towards the topographic feature that is Mountain Station, however there will be exceptions.

The visual impact on Scone is generally moderate reflecting moderate visual effects and sensitivities at this distance. The impacts on the more distant towns of Aberdeen and Muswellbrook will be low.

The visual impact on the highway and railway is generally low and is likely to be a visual feature in an ever changing view as seen from these travel corridors.

The Kyoto Energy Park Visual Impact Map is reproduced above in Figure 11.4 (Figure 8.1 as shown).

11.8 Shadow Flicker

Shadow flicker from wind turbines can occur when the sun is low in the sky and moving shadows are cast by the rotating blades on an area around them. When viewed from a stationary position this can appear as a flicker.

There are currently no guidelines for Shadow Flicker assessment in NSW. The occurrence of shadow flicker was modelled by Garrad Hassan Pty Ltd using guidelines most notably that of the Victorian wind farm guidelines, which is considered standard industry practice. Shadow flicker calculated in this manner overestimates the number of annual hours of shadow flicker experienced at a specified location.

Garrad Hassan has adopted the more conservative approach and has used a limit to the length that a shadow can be cast of 1 km from a turbine. Analysis of duration of shadow flicker has been conducted for the area around the proposed Kyoto Energy Park, with approximation of shadow diffusion with distance. Maps of shadow flicker duration have been produced using a sophisticated computer model for regions immediately around the proposed development showing the predicted hours per annum of shadow flicker. These maps are reproduced in Figure 11.4 for Middlebrook Station and Figure 11.5 for Mountain Station.

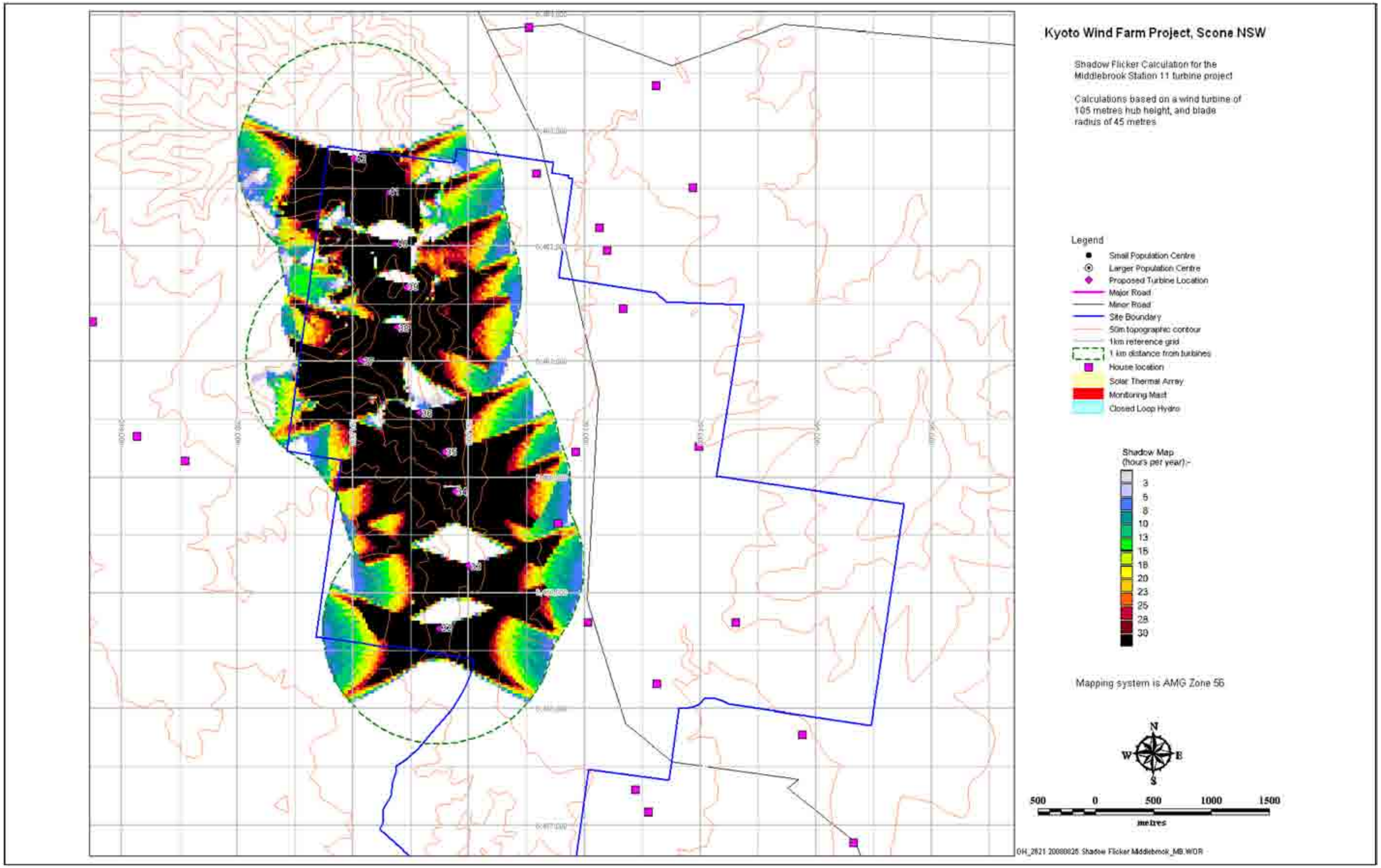

Figure 11.4 Modelled Shadow Flicker hours at Middlebrook Station (Garrad Hassan 2008)

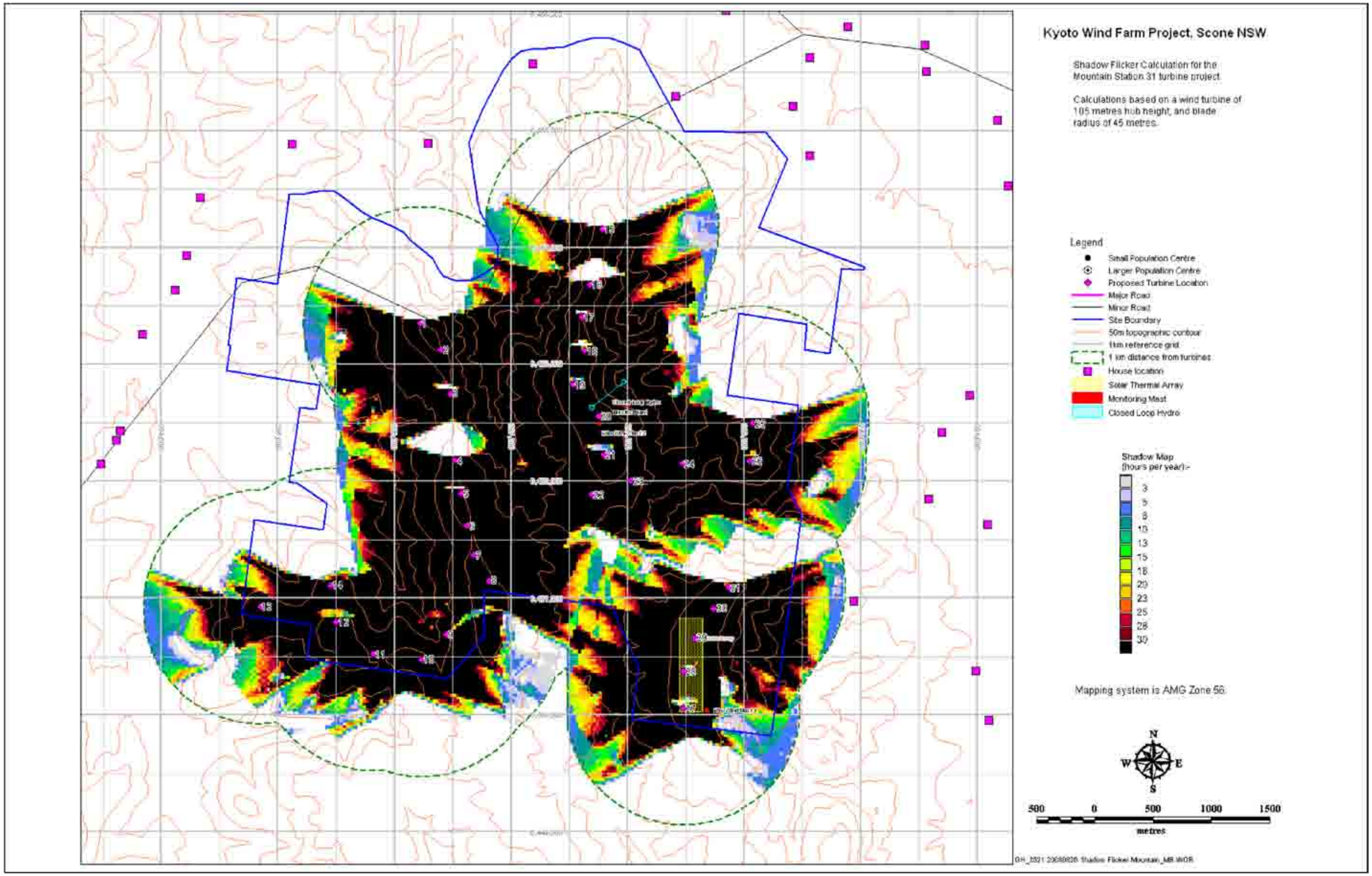

Figure 11.5 Modelled Shadow Flicker hours at Mountain Station (Garrad Hassan 2008)

The assessment concludes that no nearby houses has modelled shadow flicker of greater than 30 hours per annum (current guidelines) and therefore shadow flicker is not expected to be a constraint to the project.

The Flicker model shows that the Manager's residence proposed on Mountain Station will experience greater than 30 hours p.a. of Shadow Flicker from wind turbines. The Manager's residence shall be used solely for the accommodation of the Park Manager. Shadow Flicker impacts on the residence shall be considered in the final design of the residence and managed through the operation of an onsite Occupational Health and Safety Plan.

11.9 Blade Glint

Blade glint refers to the potential for the movement of the blades to catch the light and produce glint which may be seen from surrounding areas. Blade glint is nearly impossible to quantify due to the variations of sunlight, light intensity, cloud cover and the complex geometry of the wind turbines and the surrounding terrain. If it were to occur, as with shadow flicker, it would only occur for a short period as the sun moves in the sky.

At present there are no formal regulations or guidelines in NSW pertaining to Blade Glint. To carry out their assessment, Garrad Hassan has used the Victorian wind farm guidelines as standard industry practice.

The paint used on modern blades and tower of the wind turbines helps to significantly reduce any occurrence of glinting. Blades would be finished with a surface treatment of low reflectivity (i.e. matt finish) to ensure that glint is minimised. In this way blade glint can be mitigated through the use of matt coatings.

11.10 Design Strategies, Visual Mitigation Treatments

The major visual impacts created by the Kyoto Energy Park are created by the wind turbines in the project. Because of the scale of the wind turbines, visual treatments to reduce visual sensitivity and visual effect need to be achieved at or close to the viewing locations. Visual treatments of other components of the Kyoto Energy Park can be completed at the site.

The full range of visual treatments have been separated into treatments to be applied to generator components and facilities on site and treatments to be applied to receivers identified as having a potential visual impact.

11.10.1 Visual Mitigation Treatments at Site

Wind Turbine Colour

Colour of the wind turbine elements is the only practical consideration for treatment of wind turbine components on site. In this context the off-white and softer light greys or soft grey-greens are to be used.

Mt Moobi Solar PV Farm

The solar plant is located on the eastern edge of the Mountain Station Site along the Mt Moobi Plateau. It will consist of arrays of solar panels arranged along short east west rows with the panels set at approximately 30 degrees (fixed frame) of the horizontal to face the northern sun. The maximum elevation of the solar plant is 1.5 - 14m height above ground level, dependent upon the final solar option. For a full description of solar options refer to Section 2.3.7.

There should also be a visual buffer on the eastern escarpment to screen the solar plant from view. Planting should consist of a minimum of 5 rows of indigenous trees and tall shrubs, with vegetation height dependent on final solar option selected. If the parabolic-dish structures are utilised (height =14m) then these structures would be set back from the eastern edge of the Mt Moobi escarpment.

There will be no reflected light from the collectors on surrounding residents as they will be orientated or track towards the sun.

Mini- hydro Plant (Closed-loop)

This plant is well integrated and screened from external view. Care should be taken in minimizing clearing of trees when constructing the water pipe lines on slopes. Holding tanks and associated facilities should be coloured olive green to minimise colour contrast. Screen planting to header tanks and upper sections of water race pipelines should occur as required.

Site Access Roads

Generally roads will not be visible to surrounding areas and will generally utilise existing roads and tracks. Treatments will aim at reducing visual contrast and scale of the roadways. Specific recommendations include:

- Roads and construction tracks are to use existing trails where possible;
- New trails and roadways should avoid tree clearing to utilize the tree canopy for screening purposes;
- Route selection should minimize views on to the road, giving special care in relation to potential views from locations parallel to the road alignment;
- Minimise straight alignments and follow the contour of land;
- Design the road batters to maximize integration;
- Design consideration for road down sizing and or restoration after construction;
- Road Batter revegetation;
- Off site planting, as used for wind turbine integration treatments, will also have benefits for road integration.

Buildings

Final design of all buildings shall be completed prior to construction including the Manager's residence, Visitor's and Education Centre and the Maintenance shed. Design principles to be adopted in the final design include:

- Buildings on ridgelines shall be height limited in accordance with the Visual Assessment (Appendix B). The Managers residence will have a height limit of 8m. The Visitors and Education Centre shall have a height limit of 6m. Both buildings will be heavily integrated into the landscape with vegetation screening;
- The building roof of the Visitors and Education Centre is to create an overhang to produce a shadow effect on external walls;
- The Maintenance Shed is located on the flats in a well screened area with limited visual interference to surrounding areas. The height and colour of the shed shall be based upon final design and allow for low visual form and function of the structure;
- The buildings will be painted with colours to assist in the integration of buildings into the surrounds;
- Supplementary planting should be provided to integration elements both in front of and behind built form elements;
- Building elements should be designed and of a colour suitable to achieve minimum contrast with existing colours of receiving landscape.

Overhead Transmission Lines

Treatments to increase visual integration and decrease visibility to sensitive viewing locations include.

- Replace the old timber poles (with cross arms supporting insulators) with simple pole structures featuring cantilevered insulators to accommodate new circuits;
- Existing distribution circuits are to be placed on the new transmission line poles;
- The poles should be the new light green colouring as shown in Figure 19.9 (Concrete poles);
- At viewer locations integration planting should be undertaken as needed in areas such as highly affected rural homesteads;
- Supplementary planting should occur along alignments within town settings and approaches to achieve visual integration of the transmission line structures.

11.10.2 Visual Mitigation Treatments at viewing location

Screen Planting and Landscaping

Some rural homesteads were identified in the vicinity of the Kyoto Energy Park sites that could potentially be impacted upon and require amelioration treatments to create a vegetation filter to that part of the skyscape affected by the wind farm component.

The Visual Impact Map shown in Figure 11.4 will be used to identify homesteads that will require further investigation. Pamada will engage a suitably qualified landscape consultant to undertake an assessment of visual impact treatments to affected locations.

Treatments will consider the following:

- Integration and or screen planting at homesteads that have primary view impacted and that experience high visual impact;
- Compensatory landscape treatments for impacted homesteads generally in Thompson Creek Road , Lower Sparkes Creek Road, Dart Brook Road and Middlebrook Road areas;
- Clump planting of native trees along highly exposed rural roads;
- Complementary landscape treatments of residences in affected areas in the vicinity of Moobi Road as well as adjacent roads;
- Treatment of road edges and or driveways to provide screening and/or visual integration elements.

The assessment shall commence 6 months after the commencement of operations of the wind farm component of the Kyoto Energy Park. Remedies and treatments for visual impact shall be addressed on a case-by-case basis and implemented at affected locations as a complimentary measure.

Kyoto Energy Park Scone is wholly an Australian Enterprise. The Management is 100% Australian.

The funding of this proposal and report is 100% Australian.

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Kyoto energypark

12. Aviation

12.0 AVIATION

12.1 Introduction

Garrad Hassan completed an assessment of Aviation issues which is attached in *Appendix E Garrad Hassan Assessment of Environmental Issues Aviation.* The report examines the location and heights of the proposed wind turbines and impacts in relation to Aviation activities within the surrounding area, principally from Scone Airport. Scone airport is located on the Bunnan Road west of Scone at approximately 5.5 km from the closest turbine proposed at Mountain Station and approximately 6km from the closest turbine proposed at Middlebrook Station (see Figure 12.4).

12.2 Civil Aviation Authority (CASA)

The Civil Aviation Safety Authority (CASA), the NSW aviation regulatory body, requires notification:

(a) By an aerodrome operator, if it becomes aware of any development or proposed construction near the aerodrome that is likely to create an obstacle, or if an object will infringe the obstacle limitation surfaces (OLS) of an aerodrome; or

(b) By a person who proposes to construct a building or structure the top of which will be 110 metres or more above ground level.

The height of the proposed wind turbines are 150 metres above ground level (agl). As the proposed turbines have a total height of greater than 110m, notification to CASA was required. The Obstacle Limitation Surface (OLS) map was obtained from the Upper Hunter Council (the operator of Scone airport) and indicated that the turbines fall outside the OLS.

CASA confirmed that the proposed turbines on both sites fall outside the OLS. CASA also advised that obstacle lighting would be required under the CASA Advisory Circular AC 139-18(0) titled “Obstacle Marking and Lighting of Wind Farms”. An obstacle lighting plan will be prepared in accordance with AC-139-18(0) and approved by CASA prior to installation of the wind turbine components.

In accordance with CASA Advisory Circular AC 139-08(0), “Reporting of all Tall Structures’ any structures that are between 30 to 110 metres above ground level, must be reported to the RAAF Aeronautical Information Service (AIS). These structures are defined as ‘Tall Structures’, details of which are kept on the RAAF database.

This proposal does not include any structures which are 30 – 110 metres above ground level. Proposed new transmission poles (Either 66kV or 132kV) would have a maximum height of 19-25 metres above ground level, depending upon pole application and would therefore not require notification to RAAF.

Two existing wind masts are located on the Mountain Station site at a height of 45 metres and 65 metres above ground level respectively. These existing structures are not part of this proposal, and details have previously been logged with the RAAF.

12.3 Air Services Australia

Air Services Australia (the Federal aviation regulatory body) was advised of the proposed Kyoto Energy Park. The response received indicated that some of the turbines would infringe upon three flight procedures for the Scone local airport. These procedures were denoted 29RNAV (Figure 12.1) , NDB (Figure 12.2) and CAT C circling (Figure 12.3).

Each of these three procedures define three dimensional surfaces within space in various configurations. Details of the precise three dimensional boundary conditions of the flight procedures were obtained from Airservices Australia. Garrad Hassan confirmed using in-house 3D modelling software that some of the turbines in the original 47 turbine layout infringe the flight procedures identified by Airservices Australia.

The layout for the proposed Kyoto Energy Park project was revised to a 42 turbine layout. This revised layout incorporated a change to the position of turbine 15 (Mountain Station) and some of the turbines on Middlebrook Station to avoid infringing the Airservices Australia procedures.

In the revised layout (42 turbine layout) turbines 36, 37, 38, 39, 40, 41 and 42 (Middlebrook Station) infringe the Airservices Australia procedures. Pamada are currently investigating aircraft flight procedures at Scone to determine possible modifications to avoid infringement. This issue needs to be resolved for the proposed layout of the Kyoto Energy Park to comply fully with aviation considerations.

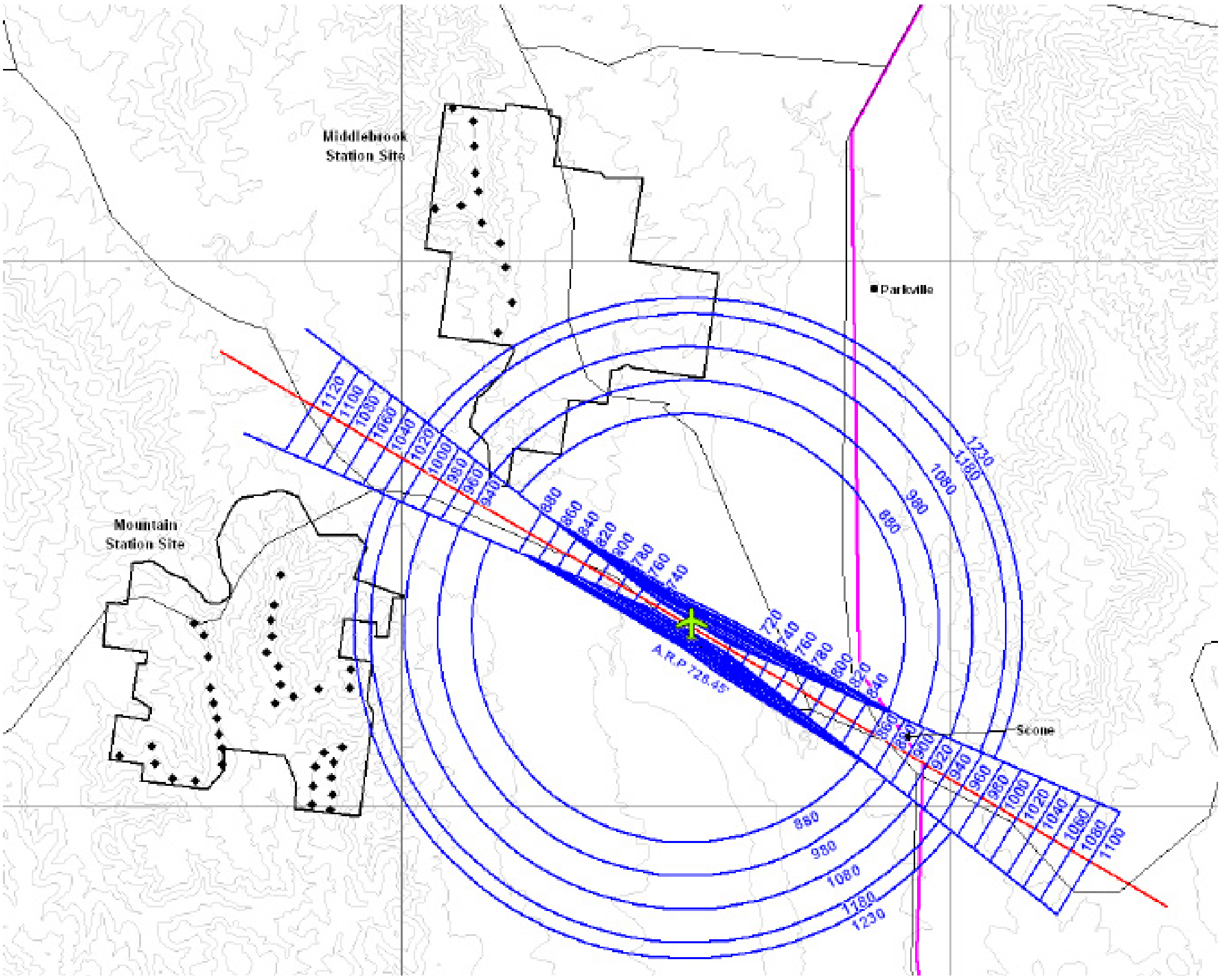

Figure 12.0 Map of Obstacle limitation surface (OLS) for Scone aerodrome.

Turbines 32,33,34 and 35 (Middlebrook Station) are outside the Airservices Australia procedure, and are therefore not encroaching any of the flight procedures.

Approval for the current turbine layout for 36, 37, 38, 39, 40, 41 and 42 (Middlebrook Station), has still to be resolved and would ultimately be subject to compliance with Air Services Australia procedures and CASA. Assuming no feasible alternative for these turbines is reached then the remaining turbines on Middlebrook Station (i.e. 32,33,34 and 35),would still be constructed.

In the revised layout (final layout) all wind turbines on Mountain Station are outside flight procedures.

Airservices Australia otherwise confirmed that the proposed Kyoto Energy Park wind farm component will not impact on Precision/Non-Precision Nav Aids, HF/VHF Communications, Cables, ASMGCS, Radar or Satellite/Links.

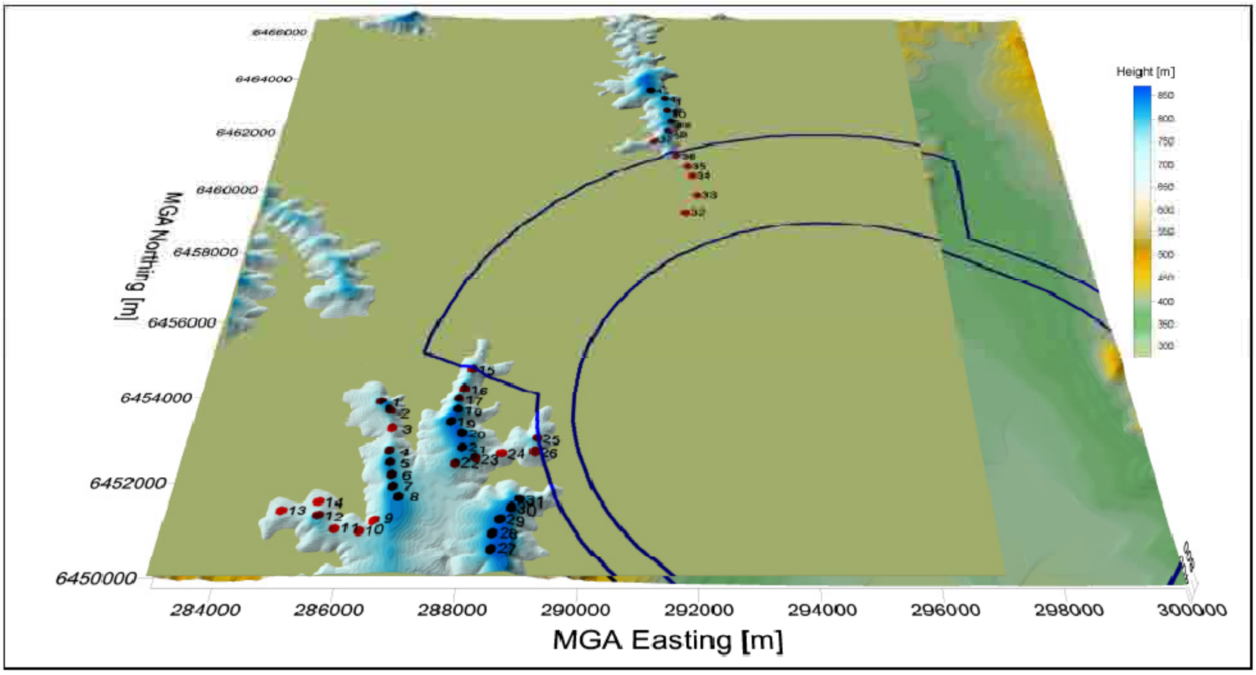

Figure 12.1 Scone aerodrome 29RNAV sloping protection surface

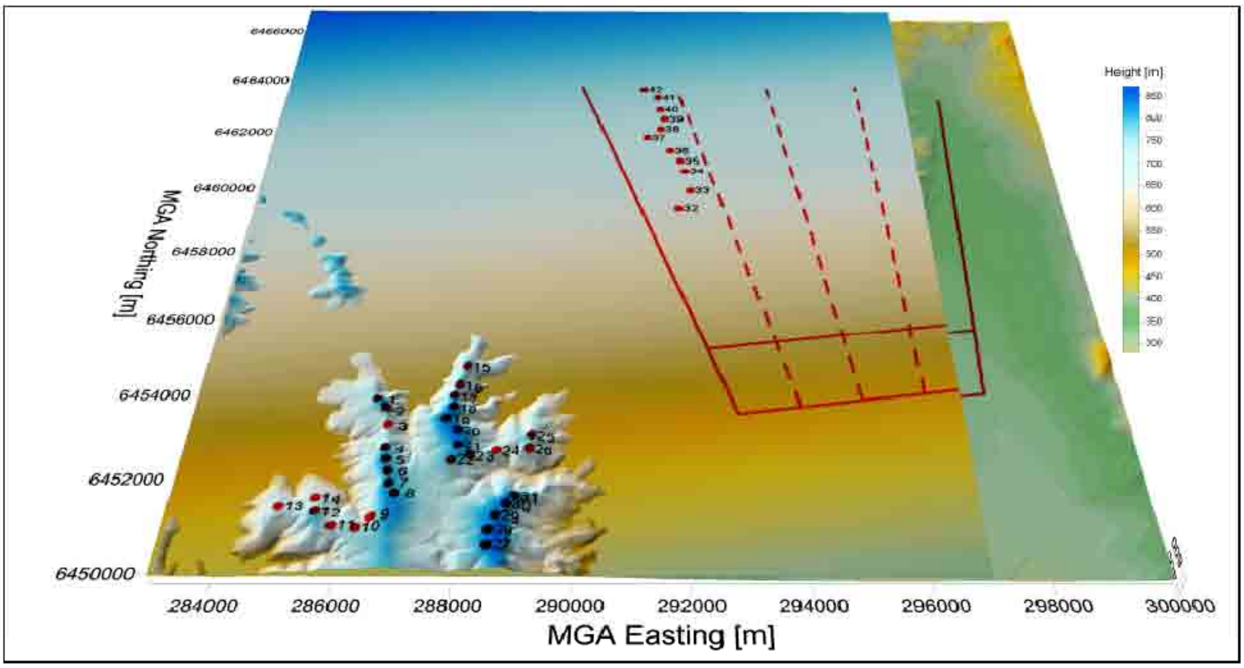

Figure 12.2 Scone aerodrome NDB sloping protection surface

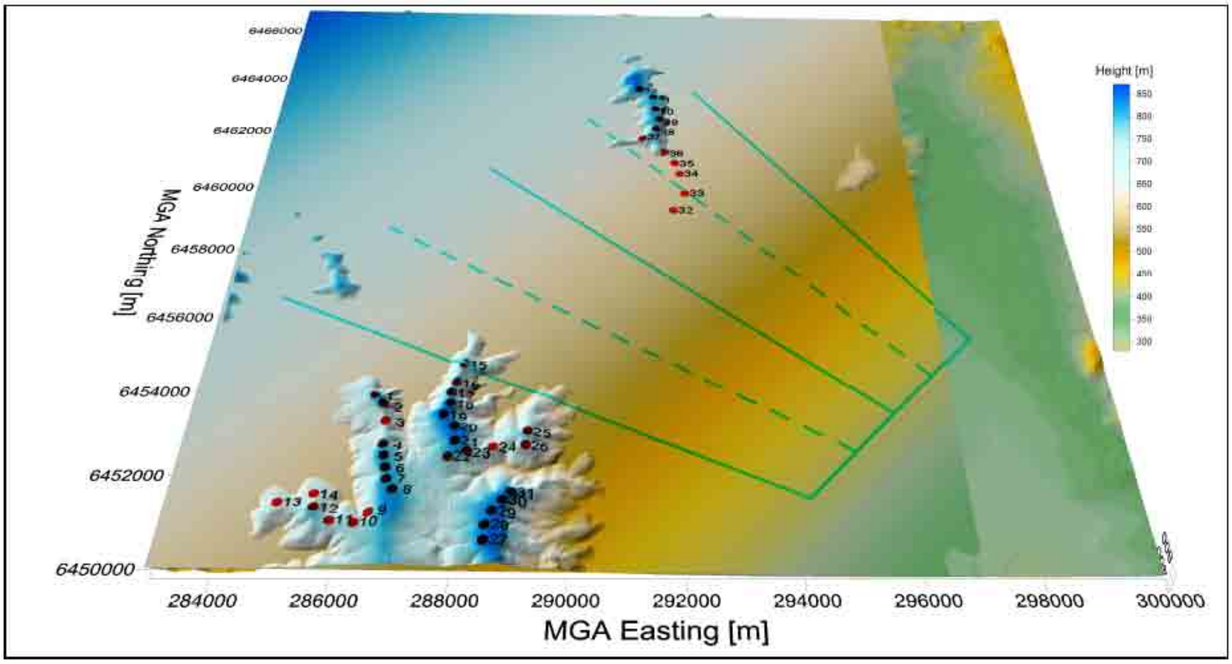

Figure 12.3 Scone aerodrome Circling protection surface

12.4 Department of Defence

The Department of Defence were supplied with details of the Kyoto Energy Park proposal. The Department of Defence confirmed that the closest RAAF base was at Williamtown with flight areas close to the Kyoto Energy Park proposal at Scone but would not be affected by the proposal. Furthermore the proposal would not impact upon any defence communications facilities. A copy of the letter of response from the Department of Defence is contained in *Appendix E(i) Department of Defence – Response to Aviation Issues (12 March 2008).*

The Department of Defence requested the following be supplied to them as follows:
- Design details of the wind turbine structures prior to commencement of construction (including location and height), and progress of the construction phase.
- Details in relation to lighting for the final turbine layout in accordance with CASA Advisory Circular AC 139-18(0) titled “Obstacle Marking and Lighting of Wind Farms”.
- Details of the final positioning of all structures above 30m be supplied to the RAAF – Aeronautical Information Service (RAAF AIS) in Melbourne. Details of the two existing wind masts on Mountain Station have been provided to the RAAF AIS.

12.5 Commercial Operators

There are four (4) main commercial and recreational operators that are based at the Scone local airport. These include aerial spraying and topdressing operations, survey mapping, aerial training and aircraft maintenance. All operators are required to use flight procedures and emergency navigational procedures in operation at the Scone airport (i.e. protected airspace) during takeoff and landing and for emergency procedures in accordance with CASA and Airservices procedures as described in Section 12.2 and 12.3 above. As all final turbine structures will be located outside protected airspace there will be no impacts on commercial aircraft using the airport.

Information regarding aerial spraying and topdressing operations in and around the Scone Aerodrome were made with the Manager of Technical Support Services from the Upper Hunter Shire Council. The Manager of Technical Support Services confirmed that the requirements from Airservices Australia would need to be followed and reflected Councils comments.

Pamada consulted and provided details of the Kyoto Energy Park proposal to four operators to determine if any local impacts were identifiable. Two of the commercial operators (Payes Air Service and Scone Aeroclub) utilise an area for training which includes a small portion of the airspace over the Mountain Station site. The general training area for these operators are large in comparison to the area utilized by the wind turbines on Mountain Station as shown in Figure 12.4. These training areas are not within the limits of the Middlebrook Station property. The other two operators (Payes Airservices and Airpasture Pty Ltd) make predetermined flights to surrounding rural locations for spraying applications and topdressing.

All four operators verbally confirmed that they had no objections with the Kyoto Energy Park proposal for installation of wind turbine generators and did not envisage any foreseeable impacts on individual operations.

It is expected that some minor restrictions to the area of utilisation for local operations would occur as a result of the imposition of the wind turbines on Mountain Station however this impact would be manageable and not pose a safety risk for local aircraft.

Prior to construction of wind turbines a map showing physical dimensions and final co0-ordinates of all structures will be supplied to the Upper Hunter Council.

12.6 Local Private Airstrips

Private airfields are located on various properties throughout the region, many of which are marked on topographic mapping. Three private airstrips are located on the landowners property, one at Middlebrook Station and the other two are makeshift airstrips located at Mountain Station on Mt Moobi Plateau, and close to the entrance point of the site. These strips are used by the landowner and others for monitoring of stock and for accessing grazing areas, tourism and aerial spraying. There is not expected to be any safety risks for planes that may use these private air strips. The Mountain and Middlebrook station sites are used mainly for grazing. No cropping is undertaken on the site. Aerial spraying activities are very infrequent. The Mountain Station airstrip is currently located on Mt Moobi plateau and will be replaced by the Mt Moobi Solar PV Farm currently proposed for the location. This airstrip is used solely by the landowner who has agreed to the replacement of the makeshift airfield.

Only one other private airstrip was located within 5 km of the two sites. This airstrip is located approximately 4km west of the closest turbine on Middlebrook Station. Other private airstrips are scattered at considerable distance to the west of the two sites and the Bunnan township. Nearly all of these rural airstrips are makeshift and used rarely or on an infrequent basis for operators accessing properties from Scone airport.

The wind turbine structures are not considered to be safety hazards to aerial agriculture operations as the structures are readily visible and the pilots can easily avoid them. Also these smaller aircraft use visual rather than instrument based landings and the turbines are readily identified and highly visible.

Prior to construction of wind turbines a map showing physical dimensions and final coordinates of all structures will be supplied to the Upper Hunter Council.

