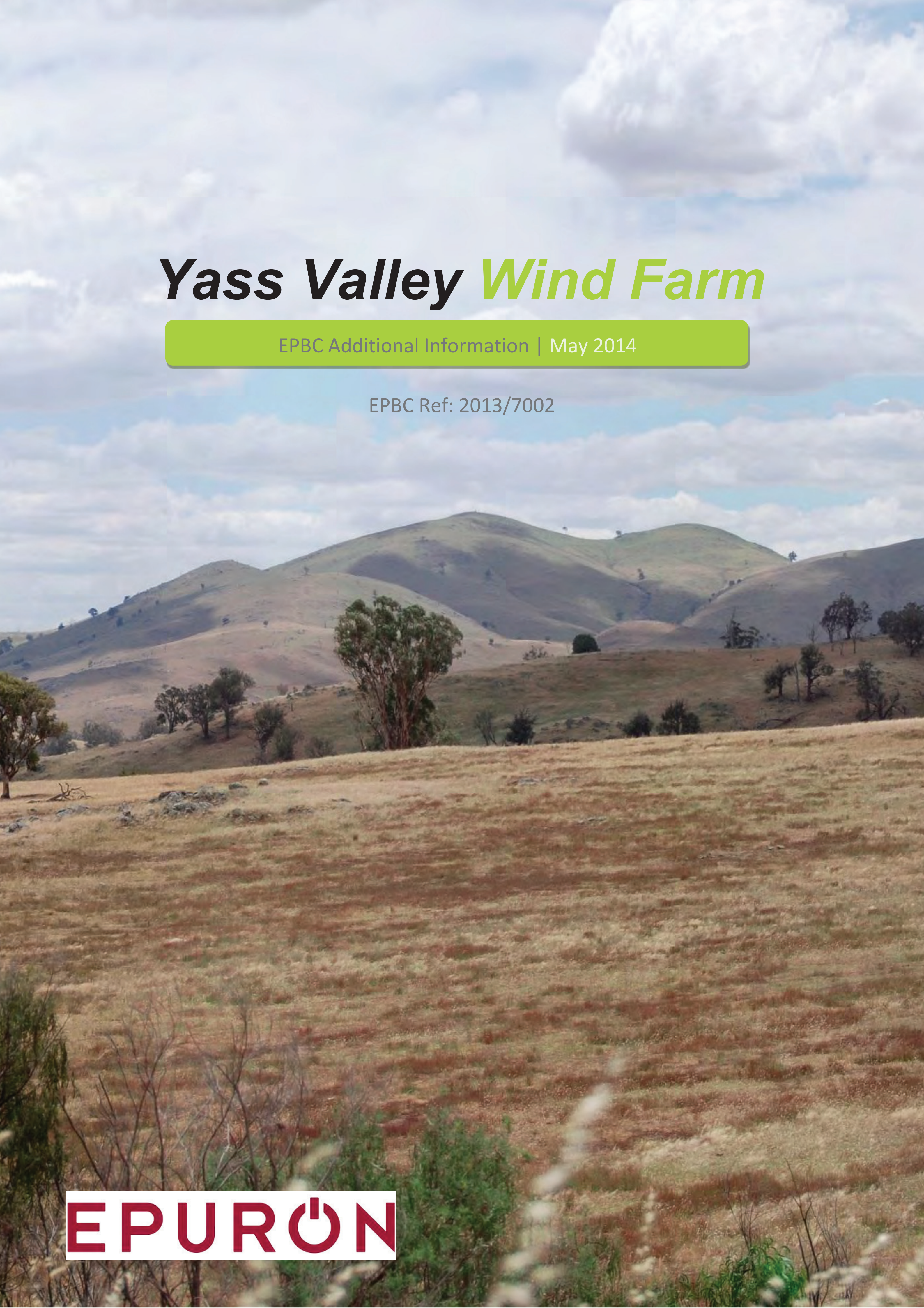

Yass Valley Wind Farm

EPBC Additional Information | May 2014

EPBC Ref: 2013/7002

EPURON

Yass Valley Wind Farm

EPBC Additional Information | May 2014

EPBC Ref: 2013/7002

Prepared By:

Epuron Pty Ltd
Level 11, 75 Miller Street
North Sydney NSW 2060
AUSTRALIA

www.epuron.com.au

Table of Contents

Figures

Tables

1 Background Information

The Yass Valley Wind Farm proposal is for the development of a wind farm in the Southern Tablelands region of NSW, approximately 30 km west of Yass and around 300 km west of Sydney.