12.7 Conclusion

The layout for the proposed Kyoto Energy Park project has been revised to a 42 turbine layout.
In summary:

Mountain Station

- A total of 31 turbines are proposed for Mountain Station site in the final layout (Turbine Nos 1 to 31)
- None of these turbines are infringing CASA regulations, Air Services Australia flight procedures, Department of Defence flight paths or communication facilities
- All operators using Scone airport are required to comply with Scone airport regulations and flight procedures. Local aerial operators at Scone airport were contacted and supplied with details of the

Kyoto Energy Park proposal. Impacts to local commercial operators were found to be insignificant as a result of limitations to training areas and restrictions imposed by the presence of the turbines. No objections were received from the operators in relation to the proposal. It is envisaged that there would be no impact or safety risk to these operators as a result of the project
- Private airfields located on surrounding rural properties are used on an infrequent basis by operators from Scone aerodrome as discussed above and would not be affected by the proposal.

Middlebrook Station

- A total of 11 turbines are proposed for Middlebrook Station site in the final layout (Turbine No's 32 to 42).
- Wind turbines Nos 32, 33, 34 and 35 do not infringe any of the flight procedures or OLS surfaces.
- Wind turbines 36, 37, 38, 39, 40, 41 and 42 are infringing the Air Services Australia flight procedures as proposed. The final layout for the project will depend on discussions between the proponent and Air Services Australia after a more detailed evaluation of the aircraft procedures for Scone airport and mitigation procedures.
- A single private airstrip was located west of the Middlebrook Station site at 4km from the closest turbine. This airstrip is used on an infrequent basis by operators from Scone airport and would not be affected by the proposal.

Airservices Australia otherwise confirmed that the proposed Kyoto Energy Park project will not impact on Precision/Non-Precision Nav Aids, HF/VHF Communications, Cables, ASMGCS, Radar or Satellite/Links.

The Department of Defence assessed the Kyoto Energy Park proposal for impacts upon the safety of military aircraft operations, defence communications and airfield surveillance radars. The Department advised that the Kyoto Energy Park proposal was outside areas used by the RAAF and that there was no impacts on communication or radar installations.

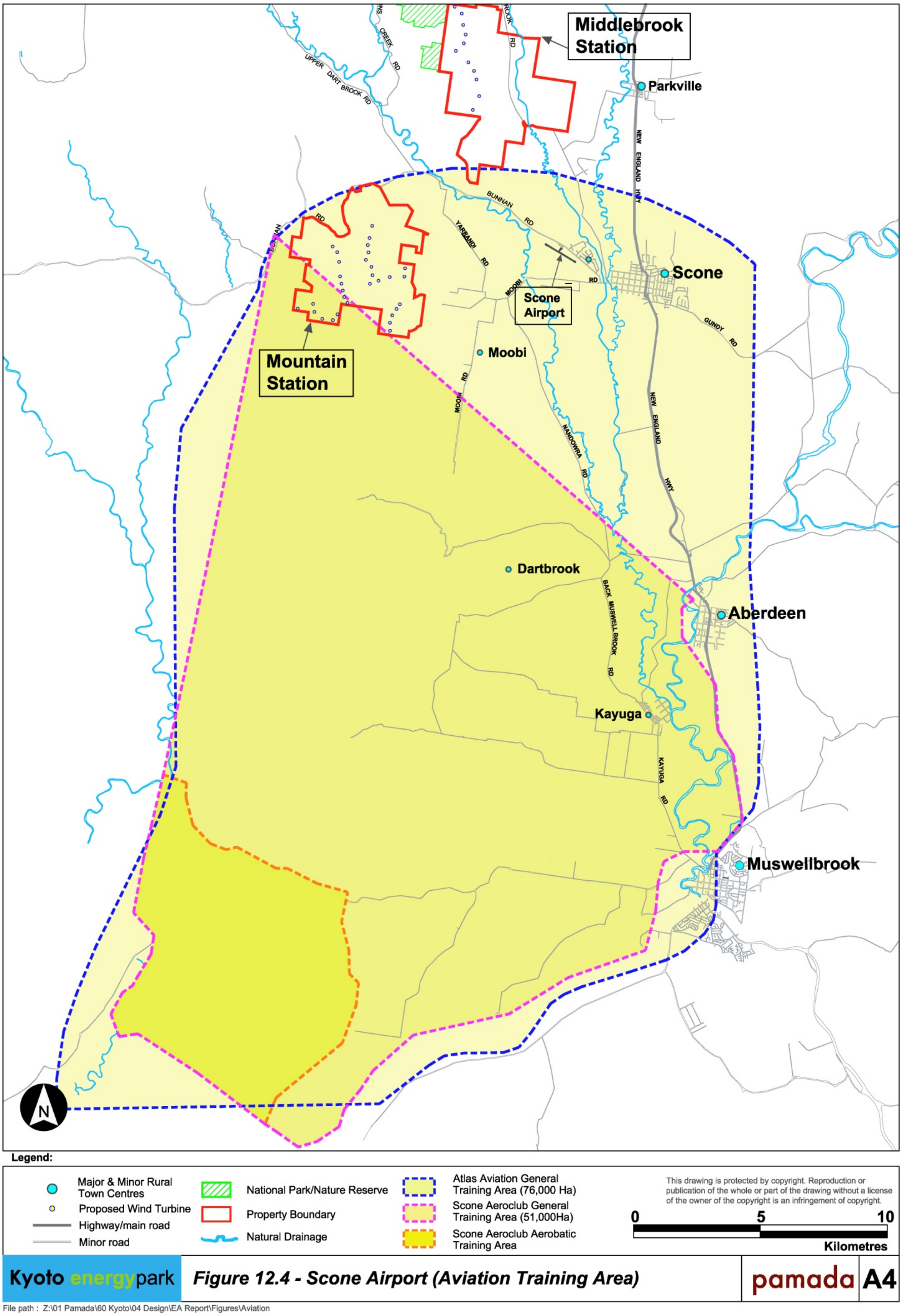

Figure 12.4 - Scone Airport (Aviation Training Area)

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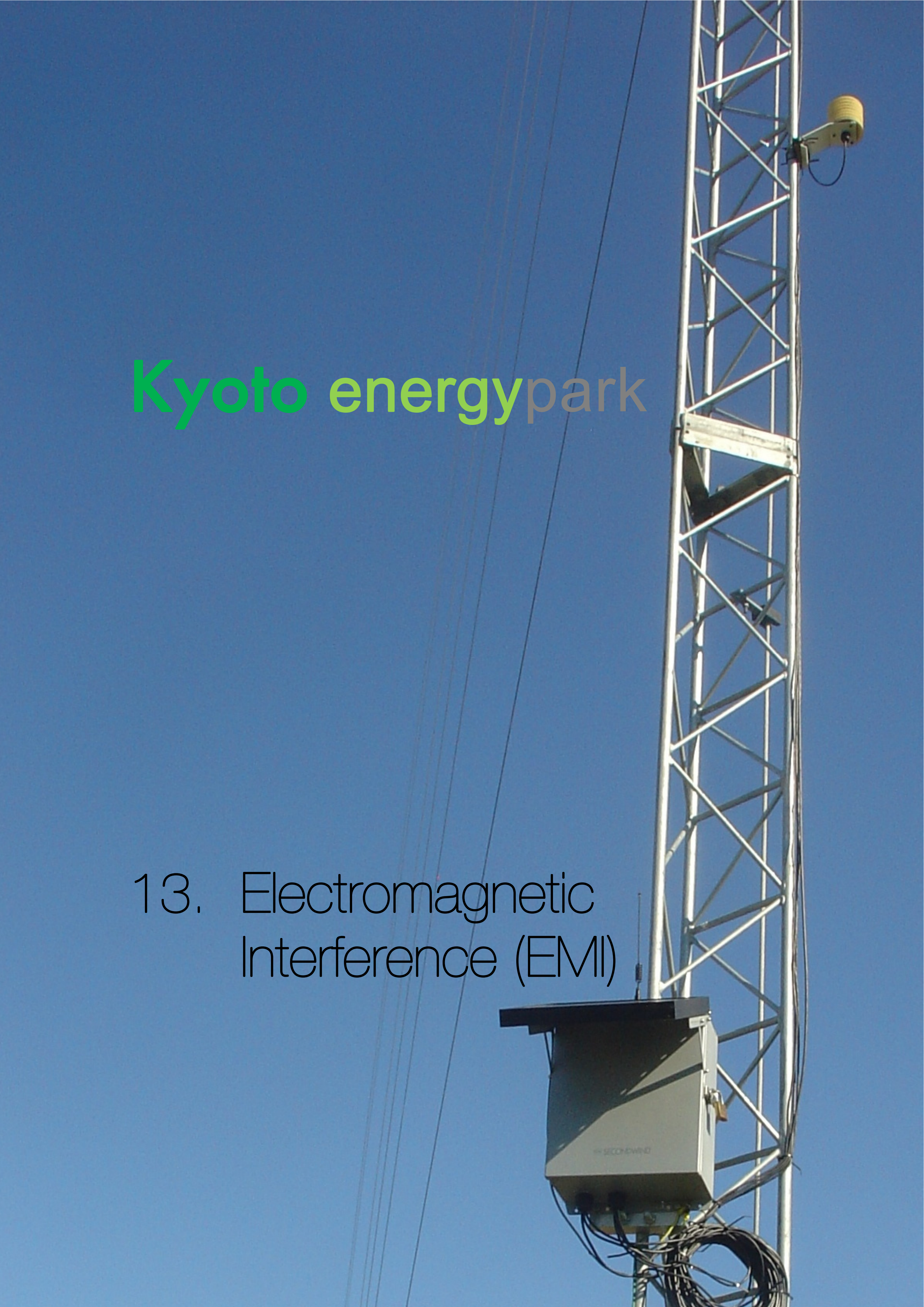

Kyoto energypark

13. Electromagnetic Interference (EMI)

13.0 ELECTROMAGNETIC INTERFERENCE (EMI)

13.1 Introduction

Garrad Hassan Pty Ltd were engaged by Pamada to undertake the Electro Magnetic Interference (EMI) assessment for the Kyoto Energy Park at Scone. A copy of the EMI assessment is contained within *Appendix F - Garrad Hassan Assessment of Environmental Issues Electromagnetic Interference (19 May 2008).*

Electromagnetic Interference from rotating wind turbine blades can potentially interfere with broadcast towers and transmission paths around the proposed Kyoto Energy Park sites. EMI can potentially occur between point to point signals (microwave signals), point to multipoint (radio communications towers) and point to area signals (analogue television). Other signals were also investigated including radio broadcasting, commercial and private mobile telephony.

In general VHF and UHF frequency band radio signals, and digital voice based technologies such as GSM and CDMA mobile, are essentially unaffected by a wind farm development. This includes land mobile repeaters, radio, the audio component of analogue television, and mobile phones.

13.2 Radio communications

The ACMA database identified a total of 91 radio-communication towers within a 50 km radius of the Kyoto Energy Park sites. Of these four (4) licenses were identified to the east of the sites at a distance of approximately 10km from the Kyoto Energy Park that potentially could be affected by the presence of wind turbines.

Two (2) of these licenses are owned by Telstra Corporation and the other two (2) owned by Energy Australia. Both of these owners were contacted by Garrad Hassan in writing and by email. Telstra confirmed that no impact to the licenses (including (CAN, IEN) radio systems, FRA system license, copper CAN cables, fibre IEN and Telstra mobile services in the region. No comments was received from Energy Australia despite many discussions.

Other radio communication licenses identified on the database and emergency service licenses will be contacted as part of the wider community consultation process, and essential and emergency service organisations be contacted, to minimise risks of conflict of the development with radio communications.

13.3 Microwave signals

Wind turbines can cause interference, or diffraction, of point to point signals. Microwave links (generally described as point to point) are used for line of sight connections for data, voice and video. However it is possible to design around this issue, as the path and interference zone of point to point signals can be calculated. The nearest transmission tower with fixed licences of Point to Point type is at least 1.7 km from proposed turbine locations.

The registered communications licences for each tower according to the ACMA database were analysed to determine the transmission paths of licences that may potentially experience interference from wind turbines. No links were found to pass over the Kyoto Energy Park sites with no associated impacts to microwave signals.

13.4 Television Interference

For analogue television broadcast signals (point to area) large scale interference can generally be avoided by placing the wind turbines at least 1 km from the broadcast tower. The nearest television broadcast tower is Rossgale Lookout and is located approximately 8.5 km to the south of Mountain Station.

Rossgale Lookout is a re-transmission source of both analogue and digital television signals that cover the Upper Hunter area. The regions where there may be the potential for television interference from the Rossgale Lookout transmission have been identified, and these are shown in Figure 13.0.

A preliminary assessment of residencies within the areas represented in Figure 13.0 would be undertaken prior to wind farm operation. As television interference from wind turbines is readily identifiable, appropriate mitigation measures (discussed below) can be readily taken if required. Should TV interference be observed after commissioning of the wind turbines, options for reinstatement of TV signals may include:;

- Pointing the householders TV antenna directly towards their existing transmitter;
- The installation of more directional and/or higher gain antenna at the affected residences;
- Relocating the antenna to a less affected position;
- The installation of a digital set top box (and UHF antenna if required);
- The installation of cable/satellite TV at the affected residences;
- Installation of a TV relay station.

A review at the most appropriate broadcast site (Rossgale Lookout) indicates that 4 free to air digital TV channels are available. Digital TV signals are essentially not interfered with by wind turbines.

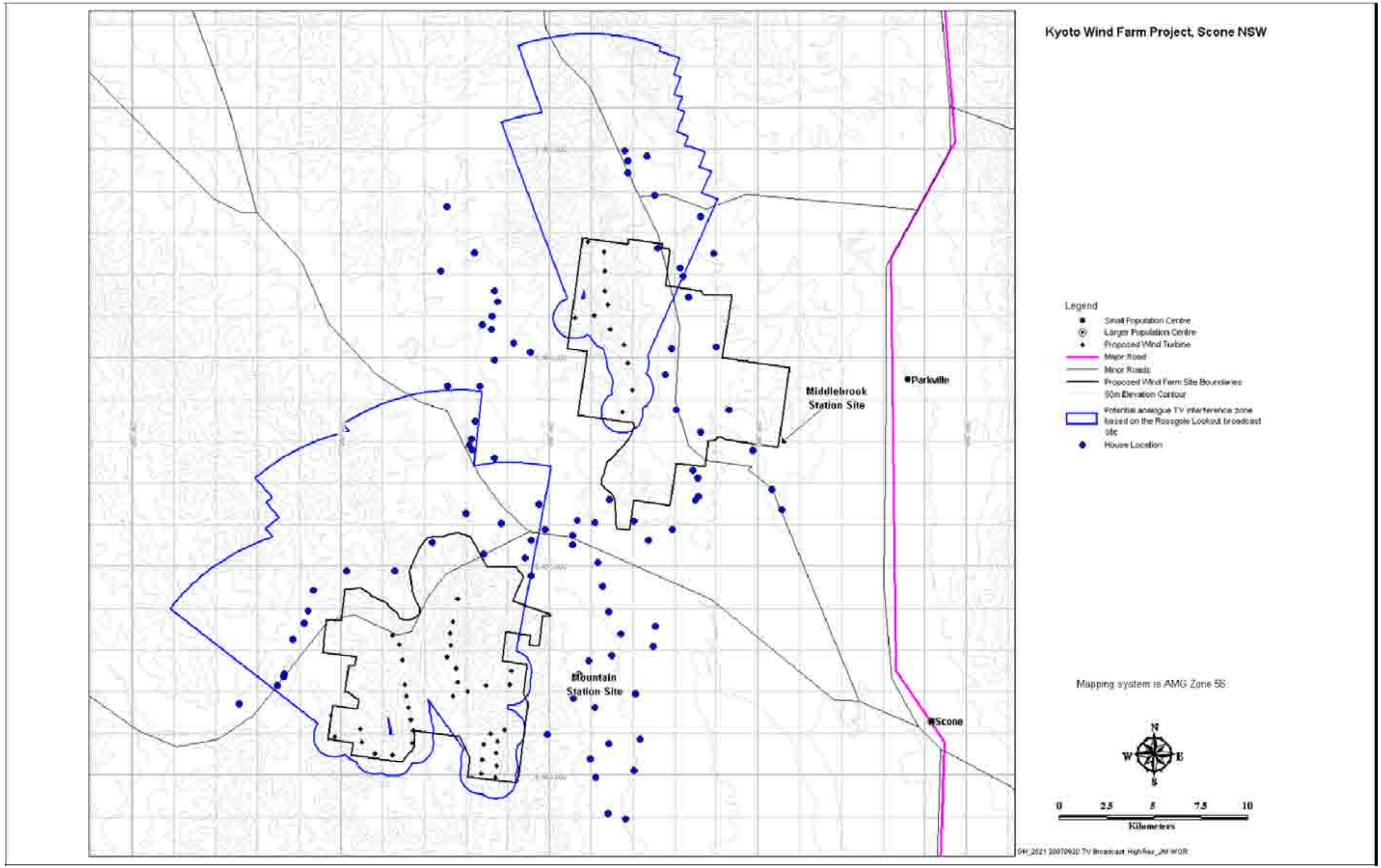

Figure 13.0 Potential TV interference zones surrounding the Kyoto Energy Park

13.5 Mobile telephones

A review of the ACMA database for other licences including radio broadcasting, commercial and private mobile telephony. These licences are generally not affected by the presence of wind turbines any more than other effects such as terrain, vegetation and other forms of signal obstruction. Should reception difficulty be encountered, the amelioration method consists of the user simply moving to receive a clearer signal.

13.6 Aviation and Defence Communications

The Department of Defence assessed the proposal for impacts upon the safety of military aircraft operations, associated defence communications and airfield surveillance radars. The Department advised that the Kyoto Energy Park proposal would have no impact on defence communication or radar installations.
Airservices Australia otherwise confirmed that the proposed Kyoto Energy Park wind turbines will not impact on Precision/Non-Precision Nav Aids, HF/VHF Communications, Cables, ASMGCS, Radar or Satellite/Links used in conjunction with the Scone local airport.

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14. Mineral Resource Sterilisation

14.0 MINERAL RESOURCE STERILISATION

A strategic assessment on the coal and gas mining potential in the Hunter Valley was undertaken by the Department of Planning in 2005. This Environmental Assessment uses information gained in the report as a background as well as information obtained from the Department of Mineral Resources.

In addition three exploration licenses were identified over the Kyoto Energy Park sites including Macquarie Energy, Sydney Gas and the NSW Department of Primary Industries (DPI). Details of the Kyoto Energy Park project were made to each party. No conflicts of interest with license holders were identified and no objections to the development were made. A summary of the outcomes of current exploration licenses over the subject sits is provided in Section 14.5.

14.1 Coal Resources

The Kyoto Energy Park proposal lies within an area that has potential for coal and gas (primarily coal seam gas) mining. The DGRs requirements identified the need to identify the presence of coal, gas and gravel resources and the impact upon mining potential and land sterilisation.

Coal resource potential refers to the actual coal located in layers beneath the surface of the ground, as opposed to coal mining potential which refers to the efficient and economical extraction of the resource.

The main factors which affect the coal resource potential of an area are:
- Depth of coal. The greater the depth of coal the more difficult and costly to extract.
- Thickness and continuity of the seams
- Quality of coal (eg presence of intrusions and non combustible material such as ash)

Other factors relate to coal mining potential and include:
- Resource of at least 15 years
- Transport infrastructure (eg heavy rail lines)
- Overlying topography of the area
- Suitable nearby port facilities
- Mine economics
- Environmental and Social considerations

Middlebrook Station was an area identified as having a limited potential for long term underground coal reserves. No areas have been yet identified as suitable for extraction. Future exploration activities would be required to fully assess potential. Exploration to date in the area were reported as ‘not been encouraging’, with developable underground coal resource unlikely based on the geological complexity of the strata in the area, overlying topography and considerable depth to coal seams.

Mountain Station was identified as having low foreseeable coal resource exploration potential based on high depth of coal seams, likely intrusions and limitations from the overlying topography.

14.2 Existing Coal mining in the area

At present there is only one underground coal mine in the vicinity of the Kyoto Energy Park. This is the Dartbrook mine located south-east of Mountain Station and approximately 5 km west of the Aberdeen township. The Dartbrook mine has recently closed due to finite resources but has potential for open cut mining in the future. Bickham mine is currently operating a test pit at South Bickham approximately 17 km north-east of the Middlebrook Station site. Bickham mine is currently proposing an open cut mine for extraction of coal. Further open cut mines are located south of Aberdeen and concentrated around the Muswellbrook and Singleton districts.

14.3 Coal Mining Potential

Coal reserves underlying the Mountain and Middlebrook Station sites are considered to have low coal mining potential as the seam is deep and potentially complex to extract. Assuming a suitable resource was encountered issues needed to be considered in extraction of the resource would include mine development economics, social and environmental considerations (noise, dust, traffic, groundwater impacts, mine subsidence) which would further restrict development. It is unlikely that the Kyoto Energy Park will have an impact on the development of this resource should it be considered in the long term.

The Upper Hunter Shire Council has generally resisted the inclusion of mines in the area however the demand for the resource has sent the inclusion of new areas for extraction. The Department of Planning 2005 study did not identify any new minable areas in the area for possible extraction in the Scone area for the next 15 years. This is an indication of the degree of difficulty in mining or extraction of the coal resource economically, as compared to other reserves at Bickham to the north and Dartbrook west of Aberdeen. The study indicated that coal seams in these areas were deep, complex and overlaid by landuse and topographical constraints. Any underground mining operation would require further extensive resource exploration prior to consideration of mining economics and development.

Based on these findings it is highly unlikely that underground coal mining would be considered on Mountain and Middlebrook Station in the short to medium term (i.e. <15 years) based on depth and complexity of suitable strata for mining, Both sites are outside existing mine subsidence areas as illustrated in Figure 14.0.

In consideration of the above factors the design of wind turbine foundations to consider future mine subsidence measures would not be warranted considering the limitations to the resource under the sites (especially Mountain Station), depths and complexity of strata, timeframes for future extraction should it be considered and economically feasibility of designing foundations for unforeseeable events.

14.4 Gas Resources

Methane gas produced during the formation of black coal can become trapped within the coal seam and is referred to as coal seam gas. Shallow black coal seams (generally les than 250 metre depth) have little on no potential gas resource capacity. As the coal seam is deep under the Mountain and Middlebrook sites there is a potential for deep coal seam gas reserves.

The **Middlebrook Station** site has a potential for long term gas reserves, however gas exploration activities to date have not recoded any intersections to date (DOP 2005).

The **Mountain Station** area contains coal seams which may include long term gas potential.

The Department of Mineral Resources were contacted in March 2007 to determine if there were any:

- current or future mining leases;
- mineral claims;
- current and a future exploration licenses

within the vicinity of the Kyoto Energy Park. The results of the search, followed up by verbal confirmation with representatives from NSW Department of Primary Industry (DPI) indicated that there were no existing or future mining leases, mineral leases and mineral claims applied to the site and immediate vicinity.

A total of three exploration licenses given by the DPI were found to exist over the two sites. The licence, term and its holder are presented below in Table 14.0.

Table 14.0 Existing Exploration Licenses over Middlebrook and Mountain Stations

Application/ Title No.	Term	Applicant/Holder and Address
Coal Exploration Licence Authorisation AUTH-286-1973	2/04/2006 – 2/04/2011	Director General NSW Dept of Primary Industry on behalf The Crown PO BOX 344 HUNTER REGION MAIL CENTRE NSW 2310
Petroleum Exploration Licence PEL-4-1991	RENEWAL PENDING	Sydney Gas Operations Pty Ltd Level 11 1 O'Connell Street SYDNEY NSW 2000
Petroleum Exploration Licence Petroleum Special Prosp Auth Appn (91 Act) 15 Petroleum (Onshore) ACT 1991	PENDING	Macquarie Energy Pty Ltd Level 7, Suite 708 33 Bligh Street SYDNEY NSW 2000

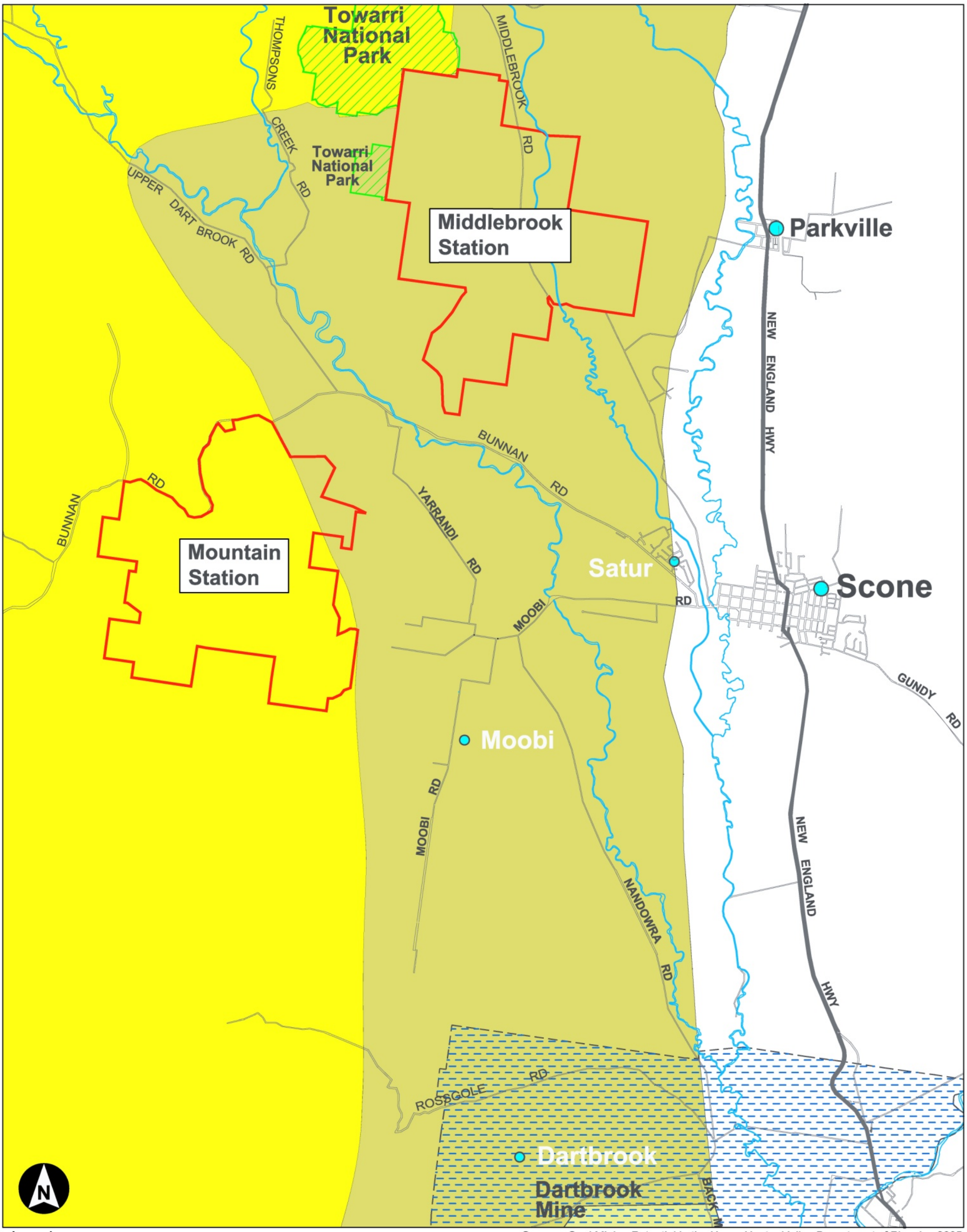
The Department of Primary Industry currently has a Coal Exploration license over the sites until 2011. Verbal confirmation was received from a representative of the DPI that no impacts to this license were identifiable.

Sydney Gas Operations Pty Ltd currently has a Petroleum Exploration Licence (No. PEL-4-1991) over the subject properties with a renewal pending.

Macquarie Energy Pty Ltd currently has a Petroleum Exploration Licence (PEL 456) over the subject sites with a renewal pending.

Both Sydney Gas and Macquarie Energy were contacted regarding there existing exploration licenses over the two properties. Both companies were provided with specific details of the project, location of components and physical dimensions of components and facilities. Both companies were asked to advise as to whether the Kyoto Energy Park proposal would have any foreseeable impact upon their existing and future exploration activities under their separate licenses .

Both companies advised that exploration activities mainly consisted of the use of a drill rig for core sampling and drilling operations at lower elevations closer to resource depth. Both Sydney Gas Operations Pty Ltd and Macquarie Energy Pty Ltd advised in writing that they had no objection to the Kyoto Energy Park proposal.



Legend:

Source: *Coal Mining Potential in the Upper Hunter Valley Department of Planning 2005*

Kyoto energypark | *Figure 14.0 - Mineral Resource Sterilisation* | pamada | A4

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14.6 Gravel and Rock Resources

An existing ridge gravel and road base quarry is located on the Middlebrook Station site which supplies RTA spec road base and gravel to the local and regional areas. The quarry is owned by Clifford Quarries who own and operate a lease over Portion 126/127 on Middlebrook Station for extraction and dry screening until 2012. A dry screening plant is also located on the site. Extracting activities are currently occurring on Portion 127 while rehabilitation activities are currently being undertaken on Portion 126.

The quarry is a dry screening operation on an alluvial clayey gravel deposit located west of the main ridgeline. This is an open cut operation, with no underground consents. Consent was granted for the quarry by the Scone Shire Council. There is an option to source gravel material from the quarry for use in the construction, concrete batching and upgrading of the access tracks.

Clifford Quarries also operate the Braeside Quarry which is 26 km north of Scone. This quarry supplies blended products including washed sands and concrete aggregates which may be used for the concrete construction activities on site.

14.7 Conclusion

Mountain Station was identified as having no foreseeable coal mining potential based on high depth of coal seams, likely intrusions and limitations from the overlying topography. The Mountain Station site does contain coal seams which may include coal seam gas potential. There are no identifiable gravel resources present within the Mountain Station site.

Middlebrook Station was identified as having reserves that potentially could be considered for the long term underground coal reserves, however resource is unlikely based on the geological complexity of the strata in the area. Exploration activities have not recorded any gas intersections to date.

The Department of Planning 2005 study did not identify any minable areas in the area for possible coal extraction in the next 15 years. This is an indication of the degree of difficulty in mining or extraction of the coal resource economically, as compared to other locations at Bickham and Dartbrook in the Upper Hunter LGA.

Other issues needed to be considered in extraction of the resource would include mine development economics, social and environmental considerations (noise, dust, traffic, groundwater impacts, mine subsidence) which would likely restrict development of this resource in close proximity to Scone.

Existing extraction licenses were researched over the subject sites. The results of the search, followed up by verbal confirmation with representatives from NSW Department of Primary Industry (DPI) indicated that there are no mineral leases and mineral claims applied to the proposed area.

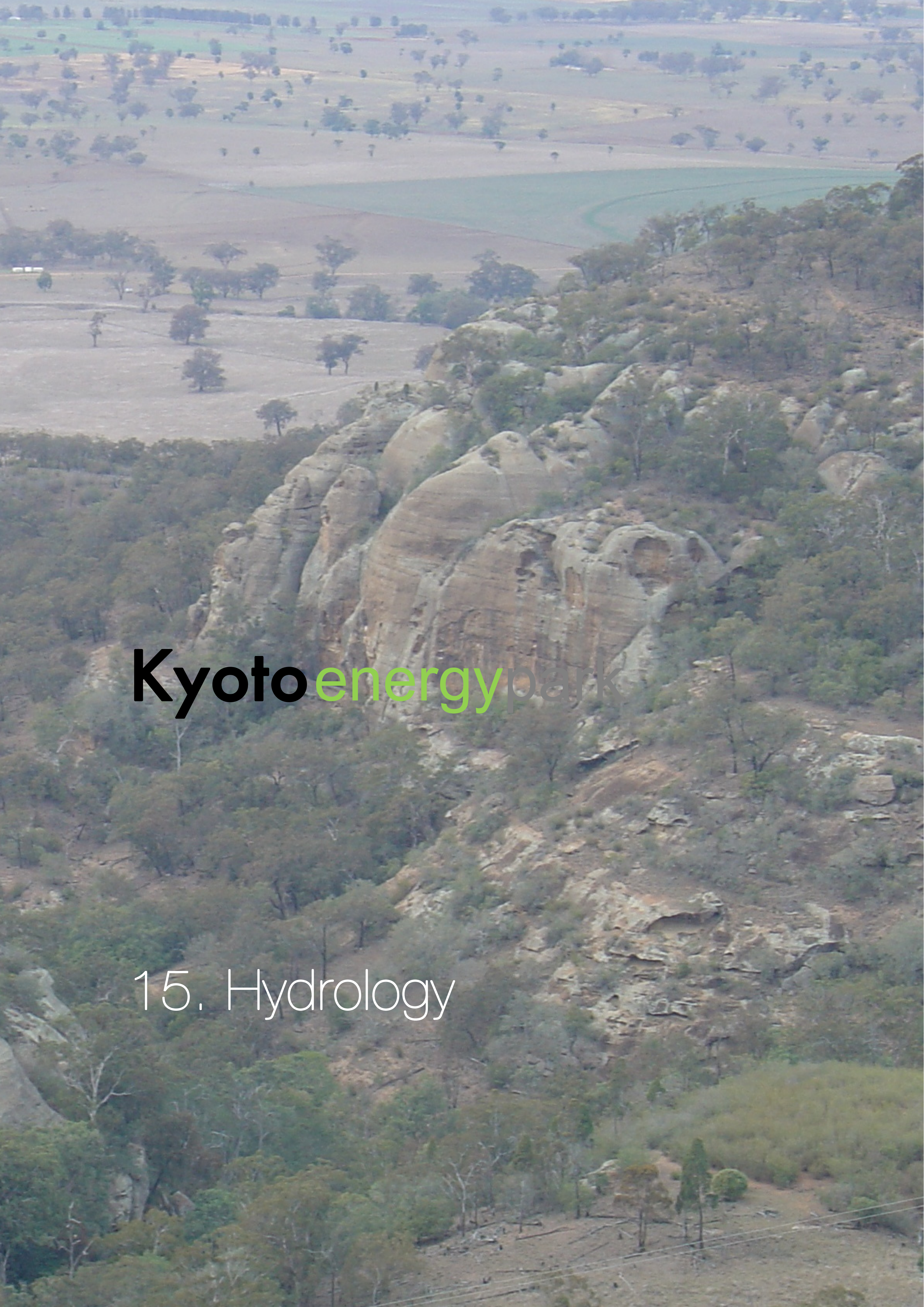
Three (3) exploration licenses given by NSW Department of Primary Industry (DPI), were identified.

The Department of Primary Industry currently has a Coal Exploration license over the sites until 2011. Verbal confirmation was received from a representative of the DPI that no impacts to this license were identifiable. The DPI requested that Pamada consult with other license holders.

Sydney Gas Operations Pty Ltd currently has a Petroleum Exploration Licence (No. PEL-4-1991) over the subject properties with a renewal pending, but has advised there is no objection to the Kyoto Energy Park proposal.

Macquarie Energy Pty Ltd currently has a Petroleum Exploration Licence (PEL 456) over the subject sites with a renewal pending, but has advised they do not foresee any conflicts with any future exploration works.

There is currently a gravel quarry operating on Middlebrook Station. The quarry is a dry screening operation on an alluvial clayey gravel deposit located west of the main ridgeline. It is an open cut operation, with no underground consents.



15. Hydrology

15.0 HYDROLOGY

15.1 Surface Water Hydrology

The topography of the Upper Hunter Valley ranges from rugged with slopes greater than 30% to gentle river flats and plateaus with slopes less than 3%. Drainage patterns are determined by this topography.

The Upper Hunter area is located within the catchment of the Hunter River and its tributaries. The Hunter is the major river of the Hunter Valley used for a wide range of uses including urban water supply, power generation, and industrial and agricultural use.

The Dartbrook/Kingdon Ponds catchment is situated in the northwest of the Hunter catchment originating in the in the Liverpool Ranges flowing in a southerly direction to join the Hunter River south of Aberdeen. The Dartbrook/Kingdon Ponds catchment can be further subdivided into the Dartbrook, Kingdon Ponds and Middlebrook sub catchments associated with each respective tributary.

The streams of the Dartbrook catchment are highly connected to the alluvial aquifer system with the recharge rate of the aquifer largely dependent on stream flows. There are a total of 66 registered water licenses within the Dartbrook/Kingdon Ponds River Catchment. Most of these are located directly on the main alluvial aquifer system along the tributaries as shown in Figure 15.0.

Middlebrook Station is wholly located in the Dartbrook catchment. Middlebrook Creek dissects the Middlebrook Station site and is located east of the Middlebrook road away from the main ridgelines and proposed works. There are no other major streams or creeks within either the Middlebrook or Mountain Station properties. Numerous secondary and tertiary drainage depressions run form the upper slopes of the main ridgelines. These slopes are generally either well grassed or vegetated but are eroded in sections which make them highly susceptible to erosion. Erosion and sedimentation controls will be used to prevent and control soil erosion around works areas and along access tracks constructions.

The majority of the Mountain Station site is located within the Dartbrook Catchment which drains to the Dartbrook Creek to the east. The western portion of the site is situated within the Wybong catchment, which drains to the Wybong Creek to the west. Given the site location on elevated ridgelines overlooking the Hunter Valley, the hydrology of the site is primarily confined to a number of first and second order drainage depressions which originate on site. Erosion and sedimentation works will be adopted to prevent and control erosion around works areas and access tracks.

15.2 Groundwater Resources

The Kingdon Ponds/Dartbrook alluvial aquifer system is the major fresh groundwater resource in the area and exists along major river and creek tributaries (Dartbrook Creek, Middlebrook Creek) as shown in Figure 15.0.

The main recharging mechanism for the alluvial aquifer system is from high rainfall periods originating in the mountainous ranges of the Upper Catchment at some distance from the Kyoto Energy Park sites. Local rainfall events contribute to a lesser extent to stream levels and recharge rates of the aquifer.

15.2.1 Impacts on Groundwater

No registered bores are located on the Mountain Station property. A number of registered bores are located within Middlebrook Station site along alluvial deposits of the creek bed. No water resources shall be sourced from on site bores during construction or operational stages of the development.

Operational water requirements for generators and general operations including amenities are contained within Section 6.6.5. Water for on-site amenities will be sourced from rooftop runoff and stored in water tanks. Surplus water and backup water for emergency services will be trucked in by a water tanker and is considered to be negligible. Additional potable water will be sourced from public registered bores located nearby to the Scone town.

Water for operational dust suppression shall be sourced from existing farm dams during early stages of operations and during road maintenance. This is likely to be minimal and well below the existing maximum harvestable right dam capacity (MHRDC) for these dams. Dams are not licensed as they were constructed prior to 1999. Water for dust suppression would be phased out as roads and disturbed areas are consolidated and rehabilitated over the sites.

Groundwater is unlikely to be encountered during the proposed works which includes construction of wind turbine foundations along the ridgelines. This is mainly due to the elevation of the ridgeline and distance from the hardrock and alluvial groundwater resources (see Figure 15.0 and 15.1). Drilling and grouting of rock anchors used for turbine footings would be in the order of 20-30 metres below ground surface level however final depth would be determined based on engineering design. No groundwater is expected to be encountered nor are any impacts to any groundwater systems as identified expected or likely.

Wind turbine foundations would be designed prior to construction based on detailed geotechnical investigation, and would be either gravity based or reinforced anchored type design. The maximum excavation depth for concrete footings would be in the order of 3-5 metres below ground surface level. Rocks anchors (used in reinforced anchor design) would be drilled into rock foundations below this. Footings are sited on elevated points along the ridgeline and it is unlikely that groundwater would be encountered.

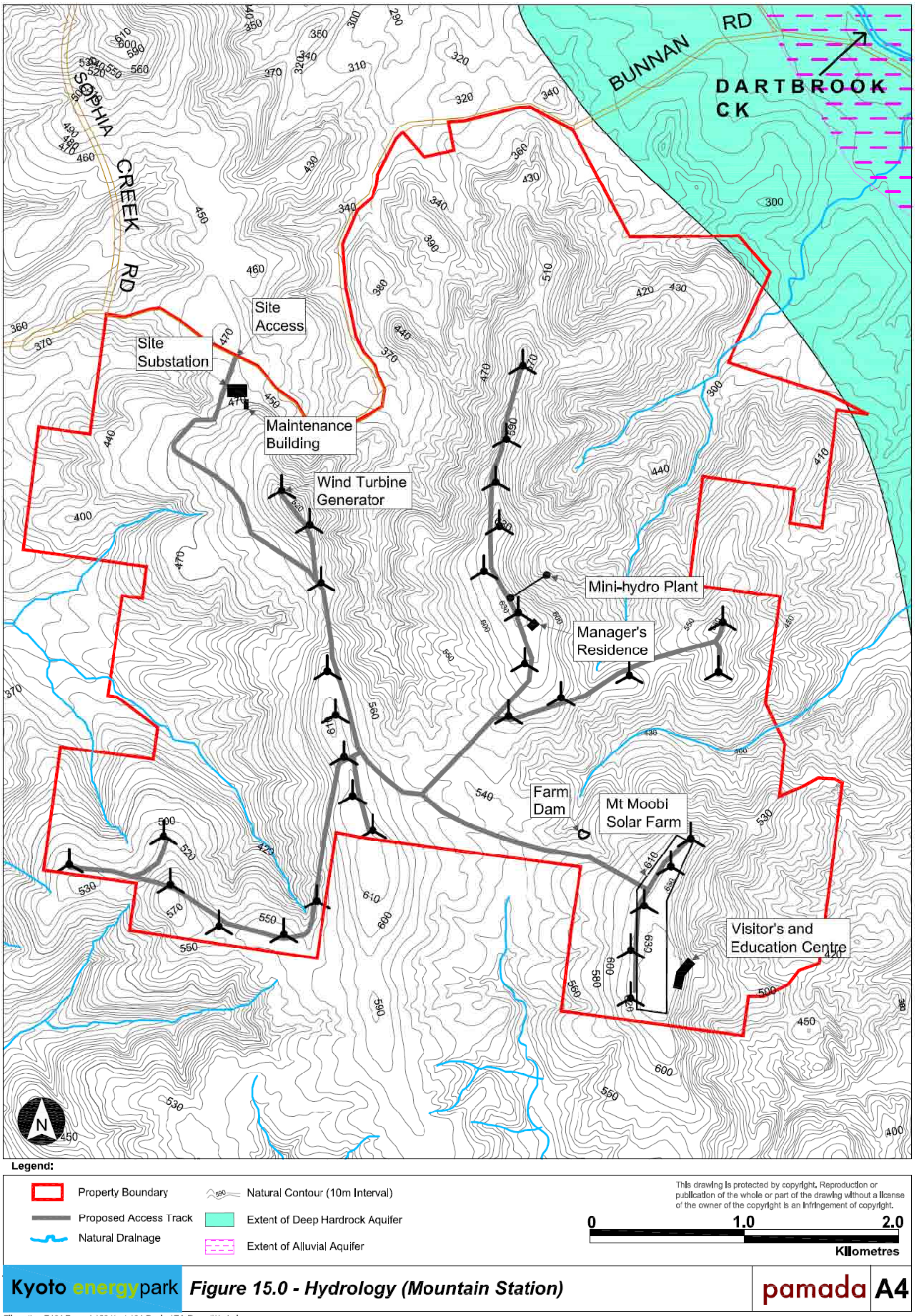


Figure 15.0 - Hydrology (Mountain Station)

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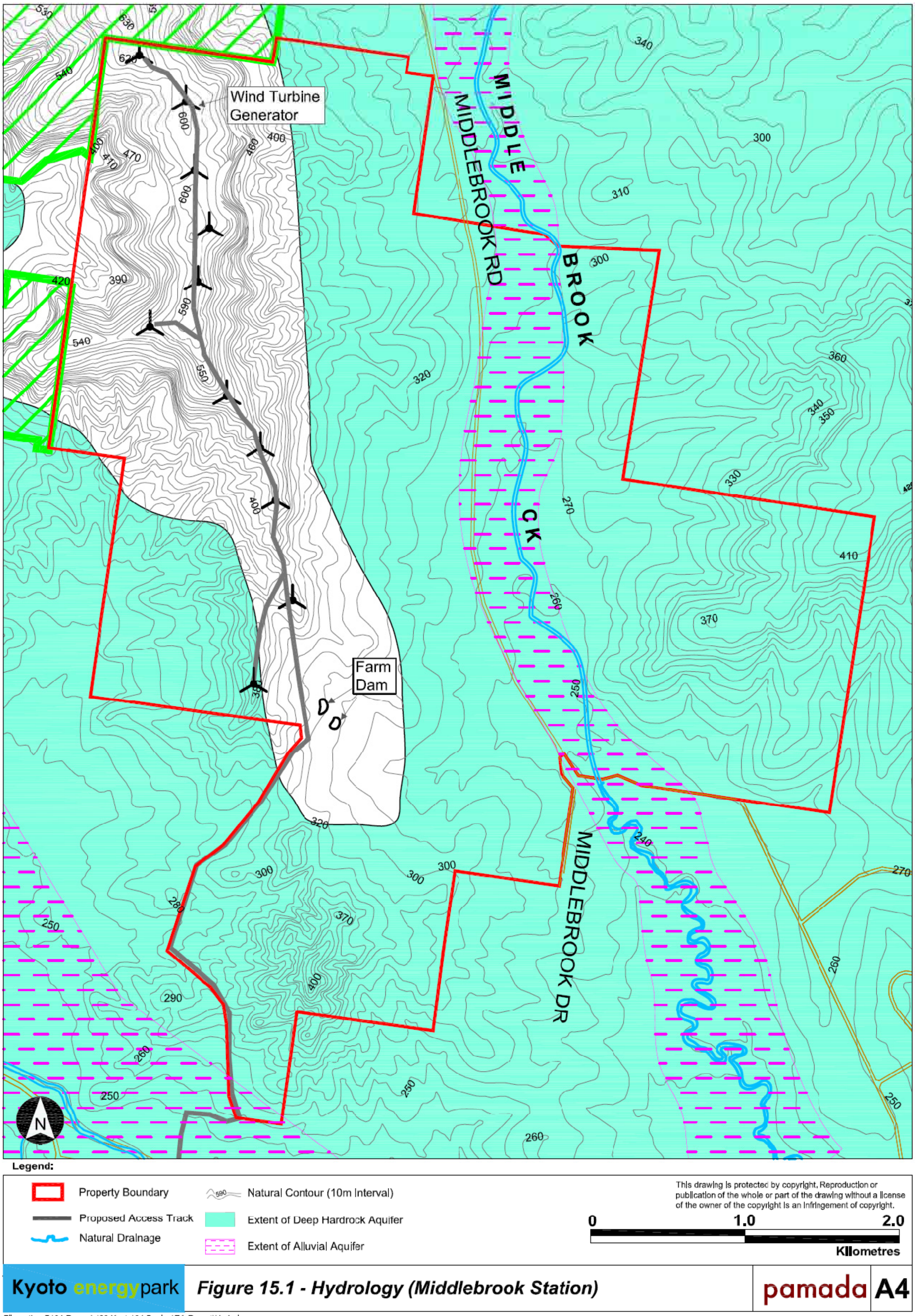

Figure 15.1 - Hydrology (Middlebrook Station)

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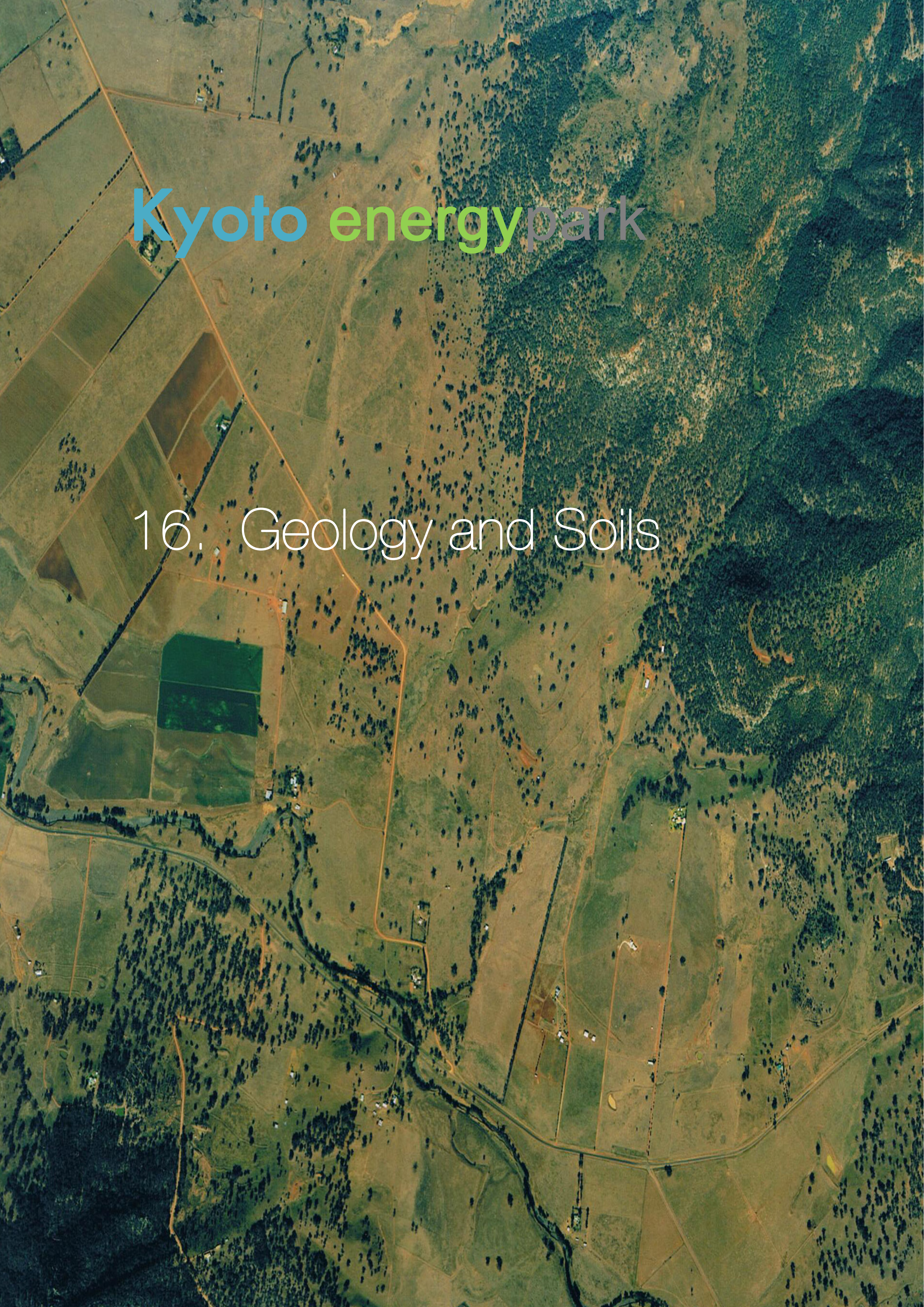
16. Geology and Soils



16.0 GEOLOGY AND SOILS

This component of the Environmental Assessment was undertaken with the assistance of the Department of Land and Water Conservation and the Department of Natural Resources. HDB Town Planning Pty Ltd initially completed a desktop survey and an inspection to clarify soil and geology profiles for both sites.

16.1 Geology

Carboniferous and Devonian sediments form the rolling hills and lower slopes immediately to the west and east of the New England Highway at Scone. These include the coal bearing Singleton measures. Jurassic sediments, predominately sandstone and shale form the steeper ground of Mt Moobi Plateau (Mountain Station).

Tertiary basalts overlie much of the higher ground including the underlying basalt rock on both sites. Quaternary alluvium and colluvium sediments occur under the river floodplain forming the valley floor.

The Middlebrook Station site is underlain by:

- The Permian aged Singleton Coal Measures Group; and
- The Cainozoic Aged Quaternary Group.

The Mountain Station site is underlain by:

- Cainozoic Aged Tertiary Group;
- Triastic Aged Narrabeen Group; and
- Permian Aged Singleton Coal Measures Group.

The site area is also edged by the Cainozoic Aged Quaternary Group, generally comprising gravel, sand, silt and clay.

16.2 Soils

Early intensive cultivation of the area has resulted in widespread sheet, rill and gully erosion in many areas. Past farming practices have caused substantial increases in catchment runoff and gully erosion, which occurs along most major drainage lines. Heavy stocking rates in the early days of settlement, has caused widespread sheet and rill erosion on the poorer soils in the Parkville Valley, which are susceptible to erosion and topsoil degradation. In these areas, ground cover is severely reduced, soil organic matter and infiltration are low, and topsoils are hardsetting. The highly aggregated black soils on basalt of the Merriwa Plateau are very susceptible to gully erosion risk. While these soils are well-structured, concentrated flows can easily dislodge individual pads, causing the profile to erode like sand.

The sites of the proposed Kyoto Energy Park are located at the junction of the Merriwa Plateau and Parkville Valley physiographic regions.

The Merriwa Plateau terrain is Tertiary basalt overlaying Triassic sediments. This terrain includes the hills, mountains, fans and occasional foot slopes. The Merriwa Plateau is characterised by rich dark Vertisols with a uniform profile of well structured clay soil which is generally black, dark red or dark brown in colour. They are reasonably fertile soils and generally do not have trace element deficiencies. Black earths show considerable erodibility if poorly managed even on gentle to moderate slopes. The Merriwa Plateau physiographic region includes, Cranbourne (ce), Erin (er), Tinagroo (tg) and Wingen Maid (wx) soil landscapes.

The Euchrozem group of soils also occur on the slopes to the west and east of the New England Highway. Euchrozems are gradational red and red brown clay soils grading from a clay loam or light clay to medium textured at depth. They are moderately fertile and the erodibility of these soils is highly variable, reflecting the complexities of the underlying geology. Under pasture they are considered stable but may be subject to severe erosion when exposed if adequate soil conservation measures are not employed.

Solodic soils are also associated with the hilly and rugged land. These soils are red in well drained locations and yellow where the water table is high. They have low fertility and are highly susceptible to erosion when disturbed.

The Wingen Maid soil type on the slopes and steep land contains acid soils of low plant available waterholding capacity, stoniness and high permeability, localised high organic matter content and hardsetting surfaces. It is characterised by steep slopes, rock outcrops, high rockfall hazard, mass movement hazard, high runoff, shallow soils and engineering hazards. On the lower slopes it has localised high run-on, high erosion risk and non-cohesive soils.

The Parkville Valley terrain consists of undulating to rolling hills, foot slopes and drainage plains on Permiam marine sediments. The alluvial soils of the flood plain and lower reaches of the Hunter River and its tributaries occur as a result of sedimentations from still or moving water. These sediments range from fine and medium textured soils to gravels in the upper reaches of the creeks. In general, these alluvial soils are fertile. The erosion potential is low due to the low gradients on which the soils are developed. However, where sodic or unstable subsoils are exposed, such as in the Parkville Valley, moderate and active gully erosion occurs. The Parkville Valley physiographic region includes, Parkville (pv), Tinagroo (tg) and Thomsons Creek (tc) soil landscapes.

Parkville Valley soils on the floodplain and low lying areas, when disturbed, are also susceptible to erosion and topsoil degradation. In these areas, ground cover is severely reduced, soil organic matter and infiltration are low, and topsoils are hardsetting.

The soil landscapes of the Merriwa Plateau and Parkville Valley area are defined in Table 16.0.

Table 16.0 – Kyoto Energy Park Soil Landscapes

Underlying Geology	Soil Landscape Name	Defining Landform Features
Tertiary – Basalt (Tc, Tb)	Cranbourne (ce)	Level to undulating plateau and broad benches of the Merriwa Plateau.
Triassic – Narabeen Group, lithic and quartz-lithic sandstones and conglomerate (RN, Rnd, Rns)	Erin (er) Wingen Maid (wx)	Long foot slopes of the Merriwa Plateau rugged steep to very steep (25% - 80%) hills. Steep benched sideslopes with cliffs, broken scarps and boulders.
Quaternary – Alluvium (Qa)	Thompson's Creek (Tc)	Floodplains draining the Merriwa Plateau and Parkville lowlands.

16.2.1 General Soil Qualities and Limitations

Soil qualities and soil limitations are properties that can be assessed on an individual soil basis. They can affect the viability and sustainability of land uses proposed for them.

Final design of all structures and buildings will include provisions for soil testing and analysis of the various soil types that occur over the two sites. This will include presence of engineering hazards, subsurface testing, presence of acid sulphate soils and soil testing and analysis.

The soils limitation analysis for the dominant soil types are presented in Table 16.1

The table below indicates that only a portion of the Parkville soils, are highly erodable and that the Wingen Maid soil is not.

The highly aggregated black soils on basalt are very susceptible to gully erosion risk. While these soils are well-structured, concentrated flows can easily dislodge individual pads, causing the profile to erode like sand. Where sodic or unstable subsoils are exposed moderate and active gully erosion can occur.

Steep slopes and rock outcrops are susceptible to high rockfall hazard, mass movement hazard, high runoff, shallow soils and engineering hazards.

Localised high run-on (on the lower slopes) can also present high erosion risk and non-cohesive soils. The amount of weathering and fracturing of the substrate has major effects on site stability, water movement and plant growth. Rock outcrops and boulders can impede excavations, construction work, access and water runoff from the site, and also reduce the site's capacity for effluent disposal.

Typically, the movement of heavy vehicles and equipment on site can be a cause of major soil disturbance, and methods including restricting movement over non-essential areas; use of broad or multiple tyres or bulldozer type tracks which spread weight over a larger surface area can assist in minimising the areas of disturbance.

Table 16.1 Kyoto Energy Park Soils Limitation Analysis

Soil Limitations Analysis

Soil Material Code	High Plasticity	Low Wet Bearing Strength	High Shrink Swell	Organic Matter	Stoniness	Sodicity/Dispersion	High Erodibility	Hardsetting Surfaces	Permeability – High	Permeability – Low	Acidity	Alkalinity	Salinity	Low Fertility	Low Plant Available Waterholding Capacity
Parkville															
pv1				L	L	L		W	L		W				L
pv2					W	L	W				L		L		L
pv3			L		L	W				W			L	L	
pv4						W				W					
Wingen Maid				W	L			L	W		W			W	L
wx1					W				L		L			W	W
wx2															

W = Widespread occurrence; L = Localised occurrence

16.3 Excavation works

Foundation works would require excavation of topsoil and rock material for construction of:

- Foundations for wind turbines and solar frames;
- Slab construction for all facilities;
- Site works, access tracks, trenches and hardstand areas

Wind Turbine Foundations

The site inspection and geological analysis suggest that conditions are suitable to support large wind turbine structures. Based on visual inspection of the site, footings would occur along the ridges and plateaus where the presence of underlying basalts exist which are capable of supporting the turbine footings. Turbine footings would be either gravity or reinforced anchored design based on final design parameters including geotechnical strength of the underlying fractured rock. Final sizing and dimensions of the footings would be subject to a detailed geotechnical investigation and design.

Slab constructions

The depth of the substation foundation will be based on the overall bearing strength of the subsurface material, which will be determined during final design stages of the project. The overall depth of footing will be less than 1m below final design surface level of the substation slab.

The nature of the geology and soils characteristic of the sites are suitable to allow any ancillary works associated with the project. Any local variations to soil and geology can be allowed for in the design of individual footings. Slabs for building facilities will be sized during final design of the building structures.

Access Tracks, trenches and hardstand areas

Road base material sourced in the locality may be used to prepare subgrade foundations, strengthen existing access tracks, and hardstand areas for erection of components. The use of compacted road base material will provide all weather access, minimise maintenance and reduce erosion potential. Erosion and Sedimentation measure will also be adopted to satisfy design requirements.

Trench construction would be staged to avoid fouling the trench but also to reduce potential for sedimentation especially on slopes.

16.4 Erosion and Sedimentation Risks and Mitigation Measures

The differing soil types that occur on site range in erosion potential from low, to very high as defined in the Soils Limitations Analysis. As such, managing potential erosion and associated landform stability and sediment mobilization impacts are serious issues during the construction and decommissioning phase. Soil compaction and soil erosion are likely to occur during all excavation works, upgrading to access tracks and the transport of road base and machinery. There is also a risk of potential soil contamination from the use of hydrocarbon fuels and toilet facilities during construction of the turbines.

Impacts of the proposal to the local soils and landforms are considered manageable. Soil testing during final design stages for the sites will aid in the design and planning of proper erosion and sediment control measures for protection of exposed works areas. Analysis of soil profiles for the sites will aid in the design and planning of proper erosion and sediment control measures for protection of exposed works areas.

Pamada's Statement of Commitments identifies the need for a detailed Construction Environmental Management Plan (CEMP) and an Operations Environmental Management Plan (OEMP) in relation to ongoing maintenance, monitoring and remediation works. Pamada is committed to ensuring that all works involving disturbance of the ground will be undertaken in accordance with best practice guidelines to ensure the minimum disturbance of the soil surface and appropriate sedimentation and erosion controls are put in place.

Mitigation strategies that would be employed during construction to manage the potential for adverse environmental impacts are outlined below.

Erosion and sediment control measures are aimed at minimizing the area and length of time soil is exposed to erosion and provision for the collection and containment of sediment. Erosion and Sedimentation risks have been identified in Table 16.2 with best practice mitigation measures for soils as defined.

Table 16.2 Kyoto Energy Park – Erosion and Sedimentation Risks and Measures

Erosion & Sed^{m} Risks	Project Stages				Mitigation Measures
	Final Design	Construction	Operation	De-commissioning	
Protect drainage lines and gullies		✓	✓		• Install sediment structures along drainage lines to limit sediment loss from works areas and avoid potential downslope contamination • Maintain soil stockpiles away from drainage lines and depressions. • Erosion and sedimentation structures shall be used around stockpiles and works areas (e.g. silt fencing)
Stabilise works area		✓	✓		• Minimize exposed works areas. • Access routes and tracks would be confined to already disturbed areas, where possible. • Disturbance of soil and vegetation should be kept to a minimum. • All completed works areas are to stabilized and restored
Erosion control measures ***Erosion control measures (cont)***	✓	✓	✓	✓	Erosion control measures shall include: • ***Site management practices*** - o appropriate scheduling of construction sequence and erosion control measures o restriction of access to non-essential areas o monitoring and maintenance of erosion control measures o use of broad or multiple tyres or bulldozer type tracks which spread weight over a larger surface area can also assist in minimising the areas of disturbance. • ***Diversion banks and channels*** – these intercept and divert “clean” run-on water away from disturbed ground and dispose of it safely below the site. Perimeter banks are low temporary structures, which may be used on small scale operations; • ***Graded banks and channels*** – these are designed to intercept and direct sediment-laden runoff from within the disturbed site to an appropriate sediment basin or trap. They also reduce the effective length of slope and hence, the velocity and erosive power of the water flow; • ***Cross banks and drains*** – as above, but are applied to small disturbed sites such as across unsealed tacks; • ***Vegetation and other ground cover*** – these serve to shield soil from erosive water (and wind) impacts; reduce the velocity and erosive power of water (and air) flow, and reduce the volume of water runoff by intercepting rainwater and improving soil permeability. The cover may be temporary or permanent. Temporary cover provides short-term stabilization over sites with high erosion hazard, where subsequent reworking will be necessary (e.g., on soil stockpiles) or prior to the establishment of permanent vegetation.

Erosion & Sed^m Risks	Project Stages Final Design	 Construction	 Operation	 De-commissioning	Mitigation Measures
					• ***Channel flow control structures*** – these structures are designed to reduce the velocity and erosive power of water flow within a channel or waterway. They include ○ check dams (to obstruct normal flow) ○ rough channel linings ○ grade stabilizing structures ○ outlet protection structures such as outfall aprons ○ stormwater detention basins (which serve to temporarily store and delay stormwater runoff ○ level spreader outlets (designed to convert channel flow into less erosive sheet flow) • Stockpiles generated as a result of construction activities would be bunded with silt fencing, (hay bales or similar) to reduce the potential for runoff from these areas.
Sedimentation control measures	✓	✓	✓	✓	• Sediment control involves the interception and retention of eroded soil material on-site, preventing its release to off-site areas. The most important strategy in sediment control is the implementation of effective erosion control measures. • Manage water flow onto and through the site. Control measures aim to reduce the flow volume, control the flow path and reduce flow velocity. • Sedimentation structures including • ***Sediment basins*** – special dams with water outlets at their base designed to intercept large volumes of sediment laden runoff from a site, typically receiving waters from channels and waterways. Suspended soil material settles out of the water and is periodically removed. • ***Sediment traps*** – generally, small temporary structures used in small catchments to trap sediment runoff before it enters stormwater pipes or channels. They require regular clean out of sediment; • ***Sediment filters*** – these function by intercepting and filtering out sediment from small volumes of water flow, which is generally in the form of sheet flow rather than concentrated flow.
Dust suppression		✓		✓	• Utilise local road base material to strengthen existing access tracks, provide all weather access, minimal maintenance and reduce erodibility. • Dust suppression of all exposed works areas with water truck
Revegetation works		✓	✓		Revegetation of disturbed areas as soon as possible upon completion of works; • Site clearing and topsoil handling – clearing and disturbance to existing vegetation should be kept to a minimum. For parts of the site undergoing greatest disturbance, the stripping and appropriate stockpiling of topsoil should be undertaken. Stockpiles

Erosion & Sedm Risks	Project Stages: Final Design	Construction	Operation	De-commissioning	Mitigation Measures
					must be adequately protected from wind and water erosion. • Plant species selection – should be made on the basis of whether temporary or long-term cover is required, the climate and soil conditions of the site, the season of growth (e.g., spring or summer), the availability of plant seed or seedlings and ecological considerations. For permanent long-term vegetative cover, native grasses, shrubs and trees will often be more appropriate, especially those indigenous to the site. • Site preparation – good surface preparation is essential to the success of a revegetation program. This involves such measures as the ripping and/or cultivation of any hard set or compacted surfaces and; the respreading of topsoil to a minimum depth of 50mm, with the organic layer at the top.
Maintenance of Erosion and Sedm structures		✓	✓		• Access tracks would be graded to enhance their stability. • Sedimentation structures to be regularly inspected and maintained • All measures must be properly monitored for their effectiveness and maintained throughout the functional life of the use.
Sediment and Erosion Control Plan (CEMP and OEMP)	✓	✓	✓		• Sediment and erosion would be controlled as part of a formal Sediment and Erosion Control Plan, as a sub plan of the CEMP and OEMP. • Soil and water management practices would be guided by the Best Practice guidelines contained within *Soils and Construction Vol. 1* (Landcom 2004).
Spill Control Plan	✓	✓	✓		The contractor would prepare and implement a **Spill Control Plan**, as a sub-plan of the **Construction Environmental Management Plan**. • Identify persons responsible for implementing the plan if a spill of a dangerous or hazardous chemical/waste should occur. • Material Safety Data Sheets (MSDS) for all chemical inventories would be located on site and readily available. • Where chemicals are used, their application and disposal would comply with manufacturers recommendations. • Any spill that occurs, regardless of size or type of spill, would be reported to the Construction Manager. • The event and clean up processes would be recorded. Information that would be recorded in the event of spill would include time and date of spill, type of chemical or waste spilt, approximate volume spilt, general area in which the spill occurred, corrective actions applied, and disposal of spilt material. • Spill protocols in the plan would dictate when the EPA would be notified. • Chemical/fuel storage areas would be identified, and be bunded to prevent loss of

Erosion & Sed[m] Risks	Project Stages				Mitigation Measures
	Final Design	Construction	Operation	De-commissioning	
					any pollutants. • Hydrocarbon spill kits would be stored at the site. A number of site staff are to be trained in the use of the spill kits. • Maintenance or re-fuelling of machinery would be carried out on hard-stand area within the laydown area. The concrete hardstand area would include bunding and flush pits for collecting and safe disposal of hydrocarbons materials. • 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.
Site Restoration Plan					• A **Site Restoration Plan** would be part of the Construction Environmental Management Plan. This would set out protocols for restoration works including Site preparation

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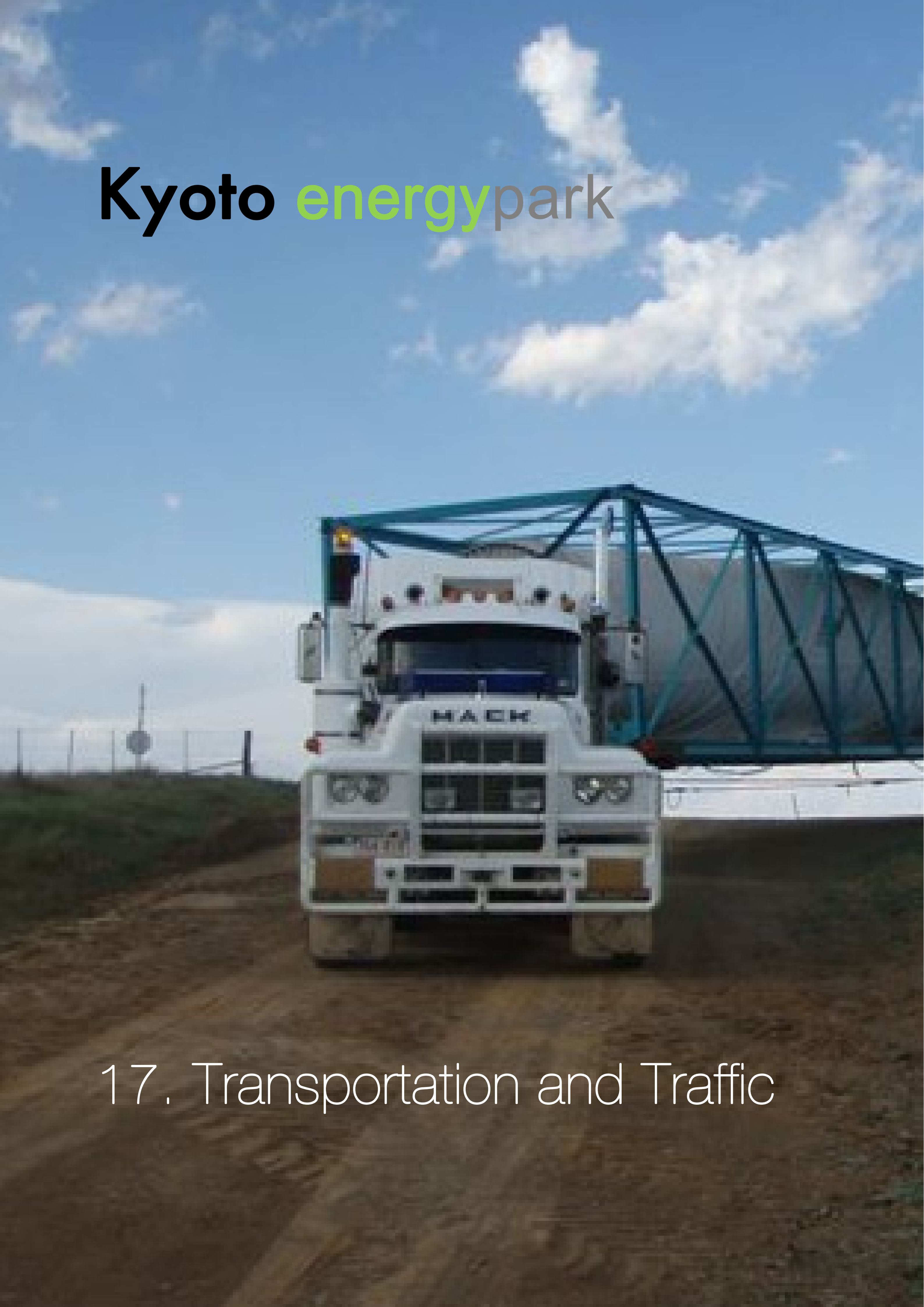

17. Transportation and Traffic

17.0 TRANSPORTATION AND TRAFFIC

17.1 Introduction

The Traffic and Transportation Assessment was undertaken by Pamada Pty Ltd and is contained in *Appendix J Traffic and Transportation Impact Assessment (May 2008)*.

Pamada Pty Ltd have been involved with construction and logistics operations for wind farm projects in South Australia and therefore have the experience for detailed logistical planning and consultation in wind farm development.