A referral for the project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was lodged on 11 September 2013. The Department of the Environment determined that the proposed action was a controlled action on 11 October 2013 and requested further information in order to be able to assess the relevant impacts of the action. This Additional Information report provides the additional information in accordance with the specific format requested by The Department of the Environment by letter dated 18 October 2013.

1.1 Background Information on the Purpose & Need for the Proposal

As presented in the EPBC referral to the Department of the Environment on 11 September 2013, the Yass Valley Wind Farm proposal would involve the construction and operation of a wind farm. The proposal includes:

- Up to 126 wind turbines across the Coppabella and Marilba precincts;
- Internal site access tracks and minor upgrades to existing public roads required for the installation and maintenance of the wind turbines;
- Electrical connection between the turbines and on-site substations using a combination of underground and overhead power lines;
- Overhead power lines connecting the on-site substations to the nearby TransGrid transmission lines; and
- An onsite operation and maintenance facility.

Additional temporary construction activities and infrastructure such as a temporary construction compound, concrete batching plant and storage areas would be required during the construction and refurbishment phases.

The Yass Valley Wind Farm would provide the following primary benefits:

- In full operation, it would generate more than 993,400 MWh of electricity per year - sufficient for the average consumption of around 124,250 homes.
- It would improve the security of electricity supply through diversification of generation locations.
- It would reduce greenhouse gas emissions by approximately 960,575 tonnes of carbon dioxide equivalent (CO_2e) per annum
- It would contribute to the State and Federal Governments' target of providing 20% of consumed energy from renewable sources by 2020.
- It would contribute to the NSW Government's target of reducing greenhouse gas emissions by 60% by the year 2050.
- It would create local employment opportunities (up to 303 jobs during construction and 28 operations and maintenance jobs) and inject funds of up to $463 million into the Australian economy and $94 million into the local economy.

In addition to these primary benefits there are also secondary benefits and opportunities for improvement in infrastructure, tourism and ecology.

1.2 Contextual Information on Other Proposed or Operating Wind Farms in the Area

The Yass Valley Wind Farm Proposal falls within the ACT/NSW Border Region Renewable Energy Precinct. The precincts are a State Government developed initiative to encourage community partnership in areas where significant future renewable energy development – especially wind farms – is expected with the aim of giving local communities a voice and a stake in renewable energy development (OEH, 2013).

There are currently four proposed wind farm developments and one approved, yet not constructed, within the Yass region (see Figure 1-1):

- Bango Wind Farm – 200 MW
- Conroy's Gap Wind Farm (approved) – 30 MW
- Rugby Wind Farm – 166 MW
- Rye Park Wind Farm – 378 MW
- Yass Valley Wind Farm – 315 MW

An EPBC Referral (Ref 2013/6810) for the Bango Wind Farm was submitted on 28 March 2013 and included a Significant Impact Assessment for the Superb Parrot. The assessment found that the proposed action would not significantly impact on the Superb Parrot. The proposed Yass Valley Wind Farm is unlikely to have a significant on the Superb Parrot and the cumulative impact from the wind farms is also not likely to have a significant impact on the Superb Parrott (Refer section 4.1.4 of this report).

The Yass Valley Wind Farm (this referral 2013/7002) action adjoins the Conroys Gap Stage 2 Wind Farm (2013/6989) action but is likely to have a separate owner and slightly different construction timeframe.

The Conroys Gap Stage 2 and Yass Valley Wind Farm actions are progressing through the NSW State Planning process as a single project – the Yass Valley Wind Farm but due to the differing nature of these two approvals and their associated liability for compliance (State planning approval runs with the land and EPBC determinations are provided to the Proponent), the 126 wind turbine Yass Valley Wind Farm is being referred separately.

Refer Figure 2-7 for a map showing the boundaries of the Conroys Gap Stage 2 and Yass Valley Wind Farm actions.