This assessment is limited to traffic issues external to the proposed Kyoto Energy Park sites. The report took in to consideration transportation and traffic impacts for construction, operation and decommissioning stages. The detailed assessment includes consideration of the following:

- The suitability of the existing road infrastructure for overmass and oversize special purpose vehicles accessing the site;
- The type and number of vehicles generated during the construction and operational phases;
- Statutory and permit requirements for oversize and overmass vehicles and access on local road networks;
- Traffic generation and safety issues;
- Port of entry options for safe and efficient handling of over-dimensional components.
- Recommendations to be included in Environmental Management during construction and operation.

17.2 Transport of Oversize and Over Mass Components

During the construction phase of the project it will be required to transport oversize and/or overmass components consisting of the following:

Wind Turbine Components

The report considered the transport requirements for the Suzlon s88 2.1 MW Wind Turbine Generator. For the purposes of this report the Vestas V90 3.0MW is similar in size and weight of the components to the Suzlon machine.

The components of the turbines are transported in the following way:

- Tower sections or tubes - transported individually using low bed or multi-axle truck trailers. Currently manufactured in Victoria and South Australia and Queensland. The tubes will most likely transported by road and require an oversize and overmass permit from the RTA. Currently there is an option to manufacture tubes within the Newcastle area which is being investigated.
- Blades - which are transported individually or in pairs on registered extendable trailers. The blades will require an oversize permit from the RTA.
- Nacelles - transported individually using low bed or multi-axle truck trailers (see typical transport arrangement Figure 17.0). Nacelles will require an overmass and oversize permit.
- Nose cones - transported in pairs on a flat bed truck. No permits are required for transport.
- Hubs - transported individually using flat bed truck or semi-trailer. No permits are required for transport.

Substation Transformer

Up to 2 transformers will be transported separately on a large multi-axle low loader trailer with assisted pilot vehicle and police escort. At 55-70 tonne, it will require an over mass permit for transportation.

Concrete Batching Plant

The plant will be mobile and of a size that will require a permit from the RTA for transportation.

Earthmoving equipment and Heavy Cranes

Heavy earthmoving equipment will be transported during site establishment stages on multi-axle low load trailers. Large and small cranes will be needed during loading, unloading and erection.

Figure 17.0 Transportation of a turbine nacelle with pilot vehicle at rear

17.3 Roads and Traffic Authority Requirements

Over size and over mass permits are required from the NSW RTA for load-carrying and Special Purpose Vehicles (SPVs) exceeding standard dimensions and mass limits. Oversize permits are required for loaded vehicle dimensions exceeding maximum standard dimension limits of 19.0 m long, 2.5 m wide and 4.3 m high. Mass limits are based on axle spacing of the truck and trailer and requirements from the RTA.

The RTA Special Permit Unit was consulted and advised that the dimensions of all oversize and overmass components would be required by permit application prior to transportation being approved. Also prior to transportation and of heavy components and subject to RTA requirements for permits inspections and dilapidation surveys may be required on local roads. Dilapidation surveys may also be required following the construction period to determine extent of damage on local roads from oversize and overmass vehicles.

17.4 Port Options

Wind turbine components including nacelles, blades, hubs and nose cones, panels and accessories will be manufactured oversees and shipped to Port. Four wind turbine models are being considered for the purpose of the assessment, the Traffic and Transport report considered the transport requirements for the Suzlon s88 2.1 MW Wind Turbine Generator which is one of the most common turbines currently used within Australia.

Approximately 3-4 ships will be required to transport turbine parts (excluding tower tubes), docking at 1-2 monthly intervals. The ports must have the capacity to handle ship dimensions (normally 150 metres length and 25-30 width), and berths must have capacity for lifting of heavy components (up to 100 tonne capacity).

Four port options were considered in the Assessment. Based on discussion with the Port Authorities, local Haulage Contractors and a site inspection of the Newcastle Port. The Port of Newcastle is the favoured option, as it is the most feasible option commercially and logistically. It can accommodate the specific requirements needed for unloading the components from the ship to the dock. Sufficient storage area is also available as shown in Figure 17.1 below.

Figure 17.1 – Proposed storage at Eastern Basin Port Newcastle

17.5 Transportation scheduling

The process of transportation will occur in the following manner:

1. Turbine components will be unloaded at the dock and generally stored at the port storage areas prior to scheduling transportation to site. Components may be stored at dock for 2 weeks prior to road scheduling for transportation to site;
2. Components will then be transported to the Mountain Station site by road;
3. On arrival to the Mountain Station site, components will be taken directly to hardstand areas for erection by heavy lifting cranes or unpacked in the laydown area and prepared prior to installation at turbine locations.

17.6 Transportation Routes

A survey of the proposed routes was undertaken in May 2008 by Pamada Pty Ltd. Transportation options considered include rail, road and shipping.

Rail Transport

Rail transport was not considered as a feasible option from Newcastle Port due to the potential to damage to sensitive turbine components, rail width, height clearance restrictions, and logistics constraints.

Road Transport

The preferred transport method is haulage by road. By the nature of design, the Kyoto Energy Park components will generate minimal traffic movements once operating.

17.7 Preferred Route Port Newcastle to Kyoto Energy Park Route

For trips with restrictive mass and length diversion, limitations routes were investigated. Prior to inspection of the proposed routes discussions were held with the RTA Special Permits Unit, Newcastle Stevedores and a local Heavy Haulage Contractor specialising in transport of oversize components in the area, such as 45m conveyors and 90 tonne capacity earthmoving equipment for the Hunter mines.

11 routes (including diversion routes) were surveyed by Pamada by vehicle for possible ‘pinch’ locations and areas where diversions around rural population centres such as Singleton, Muswellbrook and Scone could be made. A more detailed evaluation will be made by the RTA upon receipt of a permit application.

17.8 Site Access

The Mountain and Middlebrook Station sites are accessed from the main access points on Bunnan Road. The Mountain Station access will require relocation of the entryway to meet sight distance requirements while the current Middlebrook entry is adequate.

An internal track network will be developed for the purpose of accessing all components of the energy park. Any existing roads on the sites will be upgraded where necessary.

The existing and proposed Mountain Station access points are shown in Figure 17.2. The existing (same as proposed) access point for Middlebrook Station is shown in Figure 17.3.

Figure 17.2 Existing and proposed Mountain Station Site Access Point

Figure 17.3 Existing Middlebrook Station Site Access Point

17.9 Traffic Generation

Traffic Generation from site activities has been split into heavy and light vehicle movements for various construction activities as detailed in Appendix J and summarised in Section 3.1.15.

Heavy vehicle movements would be generated for larger components including substation transformers and turbine components. Light vehicle movements (Cars and 4WDs) would be used to transport workers and staff during construction periods.

Heavy vehicle movements would generally access the site via the indirect route (bypassing Scone), with the light vehicle access route via Bunnan Road to both site access points.

For traffic generation the worst case scenario has been assumed based on construction timeframe outlined in Table 3.2 and traffic generation activities outlined in Table 3.0. The maximum heavy vehicle movement is 8 one way movements per day (loaded) or 16 two way movements for a two month period. This would occur during concrete pours. As heavy vehicles would use the indirect route negligible impact is envisaged. While traffic on this section of the route is very low escorts and pilots will ensure free flow and access for intermittent vehicles. The Noise assessment has conservatively doubled predicted movements i.e. 20 one way heavy vehicle movements.

The Traffic and Transportation Report (*Appendix J*) highlights various mitigation measures that can be implemented to address impacts arising through transportation effects and traffic impacts. Traffic generation is likely to be minimal in relation to existing traffic conditions on schedules and local road networks. Localised impacts as a result of moving overmass and oversize components will be managed effectively to reduce road disruptions.

A Transport Management Plan (TMP) will be required and is allowed for. The TMP will address all aspects of road transportation and quantify impacts and amelioration procedures for improvements to local roads, community consultation and awareness, traffic and safety management.

An increase in traffic through Scone and the surrounding area will occur. The level of increase will vary between the construction and operational periods.

The main sources of construction traffic are:

- Tower & Turbine Traffic and Electrical Component Delivery
- Heavy Earthmoving and Erection Equipment;
- Foundation Construction / and Rock Anchors;
- Concrete aggregate, Sand and Cement;
- Water Supply for Concrete and Dust Suppression;
- Supply and Installation of the Solar PV Plant;
- Supply and Installation of the Closed loop Hydro Plant;
- Construction of Electrical transmission line connecting to the local grid;
- Employee Traffic

The main sources of traffic during the operational period are:

- Employee and Maintenance traffic
- Traffic associated with the Visitor's and Education Centre.

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18. Bushfire Assessment

18.0 BUSHFIRE RISK

18.1 Introduction

Bushfire Consultants Conacher Travers Pty Ltd, were engaged to prepare a bushfire Protection Assessment for the Kyoto Energy Park. This report is attached as *Appendix C Conacher Environmental Group – Bushfire Protection Assessment (August 2007)*.

This bushfire assessment has been prepared using the methodology set out in the NSW Rural Fire Service (RFS) publication, *Planning for Bushfire Protection - 2006 (PBP 2006)*. Construction of buildings has been assessed under the *Environmental Planning and Assessment Act* - Section 79 BA.

The report looks at the potential for bushfire risk on buildings within the site in relation to surrounding topography, slope and vegetation. The assessment of the fire threat to the Maintenance Shed, Manager's residence and the Visitor and Education Centre provided the following information which influences the fire behaviour around each of these assets.

Also included in assessment is the recommended APZs derived from the slope and vegetation characteristics using the RFS methodology. There are also recommendations for ongoing fire hazard management, water storage on site solely for fire fighting reserves, and communications.

Conacher Travers Bushfire consultants conducted independent site inspections to determine site and vegetation characteristics around proposed locations of facilities.

18.2 Manager's Residence

The location of the Managers residence will potentially be exposed to a medium level of bushfire attack. The dwelling will be required to comply with the Level 1 construction standards of AS3959. In addition, gutters and valleys to the proposed dwelling should be fitted with a protection device which prevents the build up of leaf and other combustible material within the gutters/valleys.

Asset protection zones (APZs) would be constructed around the Managers residence as shown in Figure 18.0.

Table 18.0 Asset Protection Zone (APZ)- Manager's Residence

Aspect	Vegetation within 140m of Development	Effective Slope of Land	APZ Provided	Level of Bushfire Attack	Construction Standard
North	Grass / Woodland	0-5° U	20 metres	Medium	Level 2
East	Grassland	18° D	>50 metres	Medium	Level 1
South	Grassland	0-5° D	20 metres	Medium	Level 1
West	Grassland	0-5° U	20 metres	Medium	Level 1

18.3 Visitor's and Education Centre

The location of the proposed Visitors and Education Centre will potentially be exposed to a medium level of bushfire attack. The dwelling will be required to comply with the Level 2 construction standards of AS3959. In addition, gutters and valleys to the proposed dwelling should be fitted with a protection device which prevents the build up of leaf and other combustible material within the gutters/valleys.

The APZ would be constructed around the Visitor and Education Centre as shown in Figure 18.1.

Table 18.1 Asset Protection Zone (APZ)- Visitor's and Education Centre

Aspect	Vegetation within 140m of Development	Effective Slope of Land	APZ Provided	Level of Bushfire Attack	Construction Standard
North	Grassland	0-5° U	20 metres	Medium	Level 1
East	Grassland	18° D	>50 metres	Medium	Level 1
South	Grassland	0-5° D	20 metres	Medium	Level 1
West	Grassland	0-5° U	20 metres	Medium	Level 1

18.4 Potential Ignition Sources

Bushfire risk can be defined as the chance of a bushfire occurring that will have harmful consequences to human communities and the environment. Bushfire risk is usually assessed by considering the likelihood of ignition and also the consequences of a bushfire occurring.

Given the proximity of the proposed Kyoto Energy Park wind turbines to native bush land there is a need to evaluate the effects of the proposal on fire behaviour and the possibility of bushfire ignition from equipment or operations associated with the Kyoto Energy Park. The risk of fire ignition from the construction and operational phases have been considered separately in this report.

18.4.1 Construction Risk Management

The PBP 2006 provides a methodology for assessing bushfire attack at construction stage for a building within a designated bushfire prone area. This process identifies the possible vulnerability of a structure and assesses the required 'Construction Level' in accordance with AS3959 *'Construction of buildings in bushfire prone areas*.

Ignition during the construction phase is a possibility. Activities which may cause accidental ignition include on site works involved in construction and installation of all facilities. These activities include welding and cutting (hot works), flammable liquids and accidents (eg smoking) and other risks from construction activities. Fire is also a risk originating from pole and line construction crews within road reserves and on private property.

During construction certain measures will be adopted by the Contractors using the site to manage bushfire risk. A Bushfire Risk Management Plan (BRMP) will be prepared prior to construction activities on site to reduce risk of ignition from these job tasks. These tasks shall include, but not limited to:

- Consultation with the Rural Fire Service. The closest firefighting services are located at Scone Fire Brigade located at Scone approximately 20 kilometres away;
- Management of vegetation around construction areas. Construction areas have been located within cleared areas. Vegetation management would include slashing of grasses around works areas, access roads and removal of dry vegetation around site works areas;
- Designated areas for construction activities including hot works prescribed areas. The site depot shall be used for most installation and hot works activities. Where activities are to be located away from prescribed zones appropriate risk assessments are to be preformed prior to activities being approved;
- No smoking on site except for prescribed areas;
- Management of 'hot works' areas on site, storage or flammables in locked facilities, and provision for water spraying equipment during site works activities;

- There should be no long grass or deep leaf litter in areas where plant and heavy equipment will be working; and
- All plant and heavy equipment should carry at least one Pressure fire extinguisher.

- Human Error - human error is likely to cause the greatest level of risk of ignition to the surrounding bushfire prone vegetation. Work practices should be established in recognition of the likely risk of ignition of the adjoining vegetation. These should include the provision of portable fire extinguishers during maintenance activities that involve cutting, grinding, welding etc. Particular attention shall be given to work practices during the construction and commissioning stages of the energy park. A temporary water supply shall be made available during this period.

18.4.2 Operations Risk Management

A Bushfire Risk Management Plan (BRMP) will be prepared to reduce bushfire risks during operations and protect life and property, Management plans will be developed covering Bushfire Hazard Management, fire fighting access, emergency services, emergency water supply and evacuation details.

Bushfire Risk from operational activities has been assessed. The main areas of bushfire risk were identified from:

- Overhead Power Lines
- Site Substation
- Wind Turbine Generators
- Solar PV
- Fuel/Vegetation Management
- Water for Emergency Bushfire Hazard

Overhead Power Lines

Overhead lines shall be designed in accordance with Energy Australia design specifications and management practices, including vegetation clearances, buffer zones, line and pole dimensions and configurations.

Line infrastructure shall be maintained by Energy Australia to reduce potential for Bushfire Risk from vegetation, lightning strikes, line contact, power surges and the like.

Site Substation

The generation and distribution of electricity has the potential to cause fire ignition within the substation compound area although the malfunction of equipment is rare. Potential ignition sources would include equipment malfunction such as transformer explosion, burning out of motors and overhead wiring failure. If a transformer was to explode it could have the potential to shed molten metal and burning oil for some distance from the transformer. Motors and fans can fail with the potential impact generally restricted to localised sparks.

The site substation will be located close to the Mountain Station access point in a cleared area free from vegetation and fuel source. The clearance between the equipment and the compound fence will be designed to mitigate the risk and transfer of an ignition source within the compound to the surrounding vegetation. The compound is covered with gravel to prevent ignition and spread of fire outside the compound.

Overhead wiring failure is uncommon and is usually the result of physical damage from lightning strikes or sparks given off during light rain, as a result of dust build up on the insulators over extended dry periods.

Wind Turbine Safety Standards and Design

Wind turbines manufactured today incorporate the highest quality and safety standards. Nevertheless there is always still a small risk of fire ignition from malfunctioning electrical or moving parts within the generator enclosure. The risk of fire can be associated with malfunctioning turbine bearings, inadequate crankcases lubrication, cable damage during rotation, electrical shorting or arcing occurring in transmission and distribution facilities.

Wind turbines can also be potentially impacted on by a bushfire entering the site. This is less of an issue in comparison to normal power generation sites as turbines are well above the fuel source and power transmission cables are located within the towers and underground.

Measures to reduce bushfire ignition risk are considered below and would be adopted in the EMPs for the sites:

- All structures (including wind turbines) on site must comply with The Building Code of Australia (BCA) and the Australian Standards (AS). Internal fire protection systems, are designed in accordance with industry electrical standards and inclusion of fire suppression where appropriate;
- High Voltage (HV) electrical and communications cables are buried underground; and dedicated monitoring systems within each wind turbine that detect temperature increases in the turbines and initiates shutdown when the threshold temperature is reached. i.e. wind turbine generators can automatically shut down if overheating of bearings or machine parts occurs;
- All turbine are fully enclosed;
- Nacelles (generators) are proposed at and elevation of 80 to 105 m agl well above potential fuel load sources from vegetation;
- Nacelles are designed for containment of oil leaks and spillages;
- Generators are regularly maintained to reduce potential faults;
- The Kyoto Energy Park design has located the majority of infrastructure on cleared land away from significant native vegetation;
- Vegetation around the base of turbine and transformer would be grassed and kept at a height of less than 100mm to minimise potential for fire risk;
- High voltage power cable reticulation and connections will be located underground;
- Because of their height (hub height up to 150m), wind turbines can be susceptible to lightning strikes and therefore if not designed properly can cause electrical damage and possible fire risk. Lightening protection devices will be fitted to each turbine, additionally turbines will be earthed to prevent arching or surging resulting from lightning strikes which may potentially ignite fires;
- Metallic conductors are installed within the turbine blade for connection to the main tower. Towers are properly earthed in accordance with electrical safety standards. Internal electrical works are also protected from voltage rises due to lightning strikes. Site substation would be designed in accordance with Energy Australia design parameters.

Solar PV Plant

The potential for bushfire risk from the solar PV plant during operations would be extremely rare. The PV plant will be located on a cleared plateau with substantial vegetation clearances on all sides and on critical slopes.

All structure design would comply with The Building Code of Australia (BCA) and the Australian Standards (AS). Solar PV systems would be installed by BSCE accredited installers to Australian Standards in a turnkey project. High and Low Voltage electrical and communications cables would be buried underground in cable conduits according to specifications.

Fuel/Vegetation Management

An important part of the Kyoto Energy Park Bushfire Risk Management Plan would be fuel/vegetation management. The following measures shall be included in the BMP:

- Access tracks, proposed and existing, are to act as fire breaks and will also provide access for fire fighting and emergency services;
- Asset Protection Zones (APZs) should be provided and should take the form of Inner Protection Areas, measured from the exposed wall of the any dwellings;
- Ongoing maintenance of APZs and fire trials should be undertaken;
- Fuel management within the APZs should be maintained by regular maintenance of the landscaped areas / mowing of lawns in accordance with the standard guidelines;
- Fire protection measures for plant and machinery operating on the site will be in accordance with these standards.

Water Supply for Fire fighting

Appropriate location of water access points will assist safe, effective and timely fire suppression activities. To ensure adequate access to water for Rural Fire Service (RFS), the allocation of water supplies is necessary. A separate 10,000 litre capacity water tank is required for the Managers residence and the Visitors and Education Centre respectively , dedicated solely to bushfire fighting purposes. A suitable connection for firefighting purposes is also required

In the event of a fire, water should be available and accessible to ensure that fire suppression activities are not hindered in any way and to ensure that fire appliances can identify and access water points efficiently. Multiple tankers need to be filled rapidly and simultaneously to conduct efficient and effective fire suppression.

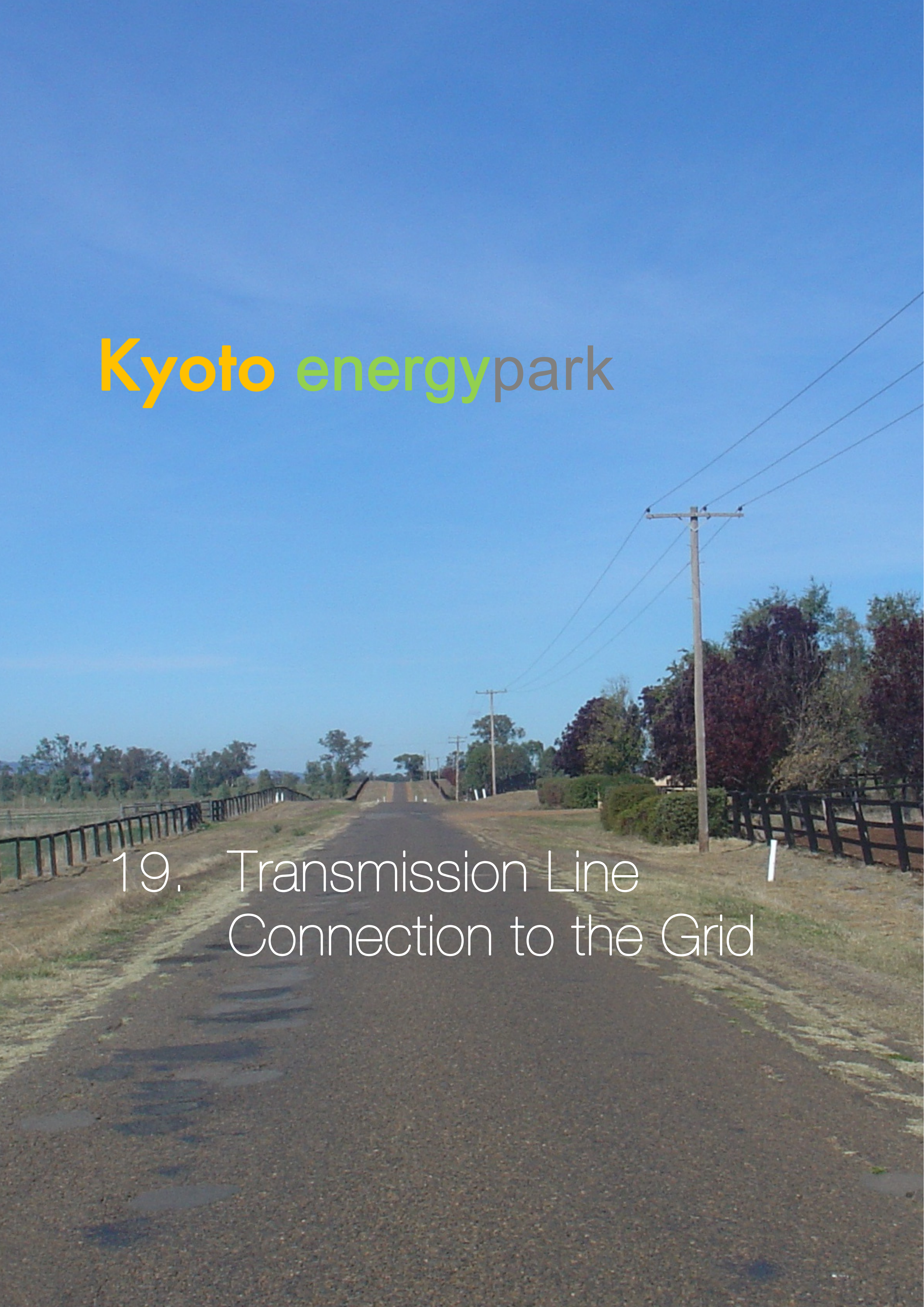
18.5 Bushfire Risk Mitigation

In order to ensure that both construction and operational bushfire risks are effectively managed, a Bushfire Risk Management Plan (BRMP) will be prepared to identify risks to life and property, and management plans to reduce these risks. Such a plan will include, but is not limited to, fire fighting, access, emergency services, emergency water supply and evacuation details and would require completion prior to any works being undertaken on the subject site.

The Bushfire Risk Management Plan (BRMP) shall be provided to ensure that the development is in accord with the requirements of *PBP 2006* and relevant standards as follows:

- Designed in accordance with requirements of the NSW Rural Fire Service and the Upper Hunter Shire Council;
- A Bushfire Evacuation Plan prepared for the site and provide access/ egress and alternative access/egress from the site;
- Construction standards as per Australian Standard AS3959 ‘Construction of Buildings in Bushfire Prone Areas’, in accordance with Part 2.3.4 of the ‘Building Code of Australia’, should apply to all dwellings proximate to the Asset Protection Zones.

Kyoto Energy Park Scone is wholly an Australian Enterprise. The Management is 100% Australian.
The funding of this proposal and report is 100% Australian.
An Australian Project



Kyoto energypark

19. Transmission Line Connection to the Grid

19.0 TRANSMISSION LINE CONNECTION TO THE GRID

19.1 Existing Distribution Networks

Energy Australia own and manage the distribution lines within the vicinity of the Kyoto Energy Park sites. Energy Australia supply electricity in the Upper Hunter LGA to residential customers within the network. These include the 33kV,66kV and 132kV networks as shown in Figure 19.0. An increase in demand for electricity in NSW, the Newcastle and the Hunter Region has resulted from factors such as an a deficit in generation capacity, increase in new housing developments, increased coal production forecast for the Upper Hunter, and the associated energy demands within the local and regional community.

Within the Upper Hunter Region, Scone, Aberdeen, Muswellbrook, Moonan and Rouchel zone substations and Muswellbrook mine are all supplied by the Muswellbrook 132/33kV Sub-transmission Station (STS). The Glenbawn Hydro generator is also connected to this system.

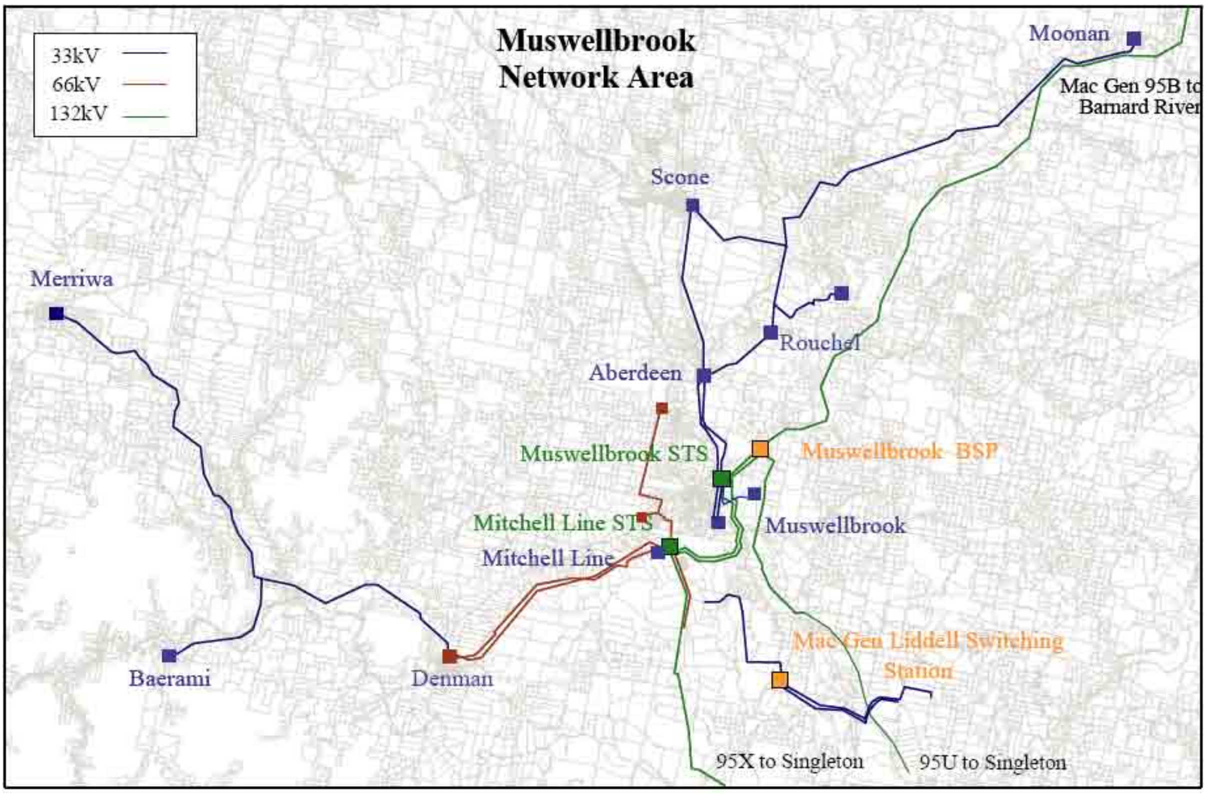


Figure 19.0 Existing Supply Network- Upper Hunter Area (Source: Energy Australia Oct 2007)

19.1.1 Transgrid

The local transmission network is owned, operated and maintained by Transgrid. There are two 330kV lines running from Muswellbrook and Liddell 330kV terminals which bypass the Scone township on the eastern side at a distance of approximately 30-35km. Transgrid were contacted by Econnect and Pamada to determine existing transmission line infrastructure in the region and potential for connection.

A 330kV connection would require the construction and commissioning of 330kV network infrastructure, which is prohibitively expensive for overall capacity of less than 200MW. The transmission line infrastructure is also larger with greater visual impact and community concerns related to landuse issues. Accordingly, the 330kV connection option has not been considered further in this report.

In addition there is a 132kV line that runs from Muswellbrook terminal station to an industrial site owned by Macquarie Generation near Barnard River. The Muswellbrook-Barnard River 132kV circuit crosses the main road between Scone and Moonan approximately 30km northeast from Scone and is therefore very difficult to access from the proposed Kyoto Energy Park sites. This option was not considered further in this assessment.

19.1.2 Energy Australia

The local area is supplied from TransGrid Muswellbrook 330/132kV terminal station. The local sub-transmission and distribution systems are owned, operated and maintained by Energy Australia. The distribution assets located in the vicinity of the proposed site are limited to the Scone 33/11kV zone substation which is located on the south east part of the town. Scone zone substation is supplied from a Muswellbrook zone substation via two single 33kV circuits.

In addition there is a 66kV circuit that runs from Mitchell line – Dartbrook to supply two local mines sites at Dartbrook (Dartbrook Mine) and Kayuga (Kayuga Mine).

The existing sub-transmission and distribution system in the area consists of an integrated 11kV network servicing local properties.

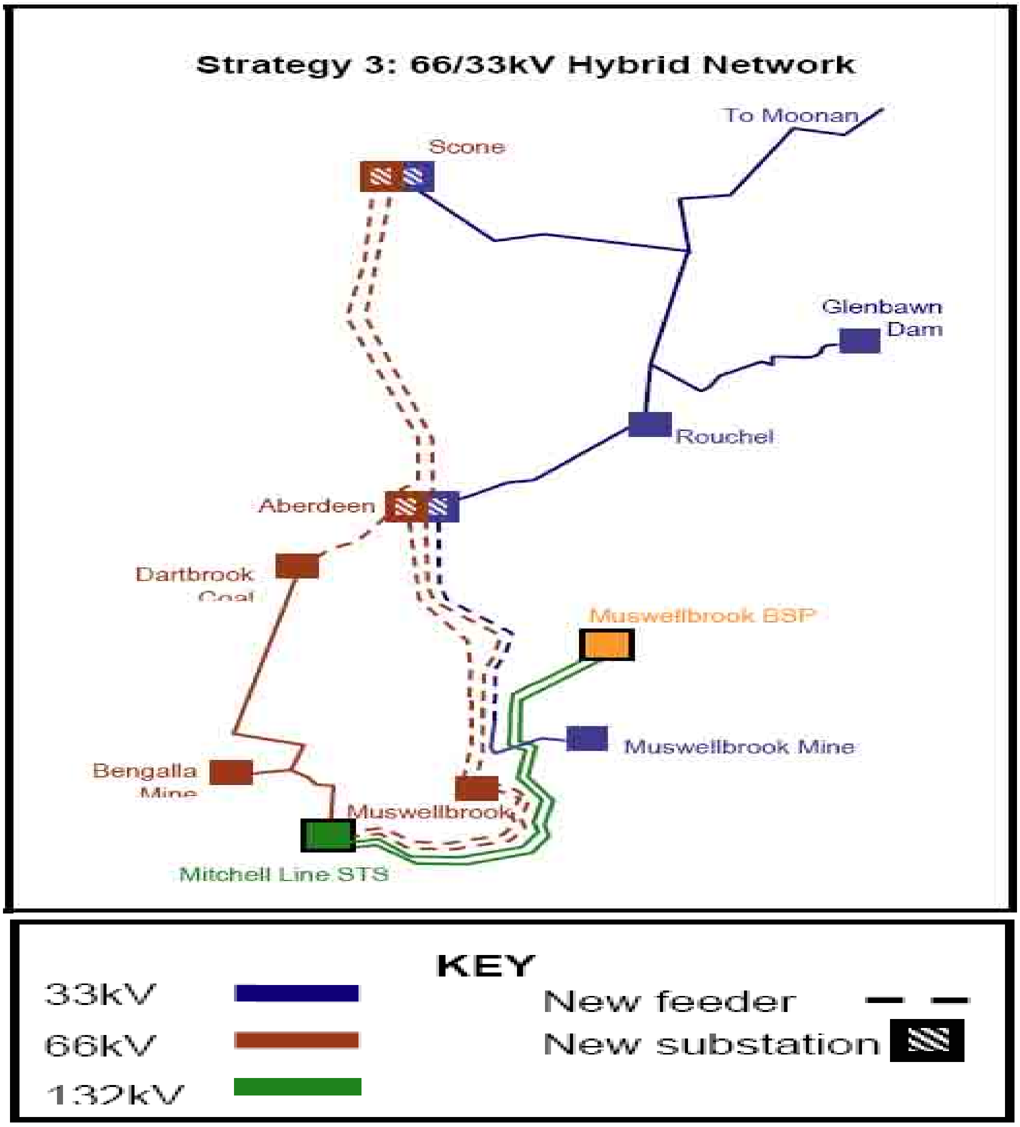


Figure 19.1 Energy Australia Upgrade to existing network (Energy Australia 2007)

Network Upgrade Scone Substation

In September 2007, Energy Australia officially announced a proposal to construct the new 66/33/11kV substation on the outskirts of Scone and an upgrade of the 33kV Scone and Aberdeen supply to 66kV (*see Energy Australia Community Newsletter March 2008 - Appendix P*). These works also included the installation of a replacement 66kV feeder from Kayuga to the new 66kV Scone substation (*see Energy Australia Community Newsletter March 2008 - Appendix P(i))*.

These works were allocated to replace worn and outdated zone substations and line infrastructure and to increase capacity and security in the region. These works were outlined in a paper released by Energy Australia entitled 'Development of New Scone 66/33/11kV Substation (to Address Capacity and Condition Issues in the Upper Hunter Area) dated 15th October 2007.

The new Scone 66/33/11kV substation was under construction at the time of writing this report.

The replacement of the Scone substation works are outlined as follows:

1) Extension of the existing 66kV 'Dartbrook' feeder to the new Scone zone substation (completed in 2009);
2) A new hybrid 66/33kV Scone substation (completed early 2009);
3) Upgrade existing 33kV feeder to a 66kV feeder from Muswellbrook to Scone (completed in 2012)

These works would be important if the Kyoto Energy Park was to connect into the new Scone STS as works under Item 3) above would need to be completed prior to connection i.e. in 2012.

19.2 Connection of the Kyoto Energy Park to the local Grid

19.2.1 Connection Options

An initial feasibility study into the existing electrical power system and connection options for the Kyoto Energy Park was undertaken by Econnect in December 2005. At the time Energy Australia advised that a number of network developments in the Upper Hunter region were planned in the next five years. These works were outlined in a paper released by Energy Australia entitled 'Development of New Scone 66/33/11kV Substation (to Address Capacity and Condition Issues in the Upper Hunter Area) dated 15th October 2007.

Econnect reviewed the original connection study in December 2007 to incorporate the latest project capacity (including solar photovoltaic plant and Energy Australia network developments, to assess their potential impact on the Kyoto project grid integration options. The report prepared by Econnect in December 2007 took into consideration a revised total capacity of up to 90MW of wind turbine generation capacity. The report was prepared assuming that augmentation of the Scone substation was completed by 2012.

19.2.3 Transmission constraints

Three (3) possible connection options were identified as feasible based on consultation with Energy Australia and a connection feasibility by Econnect. The Econnect report is attached as *Appendix L – Kyoto Wind Farm –Prefeasibility Study (Dec 2007).*

Further to this Pamada engaged Vemtec Utility and Infrastructure Services Pty Ltd to conduct a detailed Line Route Assessment. This report is attached as *Appendix M- Vemtec Pty Ltd – Kyoto Energy Park Scone Overhead Powerline Route Review (21 April 2008)*.

Existing network diagrams were supplied by Energy Australia and used to identify options for line routes from the Kyoto Energy Park site substation to the connection point on the grid.

The initial determination of a line route was governed by the following considerations:

- Utilise the ability to upgrade along existing local power lines where economically feasible and practical;
- Positioning of the proposed routes on cleared open land way from existing or proposed residential communities;

- Minimising options for easements over private land where feasible and providing other options;
- Maximising the utilisation of made or unmade road reserves (Crown Road or Electricity Easements);
- Minimise impact of the line route on existing remnant vegetation, either in road reserves or within private properties

Based on the previous information a full inspection of all line route options was undertaken by a Senior Vemtec staff and Pamada in November 2007. Four possible line route options were identified in the study with variations to divert lines around rural centres and residential zonings. Line route options were also selected to ensure no major access restrictions for private landholders or encroachments in to private property.

Further inspections were undertaken by individual environmental consultants (see Section 19.4). An assessment of the possible line route options were then made taking into account economic considerations, line losses over distribution distance, existing network and potential land-use constraints, and roadside vegetation. Furthermore variations to line route options were considered based on planning considerations such as private easements, visual impacts and physical constraints including vegetation and traffic restrictions.

19.2.4 Description of Preferred Transmission Line Routes

Four line route options were investigated by Vemtec and various specialist consultants. These four options are listed in Table 19.0. Based on studies undertaken and consultations two preferred options were identified as Option 2 (66kV to Scone STS) and Option 4 (132 kV to Muswellbrook STS). These two preferred options are illustrated in Figure 19.2.

Option 2 is the preferred option for a final Kyoto Energy Park capacity of less than 90MW, and Option 4 for a Kyoto Energy Park capacity greater than 90MW, as summarised in Section 19.8 Preferred Connection Option. Final option selection will also consider a detailed network flow study prior to construction to verify capacity.

Option 2 (66/33kV)

Option 2 involves the construction of a 66kV line infrastructure for connection to the new Scone STS located south east of the Scone township as shown in **Figure 19.2**. Option 2 would also require the construction of a 33kV line for connection of Middlebrook Station wind turbines to the proposed Mountain Station site substation along Bunnan Road. This option would require significant upgrading of existing 11kV line infrastructure (approximately 72% of works) located in rural road reserves.

Figure 19.4 - The proposed 66kV overhead line route commences at the Mt Moobi escarpment in close proximity to turbines 30 and 31. The route then follows the Crown road easement descending the Moobi escarpment until the intersection of Old Winters Road.

Two options exist for line routes east of Mt Moobi. Option 2A follows Old Winters Rd to the intersection of Yarrandi Rd and Moobi Rd. Option 2B could be considered across private land subject to a separate agreement reached between the subject landholders and the proponent. No potential restrictions to the existing land holders access was evident during inspection.

Figure 19.3 - Two options exist to bypass the rural town centre of Scone for connection to the Scone STS. Option 2A continues along Liverpool St and Kingdon St to the west of Scone bypassing the rural town centre. The route traverses the edge of the Scone Sports Complex and the Scone Sewage Treatment Works replacing existing line infrastructure in these zones. The route then utilises the existing transmission line easement to the south of the Scone Golf Course, but does not traverse it.

Option 2A bypasses built up areas of Scone and recreational areas, utilises the replacement of existing line infrastructure without restricting access to any of these zones. Option 2A does not traverse or encroach upon the Scone Golf Course as it bypasses it to the south.

Option2B is a secondary option traversing private land held by Invermein Pty Ltd. This option would completely bypass the rural centre and allow for a more direct route accessing the existing transmission line easement to the South. This option would be subject to approval by Invermein Pty Ltd for land sharing.

Option 2 would involve works in close proximity to natural waterways, which shall be undertaken in accordance with Energy Australia design standards as described in Section 19.7.2. Option 2 would also include replacement of the existing 11kV overhead line crossing the railway south of Scone. These works would be undertaken in accordance with Energy Australian standards and policies.

Option 4 (132/33kV)

Option 4 is the preferred option for a Kyoto Energy Park capacity in the order of 90MW or greater. This option would involve the construction of a 132kV line for connection to the existing Muswellbrook STS located on the New England highway just north of Muswellbrook (see **Figure 19.2**). This option bypasses rural centres of Scone and Muswellbrook towns. Option 4 would also require the construction of a 33kV line for connection of Middlebrook Station wind turbines to the proposed Mountain Station site substation along Bunnan Road. This option would require significant upgrading of existing 11kV line infrastructure (approximately 85% of works) located in rural road reserves.

Option 4 is utilises the existing rural road reserves and would mainly involve the replacement of existing 11kV line infrastructure along the route. The route follows the Bunnan, Yarrandi, Nandowra, Back Muswellbrook and Kayuga Roads for connection at the Muswellbrook STS point.

Figure 19.5 – Options exist for alternate routes (Options 4A and 4B) just north of Muswellbrook as illustrated in Figure 19.5. Option 4B is proposed as a more direct route which bypasses rural residential allotments along New England highway. Option 4B would be subject to land sharing agreement with the private landholder. No severance to land access would occur as a result of the proposal.

Option 4 would involve works in close proximity to natural waterways. These works would be undertaken in accordance with Energy Australia design standards as described in Section 19.7.2. Option 4 would also include replacement of the existing 11kV overhead line crossing the main railway north of Muswellbrook. These works would be undertaken in accordance with Energy Australian standards and policies.

Table19.0 Summary of Transmission Connection and Line Route Options

Line Route Options	Line Capacity (kV)	Route Length (km)	Connection Options	Grid Connection Owner	Capacity Constraints	Comments
Option 1	*66/33*kV*	*66kV = 18.6* *33kV = 8.5*	**Connection 1** Scone STS 66kV Terminal	Energy Australia	• Up to 60MW connection capacity until 2009 (Econnect). • Following the upgrade of the Scone- Mitchell Line 66kV feeders up to 90MW of capacity by 2012 (Econnect).	Not preferred option
Option 2 (Figure 19.2/19.3/19.4)	*66/33*kV*	*66kV = 12.6* *33kV = 8.5*	**Connection 1** Scone STS 66kV Terminal	Energy Australia	• As Above	**Preferred line route for Kyoto Energy Park capacity less than or equal to 90MW based on flow analysis.**
Option 3	*66/33*kV*	*66kV = 32.3* *33kV = 8.5*	**Connection 2** Tee Connection to Dartbrook Mine 66kV feeder.	Anglo Coal Pty Ltd	• Tee connection to the Dartbrook 66kV feeder will provide sufficient network capacity for up to 60MW (Econnect). • Additional capacity may be added but will require the re-construction of the existing Dartbrook-Mitchell line 66kV circuit. •	Not preferred option
Option 4 (Figure 19.2/19.5)	*132/33*kV*	*66kV = 41.6* *33kV = 8.5*	**Connection 3** Muswellbrook 132kV STS Terminal	Energy Australia	A connection to Muswellbrook 132kV terminal will provide the required capacity to connect in excess of 150MW of capacity	**Preferred line route option for Kyoto Energy Park capacity greater than 90MW**

** Includes provision for a 33,000V (33kV) interconnector between Mountain and Middlebrook Station sites.*

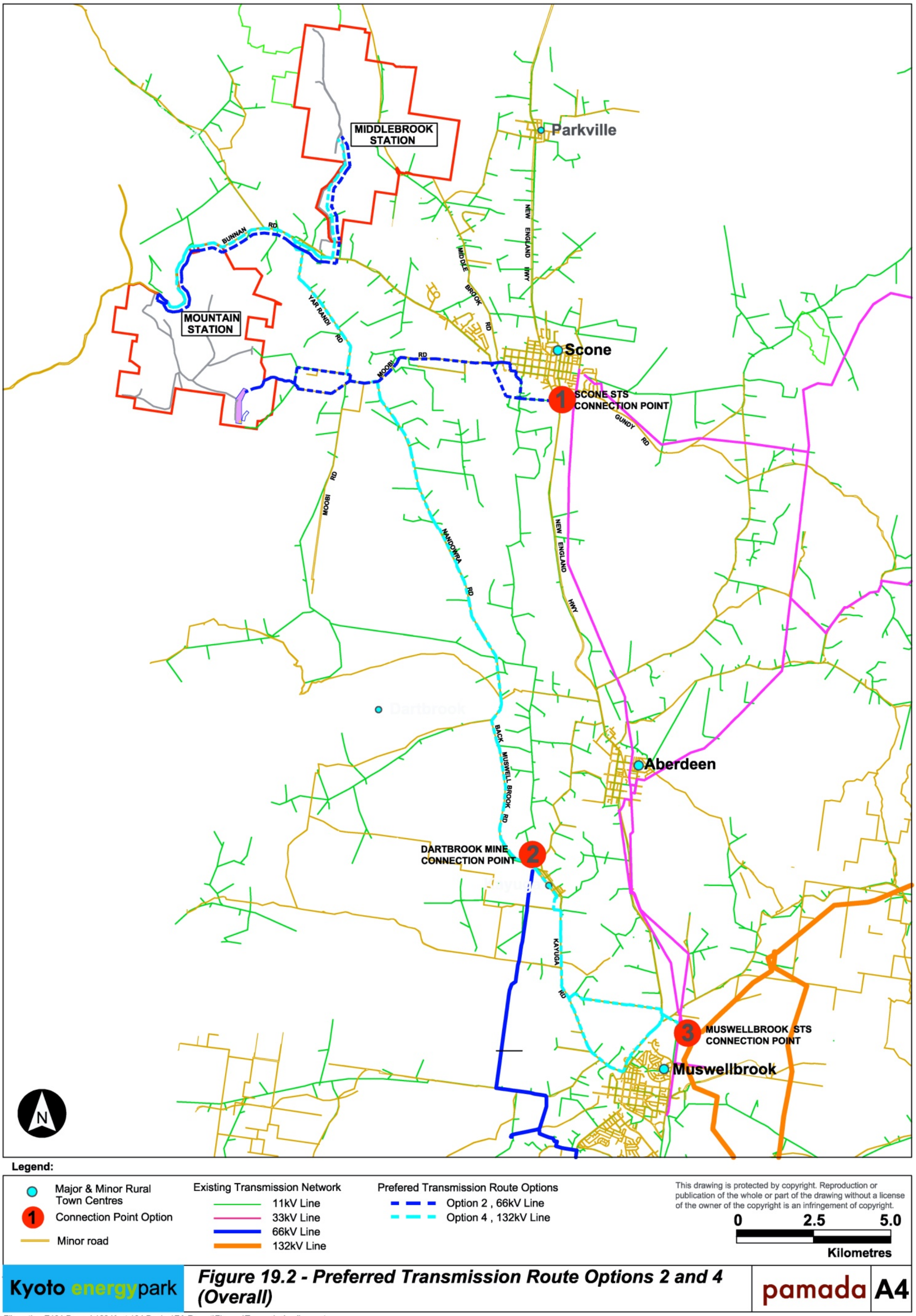


Figure 19.2 - Preferred Transmission Route Options 2 and 4 (Overall)

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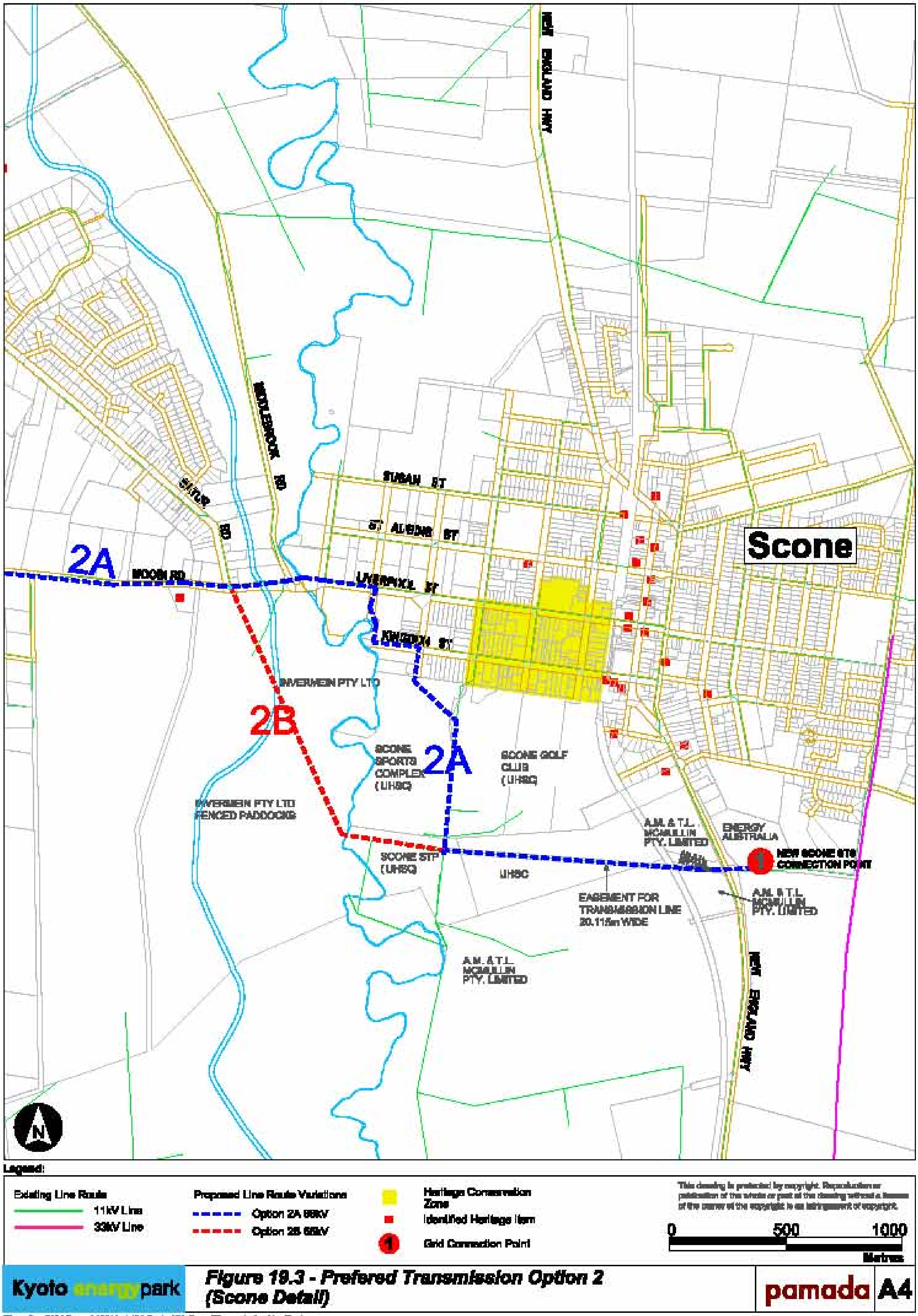

Figure 19.3 - Prefered Transmission Option 2 (Scone Detail)

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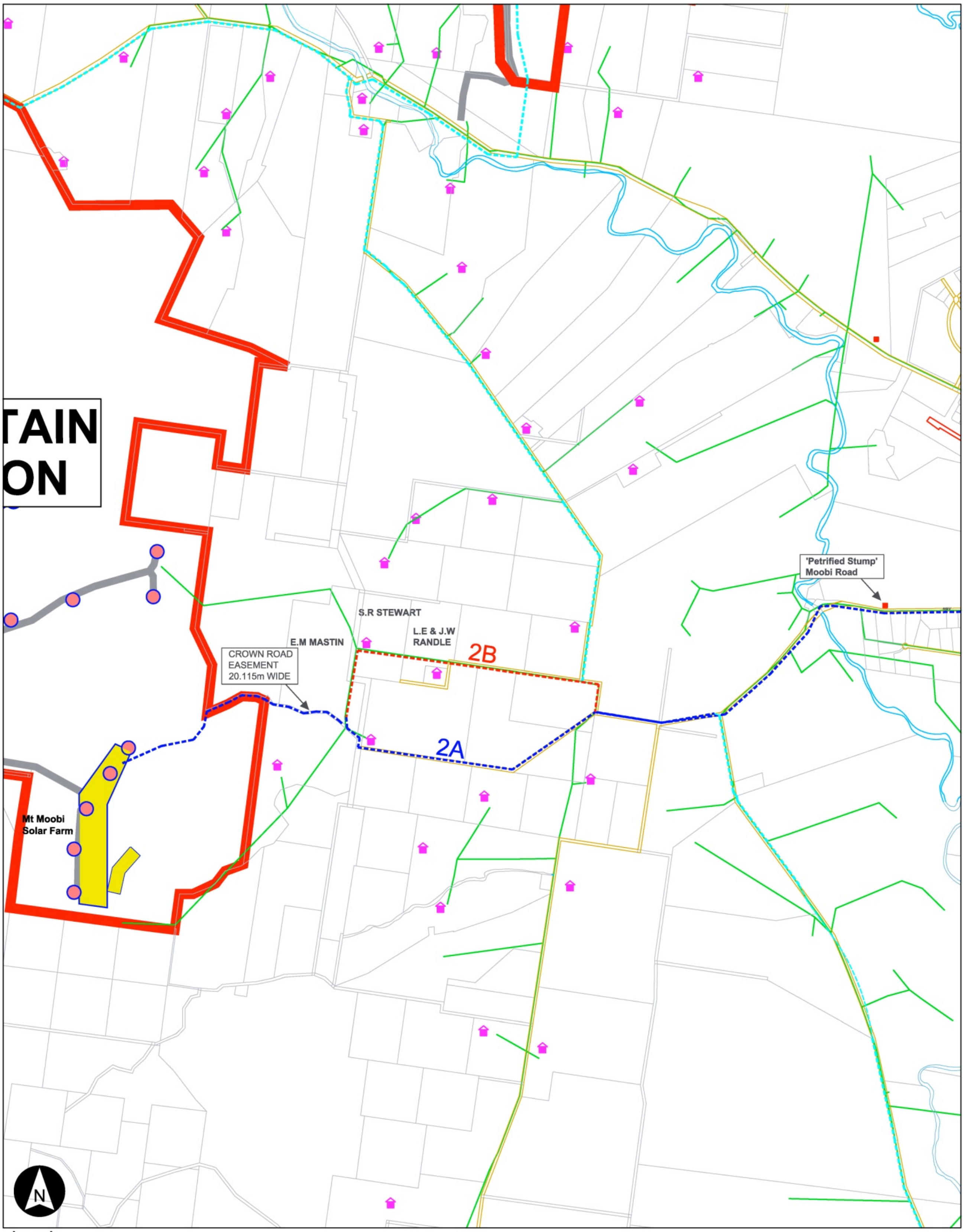

Legend:

Existing Line Route
11kV Line

Proposed Line Route Variations
Option 2A 66kV
Option 2B 66kV

Residence

0 1 2
Kilometres

Kyoto energypark

Figure 19.4 - Prefered Transmission Option 2 (Moobi Detail)

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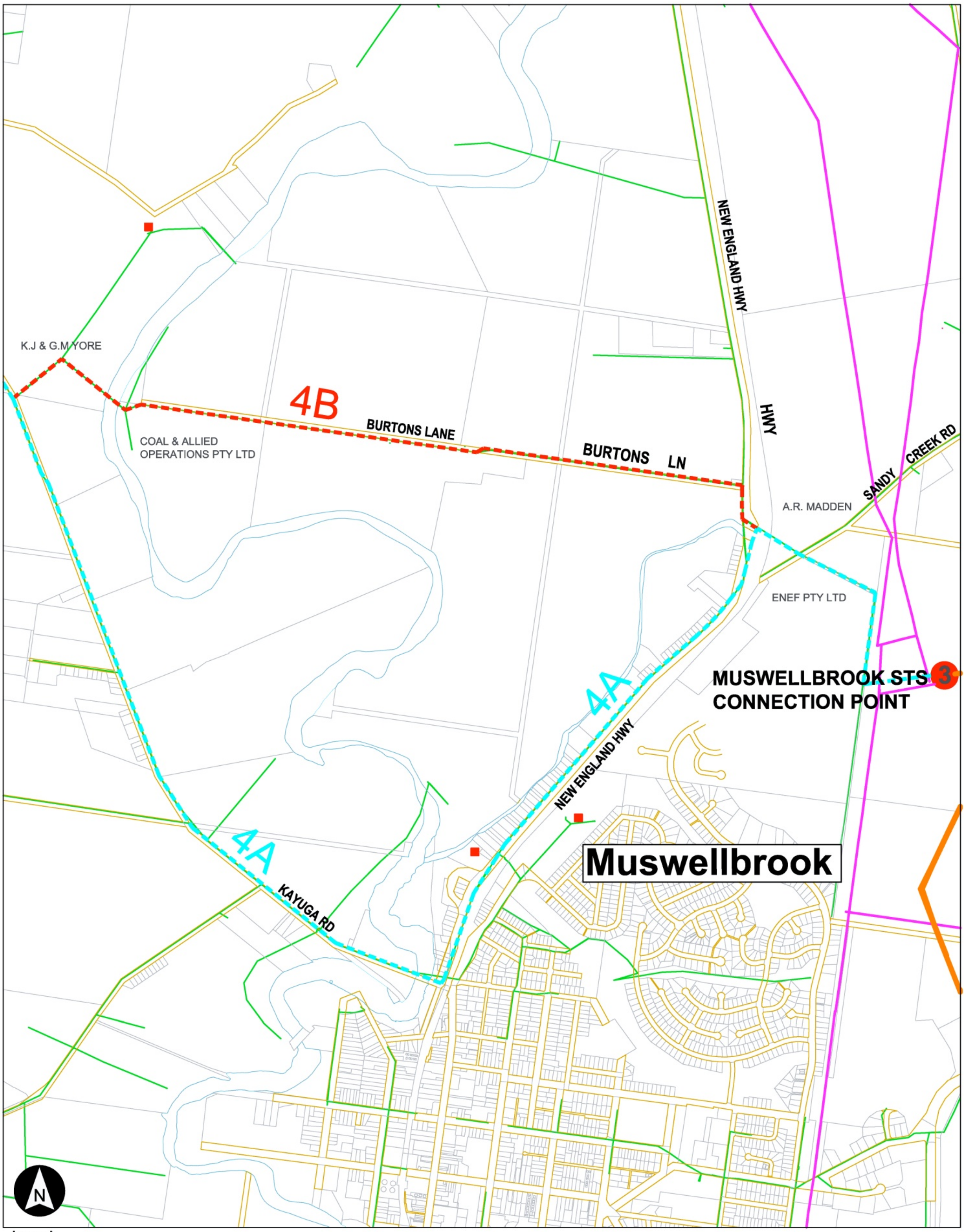

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Figure 19.5 - Prefered Transmission Option 4 (Muswellbrook Detail)

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19.3 Community Consultation

Pamada initially set up a Community Register to engage community and residents and gain feedback on the proposal. Ongoing community consultation including face to face meetings with residents, group meetings and general feedback has resulted in feedback over the proposed line route options for the Kyoto Energy Park.

Further information was gained during a Community Information Day was held at the Scone Equine Centre on Saturday 16th February 2008. Some 150 local people attended the day and 56 feedback forms were received based on various issues including overhead line route implications. Diagrams were displayed at the Day showing locations of proposed line routes for public comment. Some of the residents have expressed concern with line route locations mainly visual impacts and EMF implications for health. Consultants were available on the day to review comments from the public.

Comments received from the Community Day and ongoing discussion with individual members of the community were taken into account in the assessment. This generally translated into bypassing areas in residential zones, built up areas and houses located close to poles in road reserves. Many people were concerned that a tower type structure was being considered and potential health and visual impacts on the landscape from the pole infrastructure.

Visual mitigation factors have been summarised in Section 19.4.6. Further analysis of EMF implications have been addressed and summarised in Section 19.4.8.

19.4 Environmental Assessment of Proposed Transmission Line routes

Environmental and social assessments were undertaken for four line route options identified in the Vemtec report including:

- Flora and Fauna Surveys for line route options (Conacher Environmental Group)
- Aboriginal cultural assessment (Myall Coast Archaeology)
- European Heritage Impact (Myall Coast Archaeology)
- Soil Management (HDB Town Planning)
- Fire Risk (Conacher Travers)
- Visual impact assessment (Integral)
- Noise Compliance (Wilkinson Murray)
- Impacts of Electro Magnetic Fields – EMF (Vemtec)
- Landuse Issues (Vemtec/HDB Town Planning)
- Community Consultation (HDB Town Planning/Pamada/Key Insights)
- Government Consultation (HDB Town Planning/Pamada)
- Consultation with Utilities (Econnect/Vemtec/Pamada)

The findings and recommendations resulting from these investigations are summarised below and discussed in reports contained within relevant Appendices.

Recommendations for mitigation strategies have been included in the Statement of Commitments in Section 20.6.3 to this report.

19.4.1 Flora and Fauna Impact

Preferred Line route options predominantly follow existing roads and it is proposed that all transmission lines will be contained within road reserves and existing easements where possible. A full inspection of proposed transmission line route corridors was undertaken on separate occasions by:

1. Vemtec Pty Ltd – to identify remnant vegetation along line routes that would impact upon line route feasibility, and;
2. Conacher Environmental Group to determine if any threatened flora and fauna species were evident along route lines.

Vemtec identified small stands of remnant vegetation along Bunnan Road in the vicinity of the two sites. Selective trees may need to be removed as pole structures will be required on both sides of the road reserve to allow for communication lines between the two sites. Minimising the impact on existing remnant vegetation, will be a high priority during line construction activities. It is anticipated that remnant vegetation may only have to be removed in circumstances where:

- no viable alternative can be determined (e.g. agreement can not be reached with private land owners to deviate around remnant vegetation);
- the vegetation species presently, or are likely in future, to infringe upon the required electrical clearances stipulated under appropriate electricity industry

No threatened species were observed by Conacher during there inspection of line routes. No significant environmental constraints were observed during line route studies. The remnant vegetation along proposed line routes consisted mainly of disturbed vegetation with scattered tree species such as Ironbark, White Box, Grey Gum, Forest Red Gum, Angophora and Callitris. Any vegetation removal would only require removal of occasional trees.

In the original Vemtec line route survey some remnant vegetation was noted along Bunnan Road in the vicinity of Mountain Station that may require removal during the upgrading of overhead lines. Following the Vemtec assessment Conacher surveyed the line routes and for ecological significance. Conacher noted that a negligible amount of the EEC, mostly isolated trees, may be required to be removed for the construction of the transmission line from the northern end of Mountain Station (66kV and 132kV) and southern end of Middlebrook Station (33kV) to the Bunnan road reserve. The selective removal of the EEC within adjacent properties as above has been included in the vegetation removal summarised in Section 8.2 of this report. A summary of the Conacher survey is provided in Appendix A Section 5.3.2.

It is therefore considered that the construction and operation of the transmission line routes required to connect the Kyoto Energy Park to the electricity grid will have a negligible impact on biodiversity, flora and fauna for all line routes.

19.4.2 Aboriginal Cultural Assessment

All line routes were inspected by the Myall Coast Archaeological for the presence of Aboriginal artefacts, objects, or any impacts on places of Aboriginal heritage significant. No places of Aboriginal significance were observed along external line routes by the consultant, or the presence of aboriginal artefacts or objects.

Line routes are mainly located along existing line routes and road reserves, and would require replacement of the existing wooden pole configurations with new concrete pole configurations. Final pole configuration (i.e. 66kV or 132kV) will depend on final capacity of the Kyoto Energy Park facilities.

If Aboriginal Objects or artefacts are discovered during pole excavation works or during ground disturbance, then all work shall cease and appropriate strategies for mitigation of impacts shall be developed in consultation with the Aboriginal Stakeholders and in accordance with the Act.

19.4.3 European Heritage Impact

Assessment methodology

The proposed line transmission infrastructure was assessed to determine firstly if any known items of heritage existed along any of the proposed line route options and potential impacts associated with the a) location of the transmission infrastructure in relation known items of heritage and b) if transmission construction works could potentially damage the known Item.

Myall Coast Archaeological Services initially investigated and surveyed four (4) possible line route options for connection of the Kyoto Energy Park to the electricity grid. Based on studies as discussed in this section Pamada are considering two (2) options for connection Option 2 and Option 4. The final option will be selected based upon the final design considerations as discussed in Section 19.8.

European Heritage Impact

Both preferred options for connection including Option 2 (66kV) and Option 4(132kV) involve replacement of existing distribution lines (11kV) along existing networks. The proposed upgrade works in the vicinity of the known items are likely to consist of changing the pole material and configuration from timber to concrete. Some poles will be replaced with new timber poles generally in areas closer to towns or in character with existing residential zones with timber pole structures. The proposed changes are in line with best practice for electrical transmission purposes and generally replaced as required.

Pole Configuration and Heights

The existing network in the vicinity of the Kyoto Energy Park consists of 11kV timber poles, typically 11 to 12.5 metres high, with conductors arranged in a horizontal fashion (see Figure 19.6 below on the left). During upgrade works these poles would be replaced by concrete poles in similar arrangement to that shown in Figure 19.6 on the right. Concrete poles would be painted olive green to blend into the environment.

New concrete poles (66kV and 132kV arrangements) would be typically 18.5 to 26 m in overall height dependent on final line design considerations (pole application, numbers of conductors, spacing and strength of foundation material at pole base). The 11kV conductor arrangement would be replaced on these new poles at a distance of about 2.5m below the lowest high voltage conductor. Standard 66/132kV line and pole construction assemblies are provided in *Appendix M –Vemtec 21 April 2008.*

Figure 19.6 Photographs showing existing timber poles (left) and proposed replacement concrete poles (right) (Energy Australia 2007)

Line infrastructure works would require pole foundations to be excavated with an auger fitted to a truck or small excavator. Poles would then be concreted into place, prior to 'stringing' of overhead lines. The overall depth of pole excavation would be 2.5 – 3.5m depending on pole spacing, foundation strength, line tension and also pole application (e.g. terminal or intermediate pole).

Vibration would not be a concern as pole foundations would be excavated in compacted alluvial deposit typical of the Hunter alluvial sediments. Excavation in solid rock would generally not be required. If required it would be limited to routes accessing the site or within the sites, at considerable distance from any Heritage Items or other building structures.

In consideration of the above factors all identified Heritage Items were found to be at sufficient distance from any proposed line works for vibration to be considered an issue for further consideration.

Option 2 - 66kV connection to the new Scone STS

Preferred variations routes to the south of Scone township are shown in Figure 19.3 including Options 2A and 2B. These options bypass the Heritage Conservation Zone and most heritage items. Variations 2A and 2B were found to pass within relative proximity to four known items of local heritage (Listed on Schedule 3 of the Scone LEP). Three of the known items were found to be at sufficient distance to not have any impact. The fourth know item which passes a petrified stump located on the road verge on Moobi Road (see Figure 19.4).

The petrified stump is a protected by a cage as it is situated alongside Moobi Road as shown in Figure 19.7 below. The petrified stump is a geological item that is close to the road pavement and existing transmission line infrastructure.

Proposed works include replacing the existing pole and line infrastructure with a new 66kV line configuration. Any damage to this item is unlikely however measures would be adopted during construction to ensure this does not occur. It is recommended that the closest pole near the petrified stump be placed the maximum distance possible.

Figure 19.7 Petrified stump in cage, Moobi Road (Line Route Option 2)

Option 4 - 132kV connection to the Muswellbrook STS

Option 4 includes a connection to the existing Muswellbrook STS as shown in Figure 19.6. This route will require the replacement of existing 11kV distribution line with a new 132 kV pole configuration. The proposed route (with proposed variations) is illustrated in Figure 19.2 and 19.5. All routes have been assessed and are at sufficient distance from any heritage items to ensure there is no impact to these items.

European Heritage Recommendations

Myall Coast Archaeological made the following recommendations:

- The petrified stump is protected by a cage structure as it is located close to the road edge. Any damage to this item is unlikely however measures will be adopted in the CEMP to ensure this does not occur. It is recommended that the closest pole near the petrified stump be placed the maximum distance possible.
- Option 2B (Figure 19.3) or a combination of 2A and 2B would be the preferred option from a precautionary heritage approach.
- Option 4 (Figure 19.5) involving a 132kV line will replace existing distribution lines over the route and will have no impact on known items of European Heritage.

19.4.4 Soil Management

Depending upon specific land conditions and the time of year line construction activities are undertaken, there is a possibility that some areas along the line route may suffer from furrowing or pasture damage, arising from the passage of heavy vehicles and equipment, particularly across private easements.

Preventative and remedial measures can however be undertaken, to limit such impacts. These include, but are not limited to:

- reinstatement of affected areas;
- establishment of agreed access procedures with land owners, to minimise vehicle movements on the property and avoid sensitive or significant land areas etc.
- scheduling of the construction activities to times of dry weather conditions (i.e. summer)

19.4.5 Fire Risk

If the transmission line construction activities are conducted during periods of high fire risk, the passage of vehicles over paddocks and/or vegetated areas, could introduce a potential fire hazard. In order to mitigate or limit this risk, all construction crews will be required to carry suitable fire suppression equipment, when undertaking works during declared fire risk periods. The passage of vehicles and equipment could introduce a small risk of fuel/oil spillage during the works. Construction contractors will be required to carry appropriate oil spill containment kits.

19.4.6 Visual Impact

The visual impact of the transmission lines were addressed as part of the comprehensive Visual Impact Assessment (*Appendix B*) conducted by Integral Landscape Architecture and Visual Planning. Integral inspected line route options and visual impacts of existing infrastructure.

Visual impact assessment included recommendations for line routes and recommendations for mitigation of visual effect associated with pole structures. The final line route will be based mainly on final design capacity of the Kyoto Energy Park (see Table 19.0) with two (2) options available. Regardless of this, the lines will predominantly be located on road reserves replacing existing power poles. The installation of new, taller poles will occur and with the increased height comes increased visual effect.

The preferred line route options are 2 and 4. Following final route selection, a detailed visual evaluation will provide visual mitigation strategies, for the preferred line route option.

19.4.7 Noise Compliance

Noise impacts were assessed as a part of the comprehensive Noise Impact Assessment (*Appendix D*) undertaken by Wilkinson Murray Pty Ltd . Overhead powerlines would either replace existing lines or be constructed as new lines, for connection of the Kyoto Energy Park to the grid.

The noise assessment undertaken by Wilkinson Murray recommended that noise levels would be predicted to exceed criteria for a few days at residences within 200m of the line alignment. Transmission Line route Option 2 and 4 would be the most favourable route based on these noise criteria. These options bypass the least numbers of residencies in proximity to the line routes.

The assessment concludes that given the large distances from the Kyoto Energy Park to the residences, vibration from construction would not be perceptible.

19.4.8 Electro Magnetic Fields (EMF)

Vemtec Pty Ltd made an assessment of potential impacts of Electro-magnetic fields on household residencies in the vicinity of the proposed line route options.

In Australia, the determination of recommended maximum EMF exposure limits is governed by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) administered through the Australian Radiation Protection and Nuclear Safety Act 1998 and Regulations 1999 and by other regulatory instruments and public health organisations.

There are currently no specific Australian Standards regulating exposure to power line frequency EMF's. ARPANSA references the current standards as the "Interim guidelines on limits of exposure to 50/50 Hz electric and magnetic fields", as issued by the National Health and Medical Research Council (NHMRC).

In December 2006 ARPANSA introduced draft standards known currently as 'Radiation Protection Standard – Exposure Limits for Electric & Magnetic Fields - 0Hz to 3kHz". These standards are still in draft form but introduce a 'basic restriction' to ensure that there is no biological effect leading to adverse health outcomes as follows:

EMF Compliance

During the investigation stages of the project all transmission line routes were surveyed by Vemtec and Pamada for potential landuse restrictions. The Kyoto Energy Park proposes to utilise either 66kV or 132kV transmission lines for connection of the Kyoto Energy Park to the local electricity grid. These line routes are proposed to utilise existing alignments with upgrades, mainly in road reserves, while bypassing built-up areas with houses located adjacent to existing line infrastructure. Potential impacts of EMF on surrounding houses both present and future (based on landuse zonings) were considered along all line routes.

EMF's decay exponentially as a function of distance from their source. This means that the EMF arising from the transmission line network will diminish rapidly with distance from the line route. Figure 19.8 below, provides a typical cross section EMF profile of a 66kV and 132kV line operating at full current rating or Kyoto Energy Park capacity.

This graph shows that typical Magnetic Field strengths (mG), measured a metre from the ground at a distance from the line.

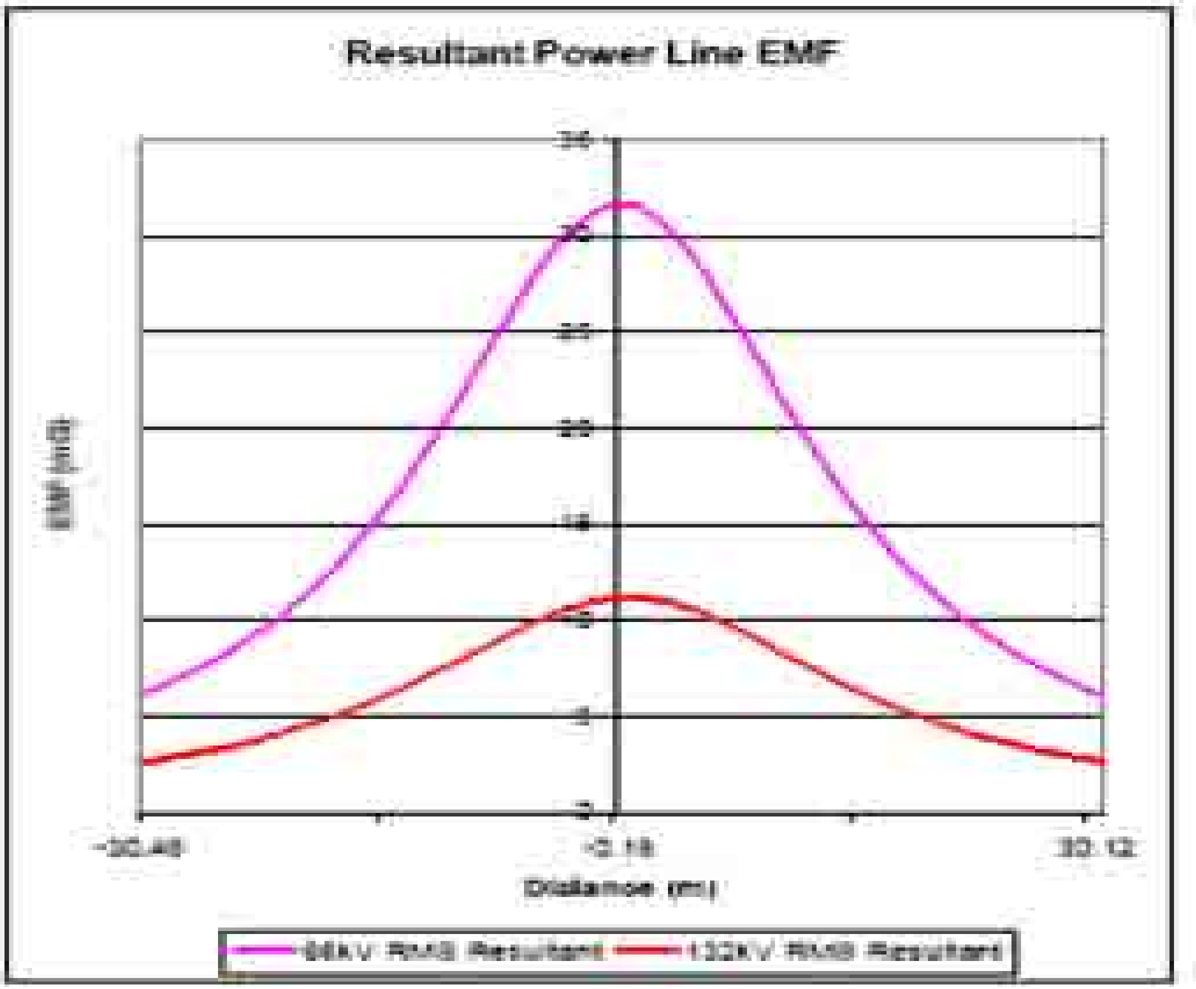

Figure 19.8 Typical 66,000 & 132,000 Volt Line EMF Profile (Vemtec 2008)

EMF compliance with both the NHMRC (current guidelines) and the ARPANSA (draft standards) are assessed in Table 19.1 below.

Thus it can be established that given the use of the standard construction design as per the drawings outlined in the Vemtec report entitled line configuration table (or similar) the EMF exposures will be managed at levels well below the currently accepted limits. No potential impacts from EMF were found in the assessment.

Table 19.1 – EMF Compliance with NHMRC and ARPANSA standards

Electro Magnetic Field (EMF) Compliance

Line Configuration	NHMRC Standard (Current)		ARPANSA (Draft 2006)	
	(General 24 hr Exposure) (mG)	EMF @30m (mG)	General Public 50HZ (micro Tesla)	EMF @30m (micro Tesla)
66kV Configuration	**1000**	**6**	**100**	0.624-3.16
132kV Configuration	**1000**	**2.5**	**100**	0.26-1.12

19.4.9 Landuse Impacts

No significant landuse issues or constraints were observed with the preferred line route options, however built up areas and rural centres and residential zones have been avoided where possible. Line routes are predominantly located in road reserves, road easements and transmission line easements. Some variations are proposed to utilise easements over private property to bypass built up areas in the vicinity of Scone (Option 2) and Muswellbrook (Option 4). Acceptance of these variations would be subject to negotiations with respective private landholders following receipt of approval for the overall project. These proposed variations to line routes over private land are represented as Option 2B, Scone (Figure 19.3), Option 2B, Moobi (Figure 19.4), and Option 4B, Muswellbrook (Figure 19.5).

Figure 19.9 below illustrates the landuse zonings for Transmission Option 2 within the Scone Local Government Area (LGA). As shown the route has been chosen to avoid main roads and built up areas while replacing existing distribution networks (11kV) mainly within existing road reserves.

Figure 19.10 below illustrates the proposed route for Option 4 (Dartbrook Mine/Muswellbrook STS Connection) north of Muswellbrook and within the Muswellbrook LGA. This proposed route would replace mainly replace existing distribution lines (11kV) as shown.

Figures 19.9 and 19.10 also highlight variations (represented as 2B,4B) for these routes. Figure 19.9 highlights transmission line option 2 in relation to local zonings of the Scone LEP 1986, being the current legislation. Figure 19.10 highlights transmission line option 4 in relation to local zonings of the draft Muswellbrook LEP 2008. It is important to note that the permissibility of transmission line networks against local zonings is not an issue as the proposed transmission line works would be permissible without consent under Division 5, Clause 41 of the Infrastructure SEPP as the Proponent meets the definition of an “electricity supply authority” and the works meet the definition of “development for the purpose of an electricity transmission or distribution network” (see Section 4.3.7).

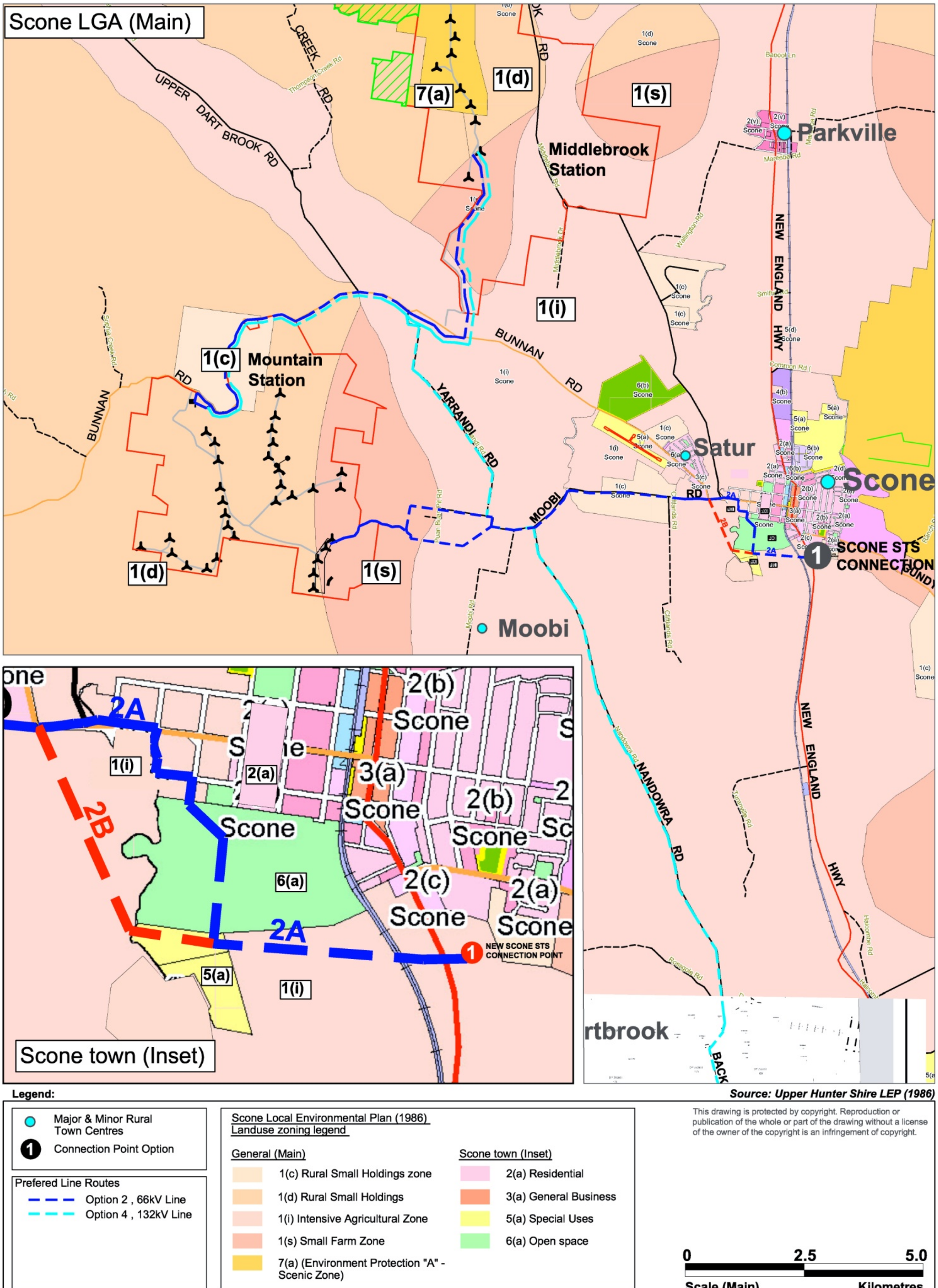

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Figure 19.9 - Line Route Option 2 and 4 - Landuse zoning (Scone LGA)

pamada A4

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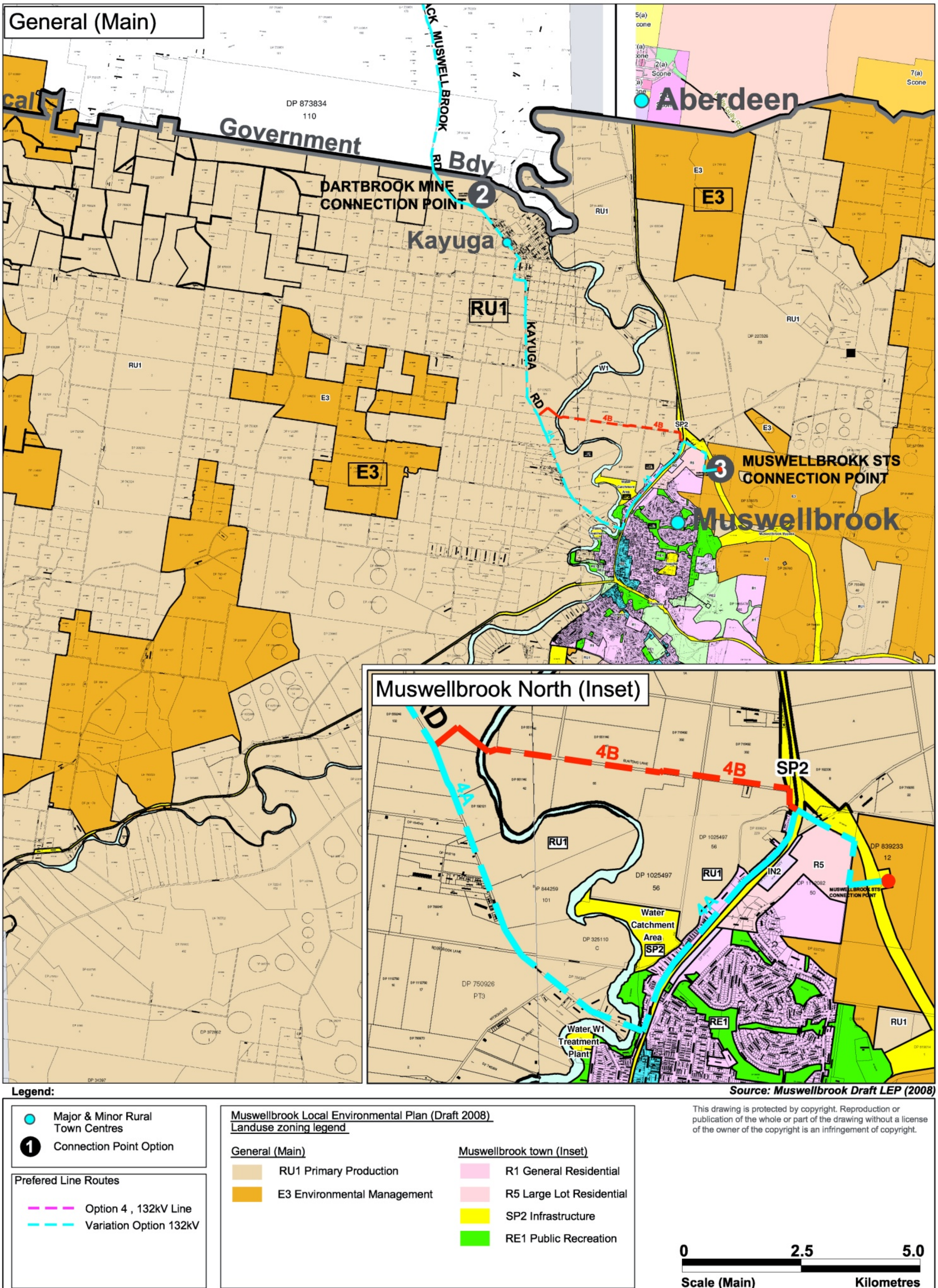

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Figure 19.10 - Line Route Options - Landuse zoning (Muswellbrook LGA)

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19.5 Government Consultation

Four options for connection were considered in the assessment. Energy Australia advised that the most favourable option was Option 2 (66kV connection to Scone STS) and Option 4 (132kV connection to Muswellbrook STS). The Upper Hunter Shire Council confirmed preference was for Option 3 and Option 4 as this route bypasses existing residential landuse zones and Scone.

19.6 Consultation with Energy Australia/Transgrid/NEMMCO

On 22 August 2007, Econnect lodged a Connection Inquiry (on behalf of Pamada) with Energy Australia for connection of approximately 90MW of renewable generator capacity (wind solar and mini-hydro) to the existing Energy Australia network. A response was received from Energy Australia on 13 December and 18 December 2007.

Ongoing consultation with Energy Australia has taken place since lodgement of the original Connection Enquiry. Energy Australia were supplied with the line route investigation undertaken by Vemtec into possible feeder routes from the Kyoto Energy Park to connection point. The Vemtec report included 3 possible connection options and 4 line route options. Pamada received comments back from Energy Australia on 30 July 2008.

A meeting was held with NEMMCO in August 2008 regarding connection options. NEMMCO indicated that they are currently undertaking a load stability analysis of the Upper Hunter network. NEMMCO also indicated that the 132kV connection may be the best option for the Kyoto Energy Park connection to reduce fault level potential with the 66kV connection.

In summary Energy Australia expressed reservations over connection to their 66kV network at any location with potential impacts associated with voltage regulation, stability, loading and protection. Energy Australia recommended that a detailed system analysis is undertaken at the time of system design for any connection. Energy Australia preference was for Option 4 (132kV). Second preference was for Option 2 (66kV) to Scone.

19.7 Final Transmission Design Considerations

19.7.1 Private Easements

Where possible, line routes shall follow existing roads, and be contained within the road reserve. The two preferred line routes options for electrical reticulation include provision for easements across private land. During final design of the line route affected landowners will be consulted on a broad range of issues.

Such issues may include:
- Agreement from the landowner to encroach upon or pass the land (i.e. create and easement for transmission);
- Subject to and agreement a preference for line route for example a land owner may prefer the line route to run adjacent to an existing fence line or property boundary;
- Current land use and future development plans for the property (if any);
- Seasonal access conditions or other relevant constraints, which may have a bearing on where and when line construction activities could be undertaken.

Assuming an agreement is reached between a land owner and Pamada for the line route to encroach upon, or pass through private property:
- An easement will be registered on land title documents in favour of the Line owner Easement widths shall normally be as specified in NS 143, or in any supporting documentation prepared justifying the need for departure from these standards. The width of an easement is defined by its function and the various tasks necessary to operate and maintain the asset it covers. It should also ensure that no unreasonable safety hazards are created for the owner of the land or the public generally. The principal determinant of easement width for overhead lines is safety clearances and conductor blowout distance.
  The typical easement widths as specified by Energy Australia are
  - 33,000 V (33kV) = 15/20metres
  - 66,000 V (66kV) = 20 metres

- 132,000 V (132kV) = 30 metres

This would generally represent the maximum width of easement for most cases of span lengths and specific terrain issues for the Kyoto Energy Park.

- The legal costs of establishing the easement on the Land Title will be borne by the developers. If a land owner wishes to obtain their own independent legal advice concerning the establishment of the easement, such costs will be borne by the land owner;
- Typically, the land owner is compensated for the establishment of an electricity easement. Common industry practice is to consider factors such as the market value of the area occupied by the easement, the number of poles and/or pole support “stays” on the property, and effects on existing land use

Easement widths given above are maximum widths but could be reduced based on pole spacing and function determined during final design of lines. Transmission easements have been located to minimise clearing of trees, and to reduce visibility from neighbouring houses. Clearance of vegetation surrounding line infrastructure would be undertaken in accordance with Energy Australia Standard NS179 Vegetation Safety Clearances (April 2002). Selective vegetation clearances would be required around poles (at 3m radius) and along lines as specified in Table 1 of NS179. Shrubs and other vegetation to a height of 3m would not be cut.

The preferred route for power reticulation to the connection point would be finalised taking into account commercial discussions with Energy Australia and final design phases during the connection agreement.

Figure 19.11 Typical Concrete Pole Configuration (Energy Australia 2008)

Transmission line Option 2 includes

19.7.2 Transmission Line Standards and Design

The existing transmission system in the area consists of an integrated 11kV network servicing local properties. Line works would involve replacing existing 11kV network along the final line route as required with a 66/11 or 132/11 kV pole arrangement. These poles would be designed to accommodate existing communications lines as per Energy Australia standards. Pole arrangements interconnecting Middlebrook Station to Mountain station would consists of 66/33/11 kV pole arrangement. Separate poles may be used for communications only between Middlebrook and Mountain Station sites along Bunnan Road. The new transmission lines would be supported on either concrete or wooden pole structures, where possible replacing the existing 11kV wooden poles. Power pole heights would vary depending upon pole type, configuration and use. Pole would be spaced approximately 100 – 150 metres apart depending on terrain. Options for pole configuration have been fully described in *Appendix N Vemtec Pty Ltd – Kyoto Energy Park Scone Overhead Powerline Route Review*.

Concrete pole configurations are the preferred pole configuration for the area and will be used in preference to existing timber poles (see typical configuration Figure 19.9). Where a new line requires the upgrading of an existing line to some extent, the existing poles shall be used where suitable. If this results in a predominantly timber line, then any new poles shall normally also be timber, although concrete poles may be used where access or environmental conditions make it more appropriate.

It is proposed that all transmission line infrastructure works external to the site shall be dedicated to the network distributor (Energy Australia) for ongoing management and maintenance subject to final negotiation. Transmission line infrastructure internal to the site including the site substation would most likely be owned and maintained by the proponent. During decommissioning only internal transmission line infrastructure would be decommissioned and removed including all internal cabling, networks, and site substation.

All line works shall be in accordance with Energy Australia methodologies and standards including line work in close proximity to waterways and rail lines. Lines would be strung across waterways and would not interfere with the flows or hydraulic or geomorphic functions of the waterways. Final line and pole design shall take into account pole configurations around waterways and design parameters. All lines including pole design, material and configuration, upgrading of existing lines shall be undertaken in accordance with Energy Australia's standard NS 135. Vegetation clearing shall be in accordance with Energy Australia standard NS 179 Vegetation Clearing. Pole boring and pole erection shall be in accordance with NS 128. Pole positioning shall be in accordance with NS 167.

19.7.3 Line Construction Environmental Management Plan

A Line Construction Environmental Management Plan (LCMP) will be implemented for line construction works to minimise the impacts from line construction operations on the local community, surrounding properties and effected landowners. Planning and implementation of the construction activities associated with the new line will take into consideration the following issues:

- any seasonal or other land access restrictions likely to influence construction activities;
- logistics and materials storage considerations;
- the number and availability of accredited construction resources and contractors;
- minimising both the number and duration of disruptions to the power supplies of customers affected by the construction works;

During the construction of the line, it is proposed to inform affected land owners and the broader community, of key project planning and construction activities, by periodic correspondence and/or local media announcements.

19.8 Preferred Connection Option

The preferred connection option and associated line route has not been decided. Matters requiring resolution include:

- Final overall generation capacity of the Kyoto Energy Park. Final design capacity currently estimated between 93 to137 MW. A number of factors may impact on this final capacity including Aviation impacts on Middlebrook station, Wind Turbine Capacity (2.1-3 MW) and solar PV Plant size (3-10MW);
- Assessment of the impact of loads coming on line (eg new mines) on the overall network at time of Connection Application;
- Further studies to quantify the impact on the local network post network upgrade, steady state voltage and voltage fluctuations, a detailed fault analysis of the network for each option based on final capacity.

The preferred options for connection and Transmission Line route Options 2 (66kV) and 4(132kV). These options involve variations to bypass town subdivisions and the central township in general. The line routes predominantly follow road reserves, existing transmission easements and along existing lines but also allow for more direct routes through private and public land reserves. No discussion with directly affected landholders has been undertaken in this assessment.

The final recommendations for connection options are summarised below:

Table 19.2 Preferred Connection Option

Final Kyoto Energy Park Capacity	Preferred Option	Recommendations
Final capacity of Kyoto Energy Park <90MW	Line Route Option 2 (see Figure 19.2/19.3/19.4)	• Perform detailed power studies for Option 2 to quantify impact on the local network post network upgrade • Prepare and submit a Connection Application to Energy Australia for Option 2. • Discuss possible private easements with landholders for nominated variations. • Environmental mitigation measures will be formulated in a Line Construction Management Plan which will include recommendations, environmental management and mitigation procedures for electrical and line construction works.
Final capacity of Kyoto Energy Park >90MW	Line Route Option 4 (see Figure 19.2/19.5)	• Prepare and submit a connection application to Energy Australia for Option 4 providing additional capacity up to estimated 160MW • Discuss possible private easements with landholders for nominated variations. • Environmental mitigation measures will be formulated in a Line Construction Management Plan which will include recommendations, environmental management and mitigation procedures for electrical and line construction works.

19.9 Conclusion

Three (3) options for grid connection and four (4) associated line routes were initially following site inspections and analysis from consultants and Energy Australia. These initial options are summarised in Table 19.0.

Transmission route constraints were identified following extensive consultation with government departments including key stakeholders (Upper Hunter Shire Council, Energy Australia) and specific feedback obtained from Community consultation and environmental consultants.

All line routes were surveyed and assessed by individual environmental consultants. Recommendations for environmental considerations are summarised in Section 19.4. Recommendations from government departments and utilities are summarised in Section 19.5 and 19.6 respectively.
Design requirements for line and pole configurations are summarised in Section 19.7. Commitments in relation to line transmissions are made in Section 19.7.3 and Section 20.6.3 Draft Statement of Commitments.

Following this two preferred options for connection were identified for connection of the Kyoto Energy Park to the local grid. These two options are referred to as Option 2 (66kV connection to Scone) and Option 4 (132kV connection to Muswellbrook), see Section 19.8

Energy Australia are currently augmenting the local substation and distribution network in the Muswellbrook to Scone area. This work has been planned to replace outdated substations and lines and strengthen the existing network in the region. A summary of these works is provided in Section 19.1.2.

To fully understand the impact of the connection of the Kyoto Energy Park to the network and design solutions would require detailed evaluation and flow and safety analysis modelling of the Kyoto Energy Park and network integrity at the time of connection. Capability of the network capacity would be further assessed during the preparation of a Connection Application submitted to Energy Australia at the time of connection. As part of this application Energy Australia would undertake a load flow and protection analysis for the Energy Park at the time of connection.

Kyoto Energy Park Scone is wholly an Australian Enterprise. The Management is 100% Australian.

The funding of this proposal and report is 100% Australian.

An Australian Project

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Kyoto energypark

20. Safety and Environmental Risk

20.0 SAFETY AND ENVIRONMENTAL RISK

20.1 Health and Safety Risks

In relation to the implementation of development projects, “Safety” relates to potentials to adversely impact on the wellbeing of individual humans. Main “Safety” issues that were identified over the construction and operation phases of the project.

Safety aspects during the decommissioning or replacement stage would be mainly limited to the dismantling of wind turbines and transportation from site similar to activities identified during construction.

20.1.1 Construction Safety

The main safety risks have been identified during the construction phase of the project include:
1. Transportation of large elements and traffic safety;
2. Handling, heavy lifting and erection of wind turbine components, including excavations and turbine assembly / working at heights;
3. Bushfire Risk during construction activities.

Transportation of wind turbine components

Potential traffic safety risks were identified in Section 17.0 and *Appendix J-Traffic and Transportation Impact Assessment*. These risks are summarised as follows:

Traffic regime disturbance and increased potential for traffic incidents as a result
Transportation of oversize/overmass components
- The preferred transportation route is via heavy vehicle routes. Some minor works will be required on local roads in the vicinity of the Kyoto Energy Park site.
- Site access points have utilised the exiting access point on Middlebrook Station which has adequate site distance and is safe for ingress and egress of heavy vehicles. The current site access point has been relocated on Mountain Station to provide adequate site distance for approaching vehicles and safety
- An experienced haulage contractor would be used under a contractual arrangement with the main contractor. The main construction contactor shall be responsible for overall management of the Haulage contractor in accordance with the CEMP and sub management plans.
- A Traffic Management Plan (as part of the CEMP) shall be adopted for management of traffic during construction and operation of the Kyoto Energy Park.
- Access tracks will be designed to be safe, all weather accessible, maintained with appropriate construction and erosion and sedimentation controls.

Handling and Heavy Lifting activities

The operation of a Wind farm is a relatively safe technology. In over 20 years of electricity generation with more than 100,000 machines installed worldwide, no member of the public has ever been injured in the operation of a wind farm. Since the early 1970’s the wind energy industry has experienced 14 worker fatalities worldwide, directly or indirectly during wind farm construction or related accidents. All of these deaths could have been prevented if today’s safe work practices had been adopted (AusWEA 2004).

According to the Construction, Forestry, Mining and Energy Union (CFMEU), mining is the most dangerous occupation in Australia. Coal miners for example have a 1 in 28 chance of being killed over their 40 year working life. Figures obtained from the International Labour Organisation (ILO) show that miners account for 1 per cent of the global workforce yet contribute seven per cent of global work fatalities (Westwick-Farrow Pty Ltd 2006).

Construction of wind turbines can potentially be a safety hazard and the risk needs to be controlled and managed. Potential site safety issues include:
- Transportation, operation of heavy machinery on site
- Transportation, handling and erection of heavy components at Port and on site.
- Erection and Maintenance of wind turbine structures at height.

l risks associated with construction and operation of oversize and overmass components including operational risks at height will be comprehensively addressed in a Site Health and Safety Plan.

Bushfire Risk
A Bushfire Risk Assessment was undertaken by Conacher Environmental Group for the Kyoto Energy Park project (*Appendix C*) and summarised in Section 18.0 of this report. Bushfire risk controls shall be introduced into a Bushfire Risk Management Plan (BRMP) for the site prior to construction commencing. Bushfire risk from operations will be required to be managed to prevent incidental ignitions and allow for emergency procedures.

20.1.2 Operations Safety

The main safety risks have been identified during the operations phase of the project include:
1. Impacts on aircraft safety;
2. Electrical Safety;
3. Bushfire Risk associated with operations;
4. Electro-magnetic fields (EMF);

While there are other potential impacts resulting from the proposed development, none of those poses a threat to individual safety.

Impacts on Safety of Aircraft
The specialist Aviation report completed by Garrad Hassan Pty Ltd (*see Appendix E*) identified potential hazards for aircraft using the local Scone aerodrome. The assessment concluded that no impacts to aircraft was identified from the Mountain Station site.

Two (2) wind monitoring masts are located on Mountain Station. CASA has been advised of the dimensions and locations of these existing facilities in accordance with their recommendations.

A total of eleven (11) wind turbines are proposed for the Middlebrook Station site. Currently seven (7) of these turbines are encroaching flight airspace. Final layout of wind turbines on Middlebrook Station has not been resolved. Final design and layouts are being investigated for these turbines. Final design and layout will need to be assessed and approved by CASA and Air Services Australia prior to construction of offending turbines.

Some private airstrips were observed on rural properties surrounding the sites. Some of these are abandoned and some are used on an infrequent basis, mainly from aircraft originating from Scone aerodrome. As wind turbine structures would be visible additional hazards are expected to be low.

Full details including locations, heights and dimensions of structures will be provided to CASA and the Upper Hunter Council (operators of Scone aerodrome) during construction and upon completion of the Kyoto Energy Park project.

Lighting of wind turbine structures will be in accordance with CASA guidelines.

Electrical Safety
Electrical works for the site would be designed in accordance with relevant standards for design, operation and protection. Final design of electrical systems shall be undertaken subject to receipt of approval for the project.

Bushfire Risk associated with operations
Consideration of ignition of bushfire from operational risks has been considered in this assessment and summarised in Section 18.4.2 of this report. The potential for ignition of bushfires from on site generators is considered low for this development if correct procedures and management practices are put in place and followed. These relate mainly to procurement of new efficient turbines, correct design standards, implementation of proper specialised maintenance on site, environmental management and emergency fire backups. Measures to reduce Bushfire Risk associated with the operations are committed to in the Draft Statement of Commitments provided in Section 20.6.3.

Electro-magnetic fields (EMFs)

The potential for health risks associated with EMFs has been assessed for transmission lines options as discussed in Section 19.4.8 of this report. Line route and configurations have been designed in accordance with regulations and standards related to line configuration and EMF to eliminate potential for EMF related risks from overhead electricity lines associated with the project.

20.2 Environmental Risk Analysis

An Environmental Risk Analysis is an assessment of the impacts likely to affect the environment of a particular project (including human) and involves estimating the effects of a proposed change and the risk of proceeding with it. Assessment of the Environmental Risk can be considered as a series of simple questions:

- What might happen?
- How might it happen?
- Will it be serious if it happens?
- What is the risk?

Methodology

For ease of evaluation, such analyses are usually presented in tabular form to identify the issues raised and provide a comparative analysis of all identified risks. The table below identifies all risks according to timeframe of assessed risks and proposed responses. It is guided by the application of the standard "Quantitative Risk Assessment Matrix" and the "Consequences" terminologies and methodologies set out below.

Answering these questions involves hazard identification, a process that identifies sources of potential harm (what?) and the causal pathway through which that harm may eventuate (how?). This is followed by a consideration of the seriousness of the harm being realised (consequence) and the chance or probability (likelihood) that harm will occur.

Hazard identification, consequence and likelihood assessments together lead to an appraisal of whether the hazard will result in a risk and to make a qualitative estimate of the level of that risk. It is helpful to use terminology that clearly distinguishes between the likelihood assessment, consequences assessment and the risk estimate. Therefore, four different descriptors have been selected for each component that are designed to convey incremental levels of importance.

The descriptors for likelihood are based on those in AS/NZS 4360:2004. The descriptors for consequence address the adverse consequences of events relating to both human health and safety and the environment. The risk estimate is derived from the combined consideration of both likelihood and consequence.

The individual descriptors can be and are incorporated into a Risk Estimate Matrix. The aim of the matrix is to provide a format for thinking about the relationship between the consequences and the likelihood of particular hazards. The level of uncertainty about either or both of these components will determine the estimated risk.

The matrix is designed to be used as a tool in arriving at an indication of likely risk. It is obvious that risks estimated as "High" or "Moderate" will require an appropriate management response.

The principal purpose of the following model analytical table is to provide an objective means of examining in greater depth, all those identified environmental impacts from the proposal which have the potential to cause danger to humans or to affect ecological balance.

Only those impacts previously identified as having potentially negative impacts are examined here. They include the potential risks to human safety, identified in the preceding section.

20.3 Quantitative Risk Assessment Matrix

The methodology reflected in the table is to:

- Highlight negative impacts and then rate those in terms of their "likelihood", "consequence" and "risk".

- Reflect the level of adverse impact in the scale and intensity of response recorded under "Proposed Control/Mitigation Measure".
- Then indicate whether the above adequately addresses the risk and if not, indicate what "further assessments" are required to achieve an appropriate level of on-going management of the risk.
- Indicate whether, following analysis and identification of available mitigation measures, the identified hazard or risk, remains a "Key Issue".

Table 20.0 Quantitative Risk Assessment Matrix

Likelihood or Frequency	Consequence Severity				
	Low (1)	Minor (2)	Moderate (3)	Major (4)	Critical (5)
E – Almost Certain	High	High	Extreme	Extreme	Extreme
D – Likely	Moderate	High	High	Extreme	Extreme
C – Possible	Low	Moderate	High	Extreme	Extreme
B – Unlikely	Low	Low	Moderate	High	Extreme
A – Rare	Low	Low	Moderate	High	High

Table 20.1 Environmental Consequence Table

Severity Level	Natural Environment	Social/Cultural Heritage	Community/Govt/ Reputation/Media
1	Limited damage to minimal area of low significance.	Low-level repairable damage to commonplace structures.	Public concern restricted to local complaints.
2	Minor effects on biological or physical environment.	Minor medium-term social impacts on local population. Minor damage to structures / items of some significance. Mostly repairable.	Minor, adverse local public or media attention and complaints.
3	Moderate, short-term effects but not affecting ecosystem function.	Ongoing social issues. Permanent damage to items of cultural significance.	Attention from media and/or heightened concern by local community. Criticism by NGOs.
4	Serious medium term environmental effects.	On-going serious social issues. Significant damage to structures/ items of cultural significance.	Significant adverse national media/public/NGO attention.
5	Very serious, long term environmental impairment of ecosystem function.	Very serious, widespread social impacts. Irreparable damage to highly valued items.	Serious public or media outcry (international coverage).

ENVIRONMENTAL RISK ANALYSIS

The letters “L”, “C” and “R” in the final Risk Analysis Table respectively represent Likelihood, Consequence and Risk identified in the two reference tables.

Table 20.2 Kyoto Energy Park - Environmental Risk Analysis

Environmental / Other Risk	Potential Impact – Short Term		Potential Impact – Long Term		Overall Risk Assessment			Proposed Control/ Mitigation Measure	Further Assessment Required – Ongoing Environmental Management	Key Issue
	Positive	Negative	Positive	Negative	L	C	R			
1. Transportation, Handling and Erection of Turbine Components		✓	✓		D	1	L	Local roads works to improve safety access to site Traffic Management on local roads Construction of turbines in terms of manufacturer’s guidelines and construction and safety management procedures.	Implementation of a Traffic and Transportation Management Plan as part of the CEMP and OEMP.	No
2. Turbine Rotation - Human Safety		✓		✓	B	0-1	L	None required. Blades above height of human activity	No	No
- Bird Strike Risk		✓		✓	A	1	L-M	Adaptive Management Plan as part of the Bird and Bat Monitoring Plan	No further assessment required for the Australian Hobby, Galah and white Throated Needletail. Adaptive Management Plant to be undertaken for Wedgetail Eagle and Nankeen Kestrel.	No No
3. Aviation - Aircraft Risk (a) CASA		✓		✓	A/B	0-1	L	Obstacle Lighting as per CASA guidelines	CASA to be approached for detailed lighting requirements when turbine design layout finalised	No

Environmental / Other Risk	Potential Impact: Short Term Positive	Short Term Negative	Long Term Positive	Long Term Negative	Overall Risk Assessment: L	C	R	Proposed Control/ Mitigation Measure	Further Assessment Required – Ongoing Environmental Management	Key Issue
(b) Airservices Australia		✓		✓	E	4	H	Issue of consent from Airservices Australia	Further detailed discussion in relation to potential impacts on airspace	Yes
- Blade Glint Risk		✓		✓	A/B	0-1	L	Matt finish painting of all turbine blades	No	No
- Shadow Flicker		✓		✓	A/B	0-1	L	None Required	No	No
4. Noise		✓		✓	D	1	L-M	Impacts fall within acceptable levels at all but one location. Noise exceedance at this location *(Peakhill)* will be managed to achieve compliance.	Ongoing monitoring as provided for in Environmental Management Plan	No
a) Construction	✓		✓		D	0-1	L	No control needed. Noise levels both on site and off-site fall within standard allowable maximum	Noise monitoring to ensure noise compliance with heavy vehicle operations on site.	No
(b) Operation		✓		✓	A/B	0-1	L	Sector management of wind turbines closest to *'Peakhill'* residence under adverse wind conditions, to be part of a Noise Management Plan for the site. Bunding to be installed N-E edge of substation area as a precaution to shield Clifton Hills Estate. SCADA or similar software control package	Comprehensive testing in accordance with OEMP during operation.	No

Environmental / Other Risk	Potential Impact				Overall Risk Assessment			Proposed Control/ Mitigation Measure	Further Assessment Required – Ongoing Environmental Management	Key Issue
	Short Term		Long Term							
	Positive	Negative	Positive	Negative	L	C	R			
								to manage turbine settings		
5. Greenhouse Gas Emissions	✓		✓		B	O	L	Overall considerable positive greenhouse benefit No GHG emissions post construction	No	No
6. Bushfire Risk								Asset Protection Zone (APZ) required around entire location 10,000 litre water tank required.	Monitoring to be component of Environmental Management Plan.	No
(a) Manager's Residence	✓		✓		D	4	M			
(b) Visitor and Educational Centre	✓		✓		D	4	M		A Bushfire Incident and Evacuation Plan	No
(c) Construction Traffic	✓		✓		C	2	L	Construction crews to carry fire suppression equipment.		No
7. Ecological - Risk from Construction Activity		✓	✓		B/C	1	L	Sectioning off protected areas in vicinity of construction works.	Review of impacts post construction, to be allowed for in OEMP and CEMP	No
8. Erosion and Sedimentation		✓		✓	C	1-2	L	Potential hazards identified prior to construction. Management of erosion and sedimentation to be detailed in CEMP and OEMP.	Yes. EMP will allow for recurrent monitoring and review	Yes
9. Visual Impact		✓		✓	C/D	1	L	Screen planting at source in areas identified in Visual assessment where closest residences would otherwise be affected.	Review on basis of post-construction feedback, in accordance with Environmental Management Plan.	No
10. Threatened Species		✓		✓	B	1	L	Monitoring provisions to	Deemed not to be a	No

Environmental / Other Risk	Potential Impact – Short Term – Positive	Potential Impact – Short Term – Negative	Potential Impact – Long Term – Positive	Potential Impact – Long Term – Negative	Overall Risk Assessment – L	Overall Risk Assessment – C	Overall Risk Assessment – R	Proposed Control/ Mitigation Measure	Further Assessment Required – Ongoing Environmental Management	Key Issue
								be included in both CEMP and OEMP re: Threatened flora population; threatened fauna species and endangered ecological community	"Controlled Action" in accordance with DEWH. However, OEMP to include monitoring of impact on bird and bat species.	
11. Biodiversity	✓		✓		B	0-1	L	Possible regeneration of surplus cleared land as vegetation offset under an Environmental Management Plan. Replant areas of White Box – Yellow Box.	No	No
12. Weed Generation		✓	✓		C/D	1	L	Weed control programs to be included in both CEMP and (post-construction) OEMP.	No	No
13. Construction and Connection of Power Line (a) Ecological Risk		✓	✓		C	1	L	Vegetation offset plan to be included in CEMP to compensate for cleared areas.	No	No
(b) Safety Risk	✓		✓		B	1	L	Construction and connection safety procedures to be built into both CEMP and OEMP	No	No
14. Power Supply Fault Levels		✓		✓	D	0-1	L	Ongoing discussions with Energy Australia in terms of Environmental Management Plan.	More detailed power system studies required after Energy Australia's Scone Substation fault level design determined. Planning consent needed for construction of	No

Environmental / Other Risk	Potential Impact				Overall Risk Assessment			Proposed Control/ Mitigation Measure	Further Assessment Required – Ongoing Environmental Management	Key Issue
	Short Term		Long Term							
	Positive	Negative	Positive	Negative	L	C	R			
									substation at wind farm site.	
15. Local Economy	✓		✓		A	0	0	N/A	No	No
16. Land Values		✓	✓		C	1	L	N/A	Review impacts of actions taken in relation to landscape screen management – which will be undertaken as component of EMP	No

20.4 Mitigation Measures to reduce Environmental Risk

The proposal represents an opportunity to reduce long-term environmental damage and risk, but identifies a small number of aspects of the proposal which will require mitigation measures to achieve that objective.

The value of the Hazards and Risks Analysis is that it highlights the capacity of the nominated mitigation measures, to reduce or eliminate the potential risk under examination.

In this instance, it is possible to develop construction-specific and operation-specific management plans which can include mitigation measures to overcome every risk other than those whose extent/scope cannot yet be fully defined. Mitigation measures have been assessed and included in the Statement of Commitments outlined in Section 20.6.3 of this report.

20.5 Residual Environmental Risks

The identified mitigation measures include further discussion and negotiation in relation to the following proposal aspects whose actual impacts cannot yet be accurately identified:

- Easement routes for transmission lines. The final transmission line route cannot be determined until the final capacity of the Kyoto Energy Park is known.
- Location of a maximum of seven wind turbines (Turbine Nos 36,37,38,39,40,41,42) proposed on Middlebrook Station which are penetrating aircraft navigation paths at Scone airport. Further consultation is required into mitigation measures to reduce the impact on aircraft from these turbines on Middlebrook Station. Mitigation measures would be subject to approval from the Civil Aviation Safety Authority.
- Impact on 'Species of Concern' identified in the Bird Impact Assessment. Anticipated possible small adverse impacts can only be tested – with ameliorative action taken adapted in the operational phase.

20.6 Ongoing Environmental Risk Management

The Statement of Commitments (Table 20.3) describes the scope of responsibilities to which Pamada Pty Ltd is committed for the life of the Kyoto Energy Park.

The Statement of Commitments identifies not only how a potential risk will be eliminated or managed, but auditing and management responsibilities for each action.

From the detailed hazards and risk analysis, it is clear that the construction and operation of the proposal can be achieved with close on-going management of only a few potential risk impacts and that even in relation to those, appropriate on-going management and control can be achieved. All potential risks will be identified in the Environmental Management Plan, with the objective to avoid compromising existing ecological/environmental balance by avoiding or appropriately containing and managing potential risks.

20.6.1 Environmental Management Plans (EMPs)

An Environmental Management Plan (EMP) is a document that sets out:

- how potential environmental hazards or impacts would be managed or mitigated (through specific objectives, actions and tasks;
- how all actions and tasks would be implemented (who is responsible, at what stage of the project, and at which locations;
- how implementation of all actions and tasks would be monitored and reviewed to ensure they are implemented and are achieving stated objectives.

Pamada would prepare both a Construction Environmental Management Plan (CEMP) and an Operation Environmental Management Plan (OEMP) following assessment and approval of the project. The CEMP and OEMP would be the primary mechanism Pamada would use to implement all mitigation measures contained in this Environmental Assessment.

Pamada would prepare a CEMP prior to the commencement of construction of the Kyoto Energy Park. The CEMP would form part of the tender documents for construction of the proposed wind farm and the successful tenderer would be required to implement the CEMP as part of their contractual requirements.

The Kyoto Energy Park Company would operate the wind farm and would be responsible for implementation of the OEMP. Both documents would be consistent with the requirements of ISO14001, the international standard for Environmental Management.

Consideration has been given to the industry "best practice" mitigation measures listed in the NSW Wind Energy Handbook (SEDA 2002) and these measures have been included in the project commitments.

20.6.2 EMP Objectives

The objectives of the Kyoto Energy Park CEMP and OEMP would be:

- construction and operation activities are consistent with all statutory and policy requirements;
- all mitigation measures contained in this Environmental Assessment are implemented in these and sub management plans;
- any conditions of consent attached to development approval for the project are implemented and included in the CEMP and OEMP;
- employees engaged in construction and operation of the Kyoto Energy Park are fully informed of and comply with all requirements of each EMP;

provision of clear procedures for managing and mitigating environmental impacts; and provision of a clear management, monitoring and reporting framework to ensure compliance.

20.6.3 Draft Statement of Commitments

A Draft Statement of Commitments has been prepared to detail the environmental management, mitigation and monitoring measures which will be implemented in conjunction with the development of the Kyoto Energy Park project in Scone. A range of ameliorative measures has been designed into the project to minimise any potential identified environmental impact. These measures will be adopted in an Environmental Management Plan (EMP) for the Kyoto Energy Park.

Table 20.3 Kyoto Energy Park- Draft Statement of Commitments

Objective	Mitigation Measures	Responsibility
Environmental Management Plans (EMPs)		
Prepare Environmental Management Plans (EMPs)	**Environmental Management Plans (EMPs)** will be prepared and implemented by qualified environmental specialists for the construction and operation phases of the project to: • Confirm the intention to prevent, minimise, and/or offset adverse environmental impacts identified in this Environmental Assessment; • Establish minimum standards and performance measures and mechanisms to set such standards and performance measures for acceptable environmental performance; • Implement regular monitoring and reporting; • Provide for the overview for environmental management of the development. The Kyoto Energy Park EMPs shall consist of a **Construction Environmental Management Plan (CEMP)**, which shall be prepared prior to construction operations commencing on site, and an **Operational Environmental Management Plan (OEMP)**, which shall be prepared prior to operations commencing on site.	EMPs (CEMP and OEMP) shall be prepared by suitably qualified consultants in accordance with the relevant guidelines and recommendations regarding mitigating measures.
Sub-environmental Management Plans		
Prepare sub- Environmental Management Plans	**CEMP sub plans** shall include: • Air Quality Management Plan • Flora and Fauna Management Plan; • Construction Noise Management Plan; • Erosion and Sedimentation Control Plan; • Bush Fire Management Plan including a Bushfire Incident and Evacuation Plan; • Spill Control Plan; • Waste Management Plan; • Near Neighbour Consultation Strategy; • Water Management Strategy; • Greenhouse Gas Strategy; • Traffic and Transportation Management Plan; • Line Construction Management Plan; • Site Health & Safety plan, for Construction • Site Restoration **OEMP sub plans** shall include: • Air Quality Management Plan • Flora and Fauna Management Plan; ▪ Bird and Bat Monitoring Plan (sub-operational and Operational) • Vegetation Management Plan • Noise Management Plan;	The CEMP and OEMP shall be prepared by suitably qualified consultants in accordance with the relevant guidelines and recommendations regarding mitigating measures.

Objective	Mitigation Measures	Responsibility
	• Erosion and Sedimentation Control Plan; • Bush Fire Management Plan including a Bushfire Incident and Evacuation Plan; • Spill Control Plan; • Waste Management Plan; • Water Management Strategy; • Traffic Management Plan; • Site Health & Safety plan;	
Monitoring and Auditing		
Audit the implementation of the Statement of Commitments and Environmental Management Plans (EMPs)	An audit program will be developed as part of the environmental management plans. This will include regular auditing by qualified environmental consultants during construction and operation of the Kyoto Energy Park as well as internal auditing by contractors and Users.	The proponent commits to such audits as may be required for monitoring
Statutory Planning		
Implementation of Planning controls	• If works are required within road reserves to allow for safe transportation of components to site will require consent under Section 138 of the Roads Act 1993. • A licence under the POEO Act will be required for operation of the temporary mobile Concrete Batching Plant at Mountain Station.	The proponent commits to the implementation of these measures as detailed in the final design stage
Project Management		
Provide effective management during the Construction of the project	Prior to commencement of construction The proponent shall prepare a **Project Management Plan** (PMP) to control overall management of the all aspects of the construction phase and safe delivery of the project. The PMP shall include: • Project details • Project Management Structure and sub management plans • Environmental Management • Health and Safety • Marketing and Communication • Project review and reporting	The proponent commits to the implementation of these measures
Air Quality		
Minimise generation of dust and emissions	An **Air Quality Management Plan** will be prepared as part of the environmental management plan to minimise the generation of dust and atmospheric emissions during the construction and operation of the Kyoto Energy Park. Measures will include:	The proponent commits to the implementation of these measures as detailed in the CEMP and OEMP

Objective	Mitigation Measures	Responsibility
	• Install and maintain erosion and sedimentation control structures Keep areas of open excavation to a minimum • Minimise stockpiling by coordinating excavation, spreading, regrading, compaction and importation activities • Apply water to active earthwork areas, stockpiles and loads of soil being transported to reduce dust. • Vegetate or cover stockpiles where material is to remain on site for a long period of time • Cease work if excess fugitive dust is observed, or phase down while the source is being actively investigated and suppression measures are implemented • Restrict traffic to defined roads and designated works areas to prevent damage to soils and erosion potential • Implement a speed limit on site and measures to control. • Remove soil adhering to the wheels and undercarriage of vehicles arriving and prior to departure from the site • Progressively landscape and revegetate areas as the construction activities proceed with locally grown species.	and associated monitoring
Community Participation		
Proactive community participation and awareness for efficient management during construction phase	• Develop a **Near Neighbour Consultation Strategy** for ongoing proactive engagement and communication with surrounding and adjoining residents. Within this strategy, develop and implement policies which aim to increase project knowledge, increase information and staff accessibility, develop community-staff relations, create proactive engagement with residents, and establish strong relations with residents, especially those surrounding residents who may further require impacts to be directly mitigated or may further be affected by electricity connective infrastructure (I.e. Line easements, power lines and connection upgrades). • Improve community knowledge and strategically relay project information to Scone residents. Develop a quarterly newsletter during construction to be distributed to surrounding residents, key community organisations and stakeholders, and that can be accessed via the Kyoto Energy Park website and be displayed on community noticeboards. • Inform near neighbours and residents, particularly those living on local traffic routes accessing the site roads to the site, of schedule plans, particularly when	The proponent commits to the implementation of these measures as detailed in the CEMP

Objective	Mitigation Measures	Responsibility
	increased levels of traffic or noise are expected to cause a disturbance during construction periods. • Establish and maintain an experienced 'Community Liaison/Relations Officer' position throughout the application, construction and operational phases of the development. This will ensure the community has an ongoing and reliable 'point of contact' with on site Contractors and representatives of the proponent, allowing concerns and questions to be relayed from the community directly to the proponent. • The proponent will continue to operate the website which will be used to publicise information during construction and operational phases. A local number would be advertised in local newspapers and on the website during construction which would have access to site construction management for resolution of issues. Ongoing communication with all community stakeholders to ensure delivery on commitments resulting from the Environmental Assessment. • During the operation of the Kyoto Energy Park, the proponent would facilitate the formation of the **Moobi Foundation** managed by non politically-aligned community representatives selected from the Kyoto Energy Park Company, Upper Hunter Council, Scone Chamber of Commerce, Country Women's Association and others as nominated. Through the Moobi Foundation it is proposed The Kyoto Energy Park Company would provide seed funding for on-going community and education programs. The allocation for funding and relevant programs would be decided by the members of the Moobi Foundation.	
Social and Economic considerations		
Utilise local and regional resources for economic benefits	• Promote Scone and the Upper Hunter region through the proposed Kyoto Energy Park and its associated activities, including tourism and education. • Utilise local and regional industries, businesses, resources and materials during both construction and operation, wherever possible, to enhance the local and regional economy. • Use local materials such as road base, concrete products etc where possible and feasible. • Promote local heritage, history and communities (Indigenous and non-Indigenous) through the on-site Visitors and Education Centre. • Minimise the impact of visiting groups, tourists and schools on local residents by restricting open hours of the Visitors and Education Centre.	The proponent commits to the implementation of these measures as detailed in the CEMP and OEMP

Objective	Mitigation Measures	Responsibility
Greenhouse gas emissions		
Reducing overall GHG production during the construction and operation periods	A **Greenhouse Gas Strategy** shall be prepared to • Review site greenhouse generating activities • Minimise potential greenhouse gas generation from construction and operational activities • Investigate management procedures for site energy efficiency • Outline management procedures for on-site recycling and material reuse The GHGS shall include the following considerations: • Work scheduling and methods that minimise equipment idle time and double handling of material • Switching off the engines of trucks while they are waiting to access the site and while they are being loaded or unloaded. Throttle down or switch off idle construction equipment • Ensure equipment is of a proper standard and not defective and maintained to ensure efficient energy consumption. Regularly maintain equipment to ensure it remains in good condition • Switch off site office equipment and lights after hours and using minimal lighting intensity for security purposes	The proponent commits to the implementation of these measures as detailed in the CEMP and OEMP Comply with mitigation measures in GHGS
Flora & Fauna		
	Subject to receipt of approval for the project The proponent will engage a suitably qualified consultant to prepare a **Flora and Fauna Management Plan** (FFMP). The FFMP shall include measures to protect and enhance flora and fauna during construction and operational phases of the project. The FFMP shall also include a separate: • Bird and Bat Monitoring Plan • Vegetation Management Plan	The proponent commits to the implementation of these measures as detailed in the CEMP and OEMP
A. Bird and Bat Monitoring Plan		
	Commence an **Adaptive Bird and Bat Monitoring program** in two parts: • pre-operational • operational Bird and Bat Monitoring procedures are to be included in the EMP in relation to threatened fauna species (*Glossy Black-Cockatoo, Grey-crowned Babbler, Spectacled*	The proponent commits to the implementation of these measures as detailed in the OEMP

Objective	Mitigation Measures	Responsibility
	Warbler, Grey-headed Flying-fox, Yellow-bellied Sheath tail-bat, Eastern Bentwing-bat and Eastern Cave Bat. The Bird and Bat Monitoring will also target 'species of concern' and particularly will be completed to include information as per Level 3 investigations for impacts on Wedge-tailed Eagle and Nankeen Kestrel. This will include population assessments and viability analysis in analysing risks and management for identified 'Species of Concern' under Auswind guidelines. Other measures shall include: • Reduction of bird activity near turbines through the following measures: • Removing road kill resulting from construction work which would otherwise attack birds of prey • Stopping visitors to the site feeding birds. • Any grain feeding of stock to be well away from turbines • Control vermin (e.g. rabbits) on site to reduce attractiveness to birds of prey, • During lambing remove any dead lambs from the vicinity of the wind turbine structures as a precaution • Where possible add bird averters to overhead wires in the vicinity of the site • Minimise external lighting of buildings or structures required for aviation safety (in accordance with CASA). Exterior lighting to the Managers residence and Visitors and Education Centre to be motion-activated. • Monitor research and mitigation at other wind farms to introduce effective measures to mitigate • impacts on avifauna • Limit the operation of turbines which are causing unacceptable impacts. Implement a control measure to be able to turn off offending turbine during peak bird strike times, based on adaptive monitoring.	Address via monitoring during operational phase, in terms of EMP Monitoring as per the Bird and Bat Monitoring Program recommendation and amelioration measures.
B. Vegetation Management Plan		
Protect and retain existing vegetation	Components of the **Vegetation Management Plan** shall include: • Monitoring procedures are to be included in the EMP in relation to threatened flora population (*Cymbidium canaliculatum*), and endangered ecological community EEC (*White Box - Yellow Box - Blakely's Red Gum Woodland*). • Areas of the EEC shall be protected and retained during construction and operation phases of the	The proponent commits to the implementation of these measures as detailed in the CEMP and OEMP EMP to include monitoring

Objective	Mitigation Measures	Responsibility
	project. Existing vegetation extents of the EEC will be protected from localises site works during construction operations. New fencing must allow for movement of mammals such as wombats and echidnas across the ridge and between vegetation stands on the lower foothills and gullies either side of the ridge. Fencing should not prohibit current access to water sources. • Any screening works or landscaping in close proximity to the turbines are not to include specific habitat of birds identified in the Bird Impact Assessment • Existing access tracks are to be utilised at all times as part of the site design in accordance with minimising vegetation removal impacts. Only areas designated in the Environmental Assessment are to be used for works areas. • Existing access tracks are to be upgraded and shall be used to minimise vegetation removal. • A weed control program will be implemented at both sites, particularly within and adjacent to areas disturbed as part of the proposal. • Avoid prolonged exposure or earth through adequate timing and scheduling of construction activities. • Revegetate exposed areas as a priority and use appropriately sized local native species. • Minimise footprint of turbine sites, access roads and buildings, avoid sensitive areas, minimise soil disturbance and erosion. • Restoration and rehabilitation of all works areas including stabilisation replanting and regrassing: - Crane hardstand areas - Site works areas and construction facilities - Vegetation screening identified in visual assessment - Revegetation will use plants and grasses grown from seed collected locally in plantings - A vegetation offset strategy will be developed to compensate for the selective removal of the EEC (*White Box - Yellow Box - Blakely's Red Gum Woodland vegetation community*). This will include vegetation management planning strategies within offset areas and adjacent to site facilities and focus on retaining and restoring areas of the EEC for regrowth. This may include excluding stock to allow for regrowth, restocking and other measures that are deemed suitable. These areas shall be identified by a suitably qualified consultant to determine areas of the EEC to retain.	procedures in relation to threatened flora population; threatened fauna species and; endangered ecological community.

<table>
<tr><th>Objective</th><th>Mitigation Measures</th><th>Responsibility</th></tr>
<tr><td colspan="3">Indigenous Heritage Issues</td></tr>
<tr><td>Protection of existing Indigenous Heritage cultural significance of sites</td><td>Final design stages of the project will need to consider the following:
• If Aboriginal Objects are discovered during ground disturbance works, then all work shall cease and appropriate mitigation strategies for the area shall be developed in consultation with the Aboriginal Stakeholders.
• The proponent shall enter into a binding agreement with the registered Aboriginal communities prior to construction regarding Aboriginal Cultural heritage and enhancement of Aboriginal Cultural value in the area.</td><td>The proponent commits to the implementation of these measures as detailed in the CEMP and OEMP</td></tr>
<tr><td colspan="3">European Heritage Issues</td></tr>
<tr><td>Protection of existing European Heritage cultural significance along transmission line routes.</td><td>Final design stages of the project will need to consider the following:
• There are no items of heritage significance located on the Middlebrook and Mountain Station properties. All impacts to existing buildings, shearing shed and impacts to the stockyards on site will be avoided during construction and operation.
• The preferred route for connection of the Kyoto Energy Park to the grid has not been decided. If the line routes identified in the report change then further assessment will be required to ensure there is no impact on “known items” of heritage.
• If Option 2 (transmission line route) is selected then protection and avoidance of the petrified stump along the road edge of Moobi road will be required. Final design of the pole locations are to ensure the maximum distance possible from the stump.</td><td>The proponent commits to the implementation of these measures as detailed in the CEMP and OEMP</td></tr>
<tr><td colspan="3">Noise Issues</td></tr>
<tr><td>Comply with noise criteria, and minimise noise during construction and operation phases.</td><td>Development of a Operational Noise Management Plan to include:
• A four (4) metre high grassed earth bund wall shall be constructed around the north east corner of site substation to ensure noise compliance.
• Sector Management of Wind turbines 27,28,29,30 and 31 in adverse wind conditions to maintain noise levels at “Peakhill” property to within noise levels. Sector management would involve programming the turbines to “ramp down” under offending wind conditions.
• Mini hydro plant to be limited to a SWL noise emission at source to below 120dB(A).
• Noise monitoring at sensitive locations to be</td><td>The proponent commits to the implementation of these measures as detailed in the CEMP and OEMP

Address in terms of Construction Noise Management Plan

Actions controlled by environmental</td></tr>
</table>

Objective	Mitigation Measures	Responsibility
	determined in the vicinity of the sites. • Wind Turbine Generators selected to have a maximum Sound Power Level (SPL) < or equal to 104.3 dB(A). • Monitoring of noise at the Managers Residence to in accordance with the Site OH&S Plan. Development of a **Construction Noise Management Plan** to include: • Construction noise expected to comply with DECC criteria. • onsite construction activities • construction of overhead lines/poles external to the site within 200m residencies • Community information during construction. Including scheduled activities involving potential noise exceedances. • Ensure equipment noise emissions are in accordance with those criteria modelled in the noise assessment by Wilkinson Murray. • Educate staff and contractors about noise and quiet work practices.	officer/acoustic consultant during construction activities
Visual Issues		
	Visual treatments implemented on site will include: **Wind Turbines** • Consider options for use of colour to reduce visual contrast between turbine structures and background, e.g. use of off white or soft light greys or soft green greys are preferred colours for wind turbines. • Use of matt finish on blades and towers minimising impacts from reflected sunlight. **Mt Moobi Solar PV Farm** • Screen planting shall be undertaken on the eastern escarpment of Mt Moobi to provide a visual buffer to the Mt Moobi Solar PV Farm. Such planting should consist of a minimum of 5 rows of indigenous trees and tall shrubs with species dependent on overall height of final structure. If the concentrated solar dish type structure is used a setback of 50m from the escarpment shall be implemented. • Locate solar panels away from the escarpment to minimise views to them from valley areas to the east. **Mini-hydro plant (Closed-loop)** • The mini hydro plant is well integrated and screened	The proponent commits to the implementation of these measures as detailed in the final design stage CEMP and OEMP

Objective	Mitigation Measures	Responsibility
	from external view. However header tanks and associated facilities should be coloured olive green to minimise colour contrast. • Minimise clearing of overtopping trees when constructing the water pipe lines down the hill. • Screen planting to header tanks and upper sections of water race pipelines shall be undertaken. **Access Tracks** • Minimise tree clearing on new sections of road to utilise tree canopy for screening purposes • Minimise cut and fill for site tracks, install effective drainage and revegetate disturbed soils as soon as possible after construction to avoid erosion. • Roads and construction tracks have been located where possible to correspond with existing trails. • New trails and roadways should avoid tree clearing to maintain tree canopy for screening purposes. • Minimise straight alignments and follow contour of land. • Re-use surplus excavated fill material on site to minimise colour contrast. • Maintain revegetation on disturbed areas to reduce visual impact. **Buildings (Manager's residence, Visitor's and Education Centre, Maintenance shed)** • Design of site building facilities shall fit in with rural nature of locality. Final design of facilities should include materials selection, general form and profile. • Managers residence and Visitors and Education Centre to have a maximum height of 8m above ground level • Building roof to create overhang to create shadow effect on external walls • Design and colouring of building elements to achieve minimum contrast with existing colours of receiving landscape • Painting with environmentally compatible colours with variety to assist in visually modulating building • Supplementary planting to provide integration elements both in front of and behind built form elements Visual treatments implemented external to the site will include: **External Transmission Lines for Connection to the Grid**	The proponent commits to the implementation of these measures as detailed in the final design stage CEMP and OEMP

Objective	Mitigation Measures	Responsibility

	Treatments to increase visual integration and decrease visibility to sensitive viewing locations include:
	• Replacement of old timber poles with new timber or new concrete poles as determined in final line and pole configuration design.
	• Existing distribution circuits are to be placed on the new transmission line poles
	• At viewer locations integration planting should be undertaken as needed in areas such as highly affected rural homesteads,
	• Supplementary planting to occur along alignments within town settings and approaches to achieve visual integration of the transmission line structures.
	
	Visual treatments at residencies
	• Integration and or screen planting at homesteads that have a primary view impacted and that experience high visual impact will be provided. Within 6 months of commencement of operations a preliminary assessment of homesteads will be undertaken by a specialist visual consultant to determine if visual treatments such as screen planting and integration is warranted. Areas for consideration are:
	  • residencies in the Thompson's Creek Rd, Lower Sparkes Creek Rd, Dart Brook Rd and Middlebrook Rd and;
	  • and to a lesser extent areas affected in vicinity of Moobi Rds and areas east of Mountain Station.
	These areas are within highly impacted areas as defined by *Figure 8.1Visual Impact Map Appendix B(i) Integral Visual Assessment Study Volume 2*.
	• Technical assistance through workshops may be required with planting assistance in highly impacted properties. Compensatory landscape treatments will be provided for households that are for worst affected generally in Thompson's Creek Rd, Lower Sparkes Creek Rd, Dart Brook Rd and Middlebrook Rd, and Moobi (and adjacent) Rds, within highly impacted areas as defined by *Figure 8.1 Visual Impact Map Appendix B(i) Integral Visual Assessment Study Volume 2.*	

Aviation Issues		
Manage aviation risks in accordance with requirements from CASA and Air Services Australia.	The following issues shall be resolved prior to construction: • Approval for final layout of wind turbine Nos 36,37,38,39,40,41,42 proposed on Middlebrook Station would be subject to approval from the Civil Aviation Safety Authority. • Subject to approval notification of final turbine design and layout , and construction program are to be	The proponent to comply with CASA directions regulations and recommendations.

Objective	Mitigation Measures	Responsibility
	supplied to CASA to update aeronautical charts • Prepare an Obstacle Lighting Plan in accordance with CASA Advisory Circular AC 139-18(0) titled "Obstacle Marking and Lighting of Wind Farms". The Obstacle Lighting Plan must be approved by CASA prior to commencement of construction.	
Electromagnetic Interference (EMI)		

	• The proponent will conduct a final assessment of 'potentially affected residencies' during operational period within 1 year of full operation of wind turbine generators of the Kyoto Energy Park.
	• Radio communication licenses identified in the ACMA database will not be impacted however will be contacted as part of the wider community consultation process during operation of the Kyoto Energy Park.
	• Low frequency radio links associated with emergency service organisations will not be impacted upon however will be contacted as part of the wider consultation process.
	• These Emergency service licenses for the following:
	  • Fire service
	  • Ambulance service
	  • Police service
	  • SES – State emergency services
	• A preliminary assessment of residencies within the areas represented in Figure 6 of the Garrad Hassan EMI report will be undertaken prior to wind farm operation. As television interference from wind turbines is readily identifiable, appropriate mitigation measures (discussed below) can be readily taken if required. Should household TV interference be observed in potentially affected areas (Figure 6) after 1 year of commissioning of wind turbines, options for reinstatement of TV signals will be assessed by a suitably qualified person. Rectification may include:
	  • Pointing the householders TV antenna directly towards their existing transmitter;
	  • The installation of more directional and/or higher gain antenna at the affected residences;
	  • Relocating the antenna to a less affected position;
	  • The installation of a digital set top box (and UHF antenna if required);
	  • The installation of cable/satellite TV at the affected
		The proponent commits to the implementation of these measures as detailed in the final design stage CEMP and OEMP

Objective	Mitigation Measures	Responsibility
	residences; • Installation of a TV relay station.	
Geology and Soils		
	An **Erosion and Sedimentation Control Plan** will be prepared prior for construction and operation stages of the Kyoto Energy Park. Erosion and sedimentation control measures will include the following specific requirements for the Mountain and Middlebrook Station sites: • Access tracks are to have sufficient cross-fall gradient to allow runoff into the swale drains designated as stormwater controls. • Site substation design to allow for rainfall collection from control facility to provide internal supplies. Overflow from the water supply tank to be directed to avoid scouring. A concrete bund will be designed around the substation as a risk control measure to prevent leaks and spill entering drainage lines. • Preparation and implementation of a **Water Management Strategy** to ensure water is conserved and recycled wherever possible during both construction and operation and that water quantity impacts are contained within the site. • Install temporary diversion drains to divert potentially hazardous surface waters from the development site of sedimentation basins. Diversion drains shall be placed on the immediate downside of any construction works, on one or both sides of the ridge as necessary, following natural slopes. • Energy dissipaters should be placed at appropriate intervals along the length of these drains to minimise erosion. • Construct temporary sedimentation basins in low-lying areas along the length of the construction sites at the location of each turbine and at all other construction sites. The basins serve as points of discharge into natural drainage paths during operation, and should be cleaned out and modified as appropriate following the completion of construction. • The basins would collect excess surface runoff from all developed areas including the proposed roadway along the ridgeline. Sedimentation basins should be constructed to a size relative to the catchment area. • Construct sediment fences below the construction site and access roads and temporary drainage system on one or both sides of the ridge as necessary, for the length of the site. • Limit vegetation removal and remove vegetation	The proponent commits to the implementation of these measures as detailed in the final design stage CEMP and OEMP

Objective	Mitigation Measures	Responsibility
	progressively to limit the area and duration that soils are exposed. • Progressively rehabilitate or stabilise disturbed areas to prevent erosion. • Minimise use of surplus stockpiles. Upgrading of access tracks are to be scheduled to reduce transportation of fill around site and minimise stockpiling of material. Excavation works are to be staged with fill works outside of the fenced construction compound. • Install silt fencing around stockpiles outside of the fenced site compound to contain sediment. • Cover or vegetate stockpiles where material is required for long periods. • Place stockpiles clear of drainage lines, natural watercourses, road surfaces and established trees. • Remove stockpiles as soon as possible. Regularly inspect all erosion and sedimentation control devices during construction period to ensure their continued effectiveness. • A bunded designated refuelling area shall be located adjacent to the site office compound located at no greater than 100 m from the nearest drainage line. • Provide spill kits on site during construction. Wherever possible construction water for dust suppression and firefighting will be obtained from on site farm dams on Middlebrook and Mountain Stations. If no water is available from dams or stormwater structures water will be obtained from an external water body or from an external water supplier. • Ensure portable toilet facilities are located more than 100 m from drainage lines. • Use licensed supply and disposal contractor to manage and dispose of all wastewater from portable toilet facilities. • Provide facilities to temporarily store and infiltrate collected surface runoff from all impervious and developed areas through the use of vegetated swale drains. The placement of these swale drains shall be below the Kyoto Energy Park site on either side of the ridgeline, as necessary. The system will take advantage of natural landforms and levels developed in the construction of the wind turbines and access road. • Revegetate swales with native species with a preference to species that are known to have good pollutant uptake facilities and some low pH tolerance. • Direct excess flow from grassy swales into low-lying	

Objective	Mitigation Measures	Responsibility
	areas and through energy dissipation devices before being directed into natural drainage courses. • Remove the existing topsoil layer from infiltration areas (if required) and replace with a sandy organic topsoil mix (0.5m maximum thickness) to increase infiltration and promote vegetation growth.	
Traffic and Transportation Issues		
	Appointment of experienced haulage contractor, responsible for all aspects of equipment transportation to site. Preparation of a **Traffic and Transportation Management Plan** including: • Design and construction of site tracks to ensure safe and stable activities • Community consultation program to be undertaken throughout transport activities, to ensure residents are informed on program, timing and management • Implementation of controls in TMP to manage traffic on and off-site to minimise impacts on local traffic flows, and impacts on site, eg through designated routes, speed limits, scheduling, maintenance etc. • Handling as per manufacturer's instructions and port requirements. • Special permits are required for all oversize and overmass components prior to transportation. • Handling and road movement in conformity with RTA licences/permits and NSW Police for oversize and overmass items, which may include surveys, inspections and dilapidation surveys. • Construction and safety management procedures during construction	The proponent commits to the implementation of these measures as detailed in the final design stage CEMP and OEMP
Bushfire Risk Management Issues		
Design measures to reduce bushfire risk. On-going management to prevent build up of combustible fuel. Safe and effective Emergency	A **Bush Fire Management Plan** including a **Bushfire Incident and Evacuation Plan** shall be prepared prior to construction and operational stages as applicable Measures adopted shall include: • Asset protection zones (APZs) are to be provided and maintained for the Managers Residence and the Visitors and Education Centre. APZs shall take the form of Inner Protection Areas, measured from the exposed wall of the any dwellings. The APZs shall be as nominated in Tables 1 & 2 of the Bushfire Protection Assessment (Conacher Environmental Group August	The proponent commits to the implementation of these measures as detailed in the CEMP and OEMP Actions recorded and monitored in terms of CEMP at

Objective	Mitigation Measures	Responsibility
procedures	2007). • Fuel management within the asset protection zones will be maintained by regular maintenance of the landscaped areas / mowing of lawns in accordance with the guidelines provided in Appendix 1, and or as generally advised by Rural Fire Service in their publications. • Construction standards as per Australian Standard AS3959 'Construction of Buildings in Bushfire Prone Areas', in accordance with Part 2.3.4 of the 'Building Code of Australia', will apply to all proximate dwellings to the APZs. • Roof gutters and valleys to all dwellings proximate to the asset protection zones should be leaf proofed by the installation of an external gutter protection shroud or a gutter system that denies all leaves from entering the gutter and building up on that gutter. Any material used in such a system should have a flammability index of no greater than 5 (as measured against AS 1530.2). • A minimum 10,000 litre water tank will be required for the: a) Managers residence and; b) Visitors and Education Centre used solely for the purposes of bush fire fighting. The tank is to be constructed of concrete or metal and if on a stand they is to be protected. A suitable connection for fire fighting purposes is required. A 65mm Storz outlet with a Gate or Ball valve must be provided. All pipes are to be metal and pumps are to be protected. • On-going vegetation and fuel management in consultation with the NSW Rural Fire Service • Compliance with relevant standards for equipment design and construction • Compliance with relevant standards for electrical safety and electromagnetic emissions for equipment design, installation and maintenance • The BEP will provide a procedure in the event of fires threatening the development complex, thus allowing the managers of the site to provide an orderly and well-trained approach to the use of fire protection equipment and the evacuation of the residents / visitors. • The management of all 'hot work' activities	commissioning.
Transmission Line Connection to Electricity Grid		

Objective	Mitigation Measures	Responsibility
Compliance with environmental criteria and effective management of these criteria during construction of line works external to the sites.	Once the preferred line route has been determined final design of the line and configuration shall be undertaken with the following considerations: • A detailed network system design for electrical connection considerations in accordance with Energy Australia requirements • easements for line routes over private land to bypass built up areas and improve safety; • line design configuration generally in accordance with specifications and diagrams in the Vemtec report Overhead Power Line Route Review dated April 2008 and this Environmental Assessment . • line design considerations in accordance with Energy Australia design parameters and this Environmental Assessment	The proponent commits to the implementation of these measures as detailed in the final design of the line route in accordance with Energy Australia design specifications.
	A **Line Construction Management Plan** shall be prepared prior to commencement of transmission line construction works. The LCMP will be implemented for line construction works to minimise the impacts from line construction operations on the local community, surrounding properties and effected landowners. The LCMP will take into consideration the following issues: • any seasonal or other land access restrictions likely to influence construction activities; • logistics and materials storage considerations; • line construction over private land easements; • minimising both the number and duration of disruptions to the power supplies of customers affected by the construction works; • During the line construction affected land owners and the broader community will be informed of key project planning and construction activities, by periodic correspondence and/or local media announcements.	Actions recorded and monitored in terms of CEMP at commissioning.
Safety and Risk		
	• Development and implementation of a **Site Health & Safety Plan**, for construction and operation activities • Handling of all components including oversize and overmass components as per manufacturer's instructions and port requirements. • Handling and road movement in conformity with RTA licences/permits for oversize and overmass items. • Construction and safety management procedures during construction	The proponent commits to the implementation of these measures as detailed in the final design stage CEMP and OEMP

Kyoto Energy Park Scone is wholly an Australian Enterprise. The Management is 100% Australian.

The funding of this proposal and report is 100% Australian.

An Australian Project

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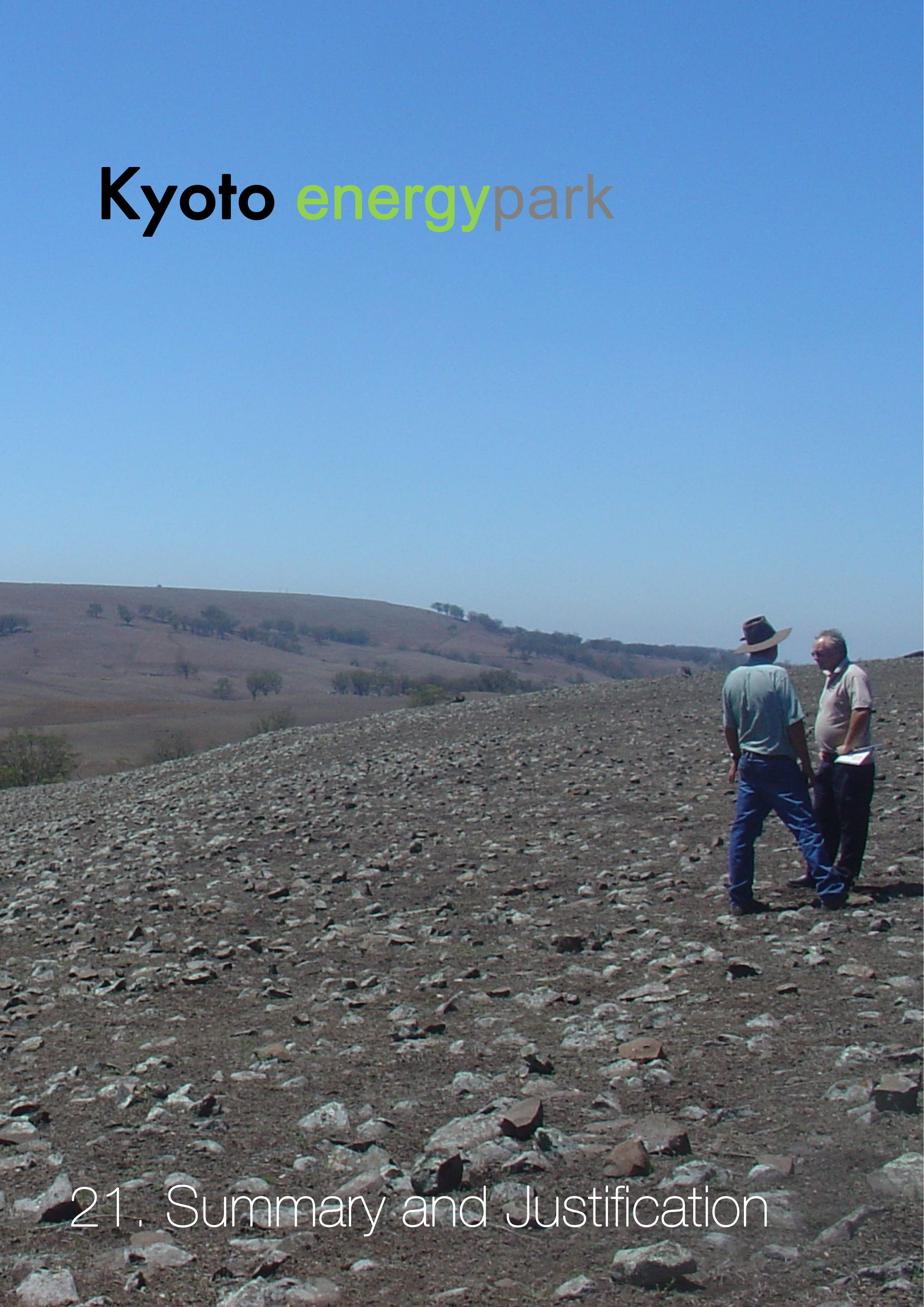

21. Summary and Justification

21.0 SUMMARY & JUSTIFICATION

21.1 Key Strategic Planning Issues

- The Kyoto Energy Park project is a major initiative in providing large-scale renewable power and distribution for the Upper Hunter region.
- The Kyoto Energy Park will be a carbon negative project with overall energy payback period of 6 months for wind turbines and approximately 13 months for the Mt Moobi Solar PV farm. This will represent a positive step in the promotion of the use of renewable energy sources. It will help to reverse potentially catastrophic climate change.
- Ongoing employment for up to 15 operation and maintenance professionals.
- Regional multiplier effects of between 914 and 1595 job years.
- Development of a new skills sectors in the renewable energy industry within the Hunter region.
- The project combines three proven, commercialised renewable technologies (solar, wind and hydro) Solar PV offers the fastest deployment of any renewable energy technologies today
- Renewable technologies integrated in a complementary way to shave expensive peak demand
- Flexibility to easily move the peak supply as the peak demand period moves according to seasons
- Reduced peak demand resulting in infrastructure and generation savings
- Creation of jobs across various fields (e.g. research, installation, project management) during development and construction
- Significant ongoing green collar employment opportunities, including Indigenous employment, in maintenance and tourism, providing sustainable transitional employment for the Hunter region
- The project will be a source of ongoing economic contribution and revitalisation for the region
- Major tourism opportunity for the region with an on-site Visitor and Education Centre
- Generation of enough green electricity to power 62,000 homes annually
- 9.5 million tonnes of CO2 abated over the 25-year project life
- Virtually no water consumption during energy production thereby avoiding 700 million litres of Hunter water consumption reduction as compared to similar volumes of traditional energy
- Ongoing tourism benefits because of the regionally-unique scale of the project. This in turn, will aid the promotion of local area heritage and other attractions associated with the wind and equine industry.
- Opportunity to benchmark how alternate energy can be integrated into and transform, existing supply infrastructure, including opportunity to re-design that infrastructure.
- Assists both state and federal governments in moving towards achievement of greenhouse gas reduction targets in accordance with the Kyoto Protocol.

This report has addressed the requirements of the Director General of the NSW Department of Planning by providing an assessment of the site in statutory, strategic and environmental context as outlined in the Director General's Requirements.

In addition strategic justification for the project is discussed in Section 6.0 which outlines government mechanisms for renewable energy, greenhouse gas emissions savings, and key strategic planning considerations and local issues. Other Key planning considerations from subsequent discussions are summarised below and possible alternatives to the project including the 'do nothing' alternative.

21.2 Statutory Planning

A full review of the legislation relevant to the proposed project is provided in Section 4.0 of this report. It is shown that the objectives of the EPI's relevant to the subject sites and project are all consistent with the proposal.

In respect to the construction phase, a license will not be required under the POEO Act for the temporary operation of a mobile concrete batching plant on Mountain Station.

A consent under Section 75V of the EPAA and Section 138 of the Roads Act is anticipated for local road works close to the Kyoto Energy Park site. Road works would include minor works such as local road widening and repairs to facilitate the transportation of oversize and overmass vehicles to site. Consent for works within or over roads will be required under Section 138 of the Act.

The site represents an important asset in providing a renewable energy resource, contributing to Australia's commitment to the targets of the Kyoto Protocol and Federal and State Government policies aimed at reducing ad managing Australia's greenhouse gas emissions.

21.3 Site Suitability & Implications of Proposed Land Uses

A full review of the existing site in relation to the social and environmental impacts has been undertaken within this report.

Detailed investigation was undertaken to ensure the environmental constraints and opportunities were fully investigated. The key benefits of the proposed Kyoto Energy Park that were identified in this report are summarised as follows:

- The Kyoto Energy Park proposal will provide an additional use of the land with minimal disturbance and destruction of the existing landscape and existing agricultural and tourist activities on the properties (an optimum use of the land).
- In relation to the important sustainability issues of greenhouse gas reduction, the Kyoto Energy Park will provide a carbon-free source of energy that will replace energy traditionally generated through burning of coal. It will displace the greenhouse gas emissions associated with the production and use of electricity and will encourage improvement in the capacity of local renewable energy.
- Previous approval for wind monitoring towers on both sites has been granted. Wind monitoring undertaken by the CSIRO has been undertaken on site for over 8 years confirming the resource potential for electricity generation from wind.
- Topography and location of the sites are well suited to a variety of renewable energies as proposed. Narrow ridgelines, exposure to winds (prevailing winds are from the valley to the east and from the west), updrafts from the numerous gullies are ideal for wind energy production. Mt Moobi Plateau on Mountain Station has ideal solar access and insolation levels for solar photovoltaic applications.
- Steep gullies are present on site for storage of energy via a mini-hydro plant that will be powered from excess renewable energy during non peak periods.
- The existing land use planning provisions include for encouraging "development which is ecologically sustainable" and will not result in "adverse cumulative impact". Eco-generating works and facilities are a permitted use within the landuse zones where work is proposed.
- Steep slopes adjacent ridgelines (east and west) cannot easily be used and will not be impacted on by the project.
- General remoteness from nearby urban areas of Scone, Aberdeen and Muswellbrook and low level effects of generated noise and visual exposure of turbines to residencies. Turbine rotation noise can be managed and controlled at a single residence .
- Relative ease of access for heavy haulage vehicles to site via a back road and relatively low level of inconvenience to local road users.
- Insignificant impact on adjacent land values
- Seen as a potential tourist icon for the Upper hunter merging in and complimenting existing benign landuses such as the equine and wine industry in the region.
- No impacts to air quality in the area
- No large water requirements and associated storage capacity typical for large scale electricity production
- Negligible impact on local biodiversity and it is not likely to affect any threatened species at the limits of their known distribution.

Also importantly the subject site represents a disturbed area of grazing land relatively free of major environmental constraints. Constraints were identified which were manageable with proper mitigation techniques and environmental management procedures.

Restoration and regeneration of native species in any area that may be impacted by the proposal shall occur during the life of the project.

The Draft Statement of Commitments (Section 20.6.3) outlines how the details of theses various reports will be incorporated into future site planning to ensure the ongoing development of the site will be done in a manner which is sympathetic to the site, the wider environment and the needs of the community.

21.4 Community Feedback

The proposed Kyoto Energy Park will provide a positive contribution to the Scone and regional community in a social and economic sense. These benefits include:

- Identify Scone as a area that is clean and free from polluting activities consistent with the area;
- Substantial capital investment associated with the development with approximately 60% (82 to 122 million) of total investment captured domestically;
- The addition of the Visitor's and Education Centre which will help as a part time education facility, developing skills in renewable technology, and contribute toward tourism in the region;
- A reduction of greenhouse gas emissions in line with Federal and State policy; and
- Increased spending in the local community through additional employment and indirect benefits.

The public have a further interest in this proposed development through their involvement in the initial stages of this application. Consultation has also occurred through media coverage, presentations, phone interviews with key organisations, consultation with residents and other forms of community consultation which has allowed the expression of views, opinions and ideas as well as feedback.

Public interest will be further maintained once the proposed Kyoto Energy Park is in operation, through the establishment of the community charter known as the Moobi Foundation. This will include seed funding and assistance in the raising of further funds to enhance and support the local community.

The main objectors to the proposal raised numerous issues, essentially being characterised by concerns for:

- Visual intrusion of the wind turbines into the landscape
- Loss of Property Values
- Bushfire risk
- Noise

This report addresses each of these concerns and any perceived negative impact does not justify non-approval of the proposal in light of the numerous and significant benefit.

21.5 Ecologically Sustainable Development & Climate Change

As a result of the initial baseline studies, undertaken as part of the Environmental Assessment of the site, a close understanding of the environmental principles of the site has been obtained. In addition the increasing need for projects to be ecologically sensitive has resulted in the concept plan being planned around the existing environmental characteristics of the site. The environmental characteristics of the site, while unique and important, support the capacity of the site to accommodate development of this type.

The proposal directly addresses the growing concern of climate change by helping transform energy generation capacities within NSW from non-renewable resources to renewable resources. This has a significant benefit by directly displacing Greenhouse Gas emissions from non-renewable generation technologies.

In 1998 Scone was identified in as a location suitable for wind energy production by the ex-Sustainable Energy Development Authority (SEDA). A wind mast was installed on site and has been monitored for a period of over 8 years confirming the wind resource for the sites. Pamada are proposing further technologies including a large-scale solar photovoltaic plant and a mini hydro plant for peak energy production and energy storage.

21.6 Consideration of Alternatives

As part of the ongoing development of the site, the Kyoto Energy Park plan has been evolving as a greater understanding of the environmental and social constraints and opportunities of the site have been obtained. In order to fully appreciate the development and consider all possible outcomes, alternatives must also be considered.

21.6.1 The 'Do Nothing' Alternative

The subject site represents an excellent opportunity to advance the objectives of the Kyoto Protocol and other green house gas reduction strategies for the benefit of the environment and the community. To do nothing would continue the trend toward using fossil fuel based energy production resulting in further greenhouse gas emissions.

Without the proposed development there would be an increased fossil fuel based energy production in the region and NSW in general, mainly through increased coal mining and gas facilities. NSW currently has a large energy capacity deficit meaning that it needs to import (buy) electricity from Queensland and Victoria at reduced efficiency and greater economic and environmental loss.

Alternative electricity production capabilities in the area include the mining and burning of coal and gas resources for electricity production. Both forms of energy are non-renewable, require mining and have significant greenhouse gas emissions and other pollutants (for gas, emissions are primarily CO_2 and

Nitrogen oxides). Both these alternatives need large amounts of clean water and require large water storage for cooling.

21.6.2 Alternative Land Use Configurations

As previously mentioned the overall design of the Kyoto Energy Park project is the result of carefully examining the site, its constraints and opportunities. Given the topography and associated constraints, alternative land uses to the Energy Park and existing grazing are not feasible.

Traditional farming practices for the site are susceptible to climate change consequences of drought and water restrictions. Groundwater systems in the vicinity are already stressed to levels that are not replenishable under current use. The proposal represents and opportunity to diversify rural incomes and develop new forms of industry that is sustainable and free from polluting activities.

The overall footprint (i.e. developable area) utilized by the Kyoto Energy Park facilities is in the order of 0.5 %. Overall damage and disturbance of the landform is minimal. Alternatives can therefore be considered limited as any development would be limited to the flat areas of the site designated for components such as the batching plant, site substation and Maintenance Shed.

Upon completion of the life of generator components (solar, wind, hydro) new technology can be easily installed to replace outdated technology. Options exist for fully decommissioning generator components at the end of the project life. Wind turbine footings are buried below ground level during site restoration and can be fully rehabilitated.

21.6.3 Consequences of not Proceeding

The subject site and development plan have been shown to be beneficial to the environment while serving the needs of the community in terms of energy consumption education and employment. Some of the main consequences of the proposal not proceeding may include the following:

- Increased production of greenhouse gas emissions and other airborne pollutants from continued use of fossil fuel based energy generation;

- Increased mining activity and transportation requirements from continued use of fossil fuel based energy generation and resultant significant loss of water.
- Non-diversification of employment opportunities skills and new technologies for local and regional economies in the Hunter Region;
- Limited injection of funds into the local economy through associated construction activities and tourism;
- Ongoing economic and environmental consequences of not addressing power generation deficits within NSW.

The Kyoto Energy Park project will provide the regional community with a valuable financial injection , employment, educational considerations and benefits from tourism attracted to the area. This includes development of new skills technologies and further educational opportunities for schools and institutions.

It is envisaged that this would also have associated spending in terms of local services and accommodation.

21.7 Principles of Ecologically Sustainable Development and Greenhouse Gas Emissions

The 5 principles of ESD are:

- Inter-species Equity – the conservation of biological diversity and ecological integrity;
- Intragenerational Equity – the provision of equity within generations;
- Intergenerational Equity – the provision of equity between generations;
- The Precautionary Principle – the assumption in decision making, that there is, or will be a serious or irreversible threat to the environment; and
- The Global Dimension – the internationalisation of environmental cost.

Inter-species Equity

It is considered that given the highly disturbed nature of the site, that the Kyoto Energy Park will have a negligible impact on regional biodiversity. Additionally, the DECC have deemed the proposal is not a 'Controlled Action' under the EPBC Act 1999.

It is considered that the adverse impacts associated with the proposal are minimal in comparison to the benefits to the environment to be gained by implementing a renewable energy based electricity supply which contributes to a long term reduction in greenhouse gas emissions.

Intragenerational Equity

The benefit of the Proposed Kyoto Energy Park will be felt by all age groups as it contributes to the achievement of a cleaner environment.

Intergenerational Equity

As clean, renewable resources, rather than fossil fuels are used in the process, there are zero emissions adding to the greenhouse effect. This will aid the move toward a 'cleaner' more sustainable environment available for future generations. This will be particularly important for the Upper Hunter in general with current initiatives to increase fossil fuel based electricity production from coal and gas resources.

The Precautionary Principle

There are no unknown or unquantifiable threats to the environment associated with the proposed Kyoto Energy Park that will require a precautionary approach to be adopted.

The Global Dimension

The proposed Kyoto Energy Park will not produce any off-site impacts. In fact, the development will contribute to Australia's targeted reductions in greenhouse gas emissions under the Kyoto Protocol.

21.8 Conclusion

The proposed Kyoto Energy Park project generates electricity from green renewable resources such as sun, wind and water storage. The project will a avoid generating greenhouse gas (GHG) emissions and significant water use associated with electricity produced from fossil fuel and thermal type power stations.

In accordance with the requirements of the Director General of the Department of Planning, the proposed Kyoto Energy Park has been assessed in relation to its potential to have impact on the environment (this includes the social, economic and physical environment). This Environmental Assessment Report contains a comprehensive analysis of the likely impacts (both positive and negative) that might arise from the proposed development. It should be noted that for the purposes of evaluation of the potential for adverse environmental impacts, the worst case scenarios have been modelled.

The greenhouse effect is recognised as one of the world's most pressing environmental problems, with the consequence being significant changes in local, regional, and global temperatures. Recently there has been increasing scientific predictions and international consideration given to the need to reduce GHG emissions and the carbon intensity of energy production.

The Kyoto Energy Park Scone is a project that will significantly reduce GHG emissions and water use by displacing electricity generated by fossil fuel sources. The federal Emissions Trading Scheme (ETS) is due for implementation in 2011 following recent recommendations from the Garnaut Green Paper and just released White Paper of the federal government. Under this scheme the Kyoto Energy Park would generate 'carbon credits' which can be traded under a national carbon scheme.

During the Environmental Assessment constraints were identified and original layouts of the project components were modified based on the detailed environmental site investigation. The final layout of the Kyoto Energy Park as proposed represents a balanced position in conserving the important environmental attributes of the site while providing infrastructure required for renewable energy production.

At a level which is readily understand, the main features of this application are:

The Main Points

The Kyoto Energy Park is a genuine attempt to bring to the world, Australia, the Hunter and all its people, a path towards a clean and sustainable future.
The Kyoto Energy Park seeks to create electricity, fed into the national grid, using the completely renewable and non-impacting natural resources of wind, solar energy and gravity. By integrating the numerous technologies, the project seeks to optimise the specific characteristics of the location and make for a genuinely sustainable enterprise.

The key elements of the park are:
- **3-10MW Solar Photo Voltaic Array;**
- **42 Wind Turbines;**
- **1 MW Closed-Loop Hydro Plant; and**
- **Visitor and Education Centre**

The main benefits are:
- The natural wind and solar resources are strong and combined with elevational change, the natural attributes of the site are excellent for an integrated Energy Park;
- Demand for electricity is close by and will make the use of the electricity generated from the Kyoto Energy Park highly efficient, producing enough **green power** for approximately **62 000 households**;
- The creation of the Kyoto Energy Park provides short term and long term **employment** and creates a **new tourism** destination for the Upper Hunter;
- The **Moobi Foundation**, an initiative of the Kyoto Energy Park shall **invest into the community** of the Upper Hunter through a Not-For-Profit structure (using community leaders);
- The Kyoto Energy Park is proposed to create clean and renewable electricity and create a transition to **less reliance on the burning of coal** as the main form of creation of electricity; and
- Creation of an enterprise that may continue without the time constraint of the resource that is harvested (such as coal) running out…. Wind and sun shall continue

The main impacts are:
- The placing onto the landscape of the 42 wind turbines, creating for some, an unacceptable visual intrusion and with others a positive visual beacon of commitment to making and keeping the Upper Hunter a clean green place, without coal mines and the ecological destruction that coal mining brings;
- The overall footprint (i.e. developable area) utilized by the Kyoto Energy Park components and facilities is in the order of 0.5 % of the sites' area. Overall damage and disturbance of the landform is extremely minimal. Upon completion of the life of the generator components (solar, wind, hydro) new technology can be easily installed to replace outdated technology or fully decommissioned, without any land degradation;
- The opportunity to **remove the equivalent of 90 000 cars** off the roads in terms of greenhouse gas abatement (which includes approximately **9million tonnes of CO_2 gases** over the initial life of the proposed technology);
- The opportunity to create electricity with negligible use of water, leaving the water in the landscape not loosing it in the cooling towers of a coal powered power station - the **saving** of approximately **700million litres of potable water annually** – or the equivalent of about **12 Olympic pools daily!**;
- Clean and renewable energy production free from other air pollutants such as coal dust, heavy metal compounds, carbon monoxide, sulfur and nitrogen oxides;
- Large scale significant **investment into rural Australia**;
- **Short and Long term jobs, reinforcing the Hunter as a region of high skills in the generation of Electricity**

The main matters consistently raised by the community relate to:
- **Intrusion into their visual reference and the potential loss of property values;**
- **Support for the concept of renewable energy, but not in the Hunter;**
- **Bird strike and Bushfire risk; and**
- **Noise Concerns.**

Main Findings of the Environmental Assessment Report

- The Kyoto Energy Park is an opportunity to support environmental sustainability, renewable energy use and regional economic benefits.
- The project is an opportunity to contribute to state-wide greenhouse gas reduction and to renewable energy targets set by the Kyoto Protocol and covered under the MRET federal legislation. The project will generate 'carbon offsets' that will be taken up or traded under the Emissions Trading Scheme (ETS) which will be implemented by the Federal Government in the future.
- Wind and solar components are expected to save 317,000 tonnes of GHG emissions annually or 9.5 million tonnes over the 30 year life of the Energy Park, assisting mitigation of greenhouse gas emissions from stationary energy sources.
- The proposal is not inconsistent with the objectives of the Scone LEP 1986 and is permissible with consent in the zones applicable.
- The Kyoto Energy Park would have negligible water requirements. Generators including solar and wind do not require water for operations. The mini-hydro plant is a closed system which when charged will require minor top up allocations during maintenance.
- There were no Aboriginal artefacts of places of Aboriginal significance identified during the investigation on both sites. Areas which were likely to contain evidence of Aboriginal occupation and habitation were not identified. Aboriginal stakeholders advised that no impact to known artefacts or aboriginal cultural heritage would occur as a result of the Kyoto Energy Park proposal.
- The proposed development will not compromise any listed items of environmental heritage for works within or external to the site.
- Direct and Indirect employment will provide increased economic activity for Scone and the wider Hunter region.
- The total expected capital expenditure for the project is between 140 and 190 million dollars. Final expenditure will depend on the final generator capacity of the park. It is estimated that 60% of total expenditure would be captured domestically.
- On-going employment for the Kyoto Energy Park would be in the order of 10 to 15 fulltime equivalent jobs.
- The addition of a tourism component in the form of the Visitor Education Centre would provide further economic benefit to the Upper Hunter region and the local area of Scone.
- Noise from on-site activities will meet DECC criteria. Construction noise impacts of a minor nature (associated with the transmission line connection to the grid), can be expected during construction of these lines. Noise mitigation measures will be required only in relation to overhead power line connection activity, where power poles are to be erected within 200m of residences.
- Noise levels were predicted to exceed acceptable criteria at one residence due to the operation of some of the wind turbines on Mt Moobi (being wind turbines 27,28,29,30,31). Sector management of some or all of these turbines would occur to reduce noise levels during operation under offending wind conditions to within criteria.

Main Findings of the Environmental Assessment Report

- The scale of the proposed wind turbines will have a visual impact on some locations in close proximity to the subject sites, including Thompson's Creek Road, Middlebrook Road and to a lesser degree, areas east of Mountain Station. In high visual impact areas it is intended to carry out 'compensatory landscape' works as needed to integrate or screen wind farm elements and re-orientate views.
- The ancillary components of the proposed development will have low, easily-managed visual impact
- All turbine blades are to have a matt finish to avoid potential blade glint issues.
- The assessment concludes that no nearby houses have modelled shadow flicker of greater than 30 hours per annum and therefore shadow flicker is not expected to be a constraint to the project.
- All wind turbines proposed for Mountain Station are outside the limits defined by the OLS and all other flight procedures. Seven of the proposed wind turbines on Middlebrook Station are currently infringing airspace defined by Air Services Australia. The final turbine layout for Middlebrook Station will depend on discussions between Pamada and Air Services Australia after a more detailed evaluation of the traffic routes and aircraft procedures for Scone airport.
- Assessment revealed one (1) endangered flora population: one (1) endangered flora community and seven (7) fauna species over and adjacent to the sites. A 7-part test concluded that the proposal was not likely to have a significant impact upon threatened species, endangered populations or endangered ecological communities. No Koalas were observed during fauna surveys and there was no evidence of previous Koala habitation within the subject site.
- The proposal will include an Adaptive Management Program for the Wedge-tailed Eagle and Nankeen Kestrel. Monitoring of bird and bat species will also be undertaken during operation of the Energy Park.
- The project was determined as 'not a controlled action' under the EPBC Act by the Commonwealth DEWHA and can be approved under a bilateral agreement.
- Potential air quality impacts would be limited to the dust generation from exposed areas during construction stages of the Kyoto Energy Park project. Exposed works areas would be limited to access roads, turbine excavations, material stockpiles, minor earthworks and regrading areas. Dust mitigation measures and soil management practices will be adopted on site during construction and operations.
- There are no estuaries or lakes located within the subject site or local area and no potential threats identified in the catchment action plan. No potential adverse impacts have been identified and no further assessments/actions are required in relation to impacts on estuaries or lakes.
- Two (2) locations within the proposed development were identified as being exposed to bushfire threat. This included the Managers residence and the Visitor and Education Centre. Bushfire threats are able to be managed through design considerations, vegetation management and on site emergency services and procedures.

Main Findings of the Environmental Assessment Report

- Coal mining potential is limited over both sites due to deep and complex coal strata. The sites have potential for long term (>15 years) coal seam gas reserves, however the Kyoto Energy Park will not precluded or sterilise any potential for the extraction. In relation to sterilisation of existing mineral/gas and gravel resources, all license holders over the properties have been contacted and have no objection to the proposal.
- The existing electricity distribution network in the Upper Hunter is currently being upgraded by Energy Australia. This includes a new substation at Scone, Aberdeen and Muswellbrook and supply networks. Under this proposal the Kyoto Energy Park will further contribute to the installation of network infrastructure in the region and supply to rural communities of Scone.
- The project sites are located on ridgelines in relatively remote locations which offer opportunities to link with existing transmission easements.
- Overhead transmission lines will be used for external connection to the grid. There are two options for connection to the grid a 66kV and a 132kV with final selection based mainly on final park capacity. The 66kV connection from the site substation to the new Scone STS consists of approximately 12.5km of external overhead transmission line. The 132kV connection would be to the existing Dartbrook Mine connection or the Muswellbrook STS (41.6km of overhead line). In addition about 8.5km of 33kV overhead line would be used to connect Middlebrook Station to the site substation.
- Most of the new line will replace existing pole infrastructure along existing road routes that have been selected to bypass built-up areas and residential zones.
- A Connection Application for connection of the Energy Park to the local grid will be lodged with Energy Australia, subject to approval of this application.
- There are no impacts related to electromagnetic interference (EMI) with microwave signals, defence and aircraft navigation signals, radio communications and mobile telephones within a radius of 50km of the two sites, as a result of the proposal. In relation to radio communications, the owners of point to multi-point type fixed licenses and essential and emergency service organisations would be contacted as part of the wider community consultation process, to minimise risks of conflict.
- Wind turbine generators have the potential to affect analogue television reception in close proximity to the site. These areas of potential impact have been identified and best practice correctional options are available and have been included in this proposal.
- No groundwater dependent ecosystems were detected on site. The construction and operations will not impact upon any groundwater systems of resources within or adjacent to the site. Water for dust control will be sourced from existing dams located on Middlebrook Station or will be trucked to site.
- The construction stage of the project is estimated at 20 months duration from commencement of works including site establishment, civil works, construction of access tracks, turbine footings and underground cabling, construction and installation of all components and ancillary facilities and transmission line connection to the grid.

Main Findings of the Environmental Assessment Report

- The erosion and sedimentation controls will be adopted during construction periods to protect soils and existing natural drainage of the site.
- The preferred port of entry for importation of solar and wind turbine components is the Newcastle Port which has the capacity for large heavy components and is the most suitable and safe point of access.
- Transportation to site is feasible. Existing heavy vehicle haulage routes were identified from Newcastle to the Kyoto Energy Park site for transportation of large wind turbine to the Kyoto site. Final routes for transportation of components would need to be approved by the RTA.
- The land surrounding the proposed Kyoto Energy Park is dominated by agricultural land, horse studs, scattered rural homesteads, lifestyle blocks, and some rural residential subdivisional developments. There is some potential for development of surrounding lots however this is mostly limited to rural lot subdivisions.
- The views of the local community have ranged from strong opposition to strong support. Those most strongly opposed to the project live closest to the proposal and have expressed their acceptance of renewable energy technologies but are concerned over local impacts such as noise, visual and potential devaluation of land. Those in support of the proposal were generally committed to “green energy” and the association with Scone as a green town.
- Given the prominence of the wind farm component, there may be an initial reduction in value to immediately adjacent residencies, based on community perception rather than actual outcomes. After a short period of time the initial effect generally reduces to zero.
- A range of Environmental Management Plans (EMPs) have been identified and should be prepared for those aspects of the development with potential risks to ensure that recommended avoidance and/or mitigation measures are properly implemented in a timely manner to the industry standards.
- Consideration will be given to the mitigation and management of health and safety risks associated with construction and ongoing operation of the facility. These risks will be managed through a series of Environmental Management Plans (EMPs) prepared prior to commencement of construction and operational activities.
- The development of this site is critical in reinforcing the need for green energy. It is ideally situated to contribute and integrate into the existing community. For these reasons the proposed development is submitted for consideration.

Kyoto Energy Park Scone is wholly an Australian Enterprise. The Management is 100% Australian.
The funding of this proposal and report is 100% Australian.
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22. Tables and Figures

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22.0 TABLES AND FIGURES

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23. Glossary

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23.0 GLOSSARY

Glossary of Terms & Abbreviations

agl	Above Ground Level
AGO	Australian Greenhouse Office
APZ	Asset Protection Zone
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
BRMP	Bushfire Risk Management Plan
CO^2	Carbon Dioxide
CO^2 e	Carbon Dioxide Equivalent
CASA	Civil Aviation Safety Authority
CBP	Concrete Batching Plant
CEMP	Construction Environmental Management Plan
DECC	Department of Environment and Conservation
DEUS	NSW Department of Energy, Utilities and Sustainability
DEWR	Department of Environment and Water Resources
DEWHA	Department of Environment, Water, Heritage and the Arts (Commonwealth)
DCC	Department of Climate Change
DG	Director General
DGR's	Director Generals Requirements
DoP	NSW Department of Planning
EA	Environmental Assessment
EMP	Environmental Management Plan
EMI	Electro Magnetic interference
EMF	Electro Magnetic Field
EPA Act (The Act)	Environmental Planning & Assessment Act
EPBC Act	Environmental Protection and Biodiversity Act
EPI	Environmental Planning Instrument
ETS	Emissions Trading Scheme
ESD	Ecologically Sustainable Development
GHG	Greenhouse Gases
GPS	Grid Positioning System
GWh	Gigawatt Hours
Ha	Hectares
HDB	HDB Town Planning & Design
HH	Wind Turbine Hub Height
HV	High Voltage Network
HWC	Hunter Water Cooperation
IPCC	Intergovernmental Panel on Climate Change
IPZ	Inner Protection Zone
KEP	Kyoto Energy Park Scone
kV	Kilovolt
LCE	Life Cycle Emissions
LEP	Local Environmental Plan
LGA	Local Government Area
LV	Low Voltage Network
MRET	Mandatory Renewable Energy Target

Glossary of Terms & Abbreviations

MW	Mega Watt (One Million Watts)
MWh	Mega Watt Hour
Nacelle	Wind Turbine Generator and Housing
NEM	The National Electricity Market
NEMMCO	The National Electricity Market Management Company
NHMRC	National Health and Medical Research Council
NOx	Nitrogen Oxides
OEMP	Operation Environmental Management Plan
PBP2006	Planning for Bushfire Protection 2006
PFM	Planning Focus Meeting
PLC	Programmable Logic Controller
RECs	Renewable Energy Certificates
RFS	Rural Fire Services
RTU	Remote Telemetry (or Terminal) Units
SCADA	Supervisory Control & Data Acquisition Software
SEPP	State Environmental Planning Policy
SSS	State Significant Site
SOx	Sulfur Oxides
STP	Sewerage Treatment Plant
SWL	Sound Power Level
TMP	Traffic Management Plan
UHF	Ultra High Frequency
UHSC	Upper Hunter Shire Council
VHF	Very High Frequency

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