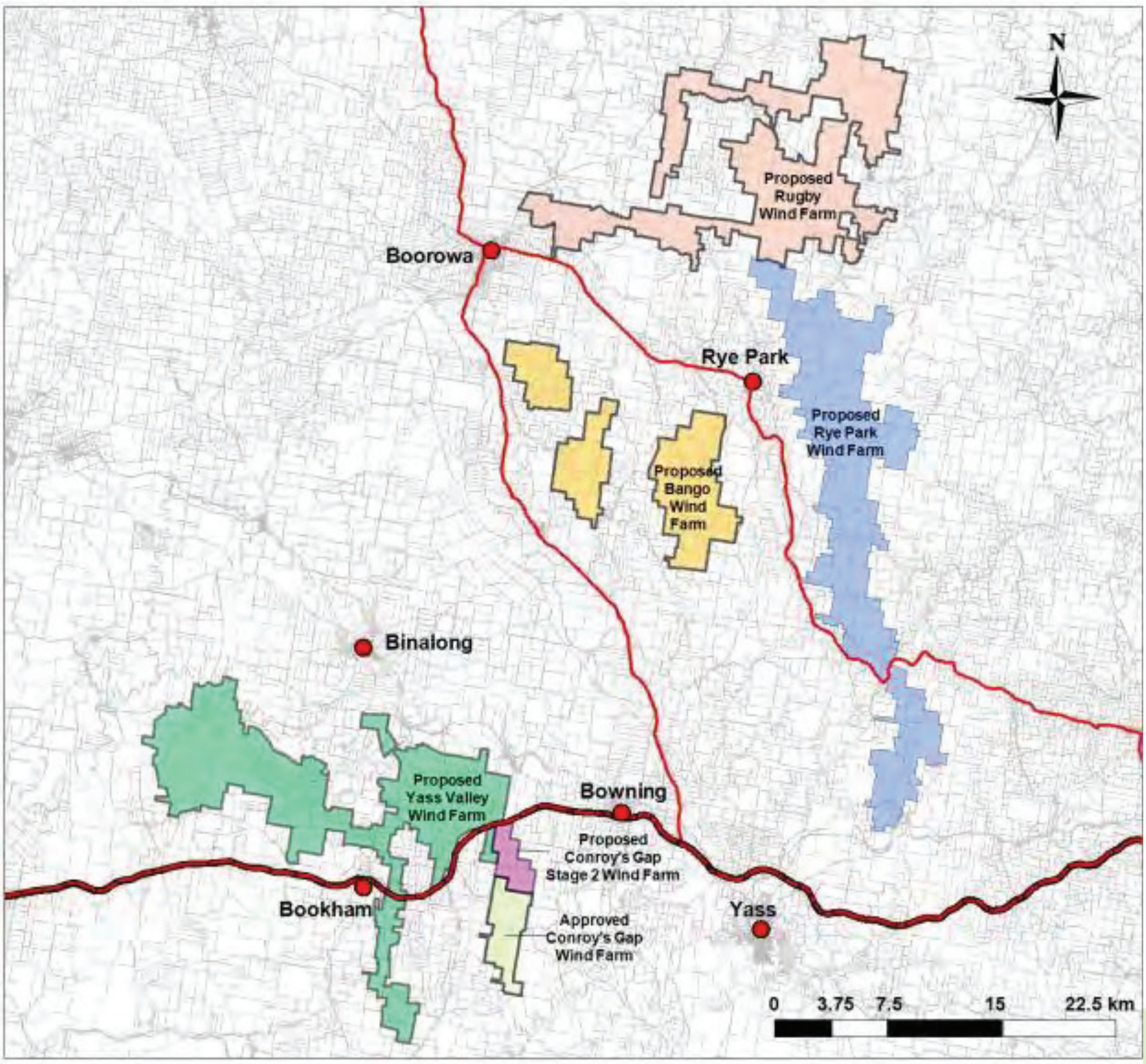

Figure 1-1 Approved and proposed wind farms near the Yass Valley Wind Farm

1.3 Objectives of the Proposal in relation to Government Strategies

1.3.1 State Renewable Energy Targets

In 2006 the NSW Government committed to reduce greenhouse gas emissions by 60% by 2050 (DECCW, 2009). In considering this level of reduction to the power generation sector in NSW, we should note:

- By 2030 energy consumption is expected to rise by 29% in the state (ABARE, 2010).
- Achieving a 60% reduction in emissions, whilst doubling our electricity use, requires an >70% reduction in greenhouse gas emissions per unit of electricity generated.
- Even if our entire fossil fuel power generation fleet was converted to natural gas, this would not even halve our existing level of emissions, and do nothing to address growth.
- Accordingly, to achieve this target, as a minimum all of our electricity growth over the next 40 years must be met with zero emission power sources.
- Wind energy is currently the most economic zero emission power source.

The Draft NSW Renewable Energy Action Plan 2012 supports the national target of 20% renewable energy by 2020. In 2011 renewable generation in NSW was 7.8%. The plan promotes the use of energy from renewable sources at least cost to the energy consumer and with maximum benefits to NSW. The Plan cites Bureau of Resources and Energy Economics statistics 2012 indicating that wind is presently the second lowest cost renewable technology behind biogas (landfill), and that wind is predicted to be the least cost renewable source of electricity beyond 2030.

The proposed Yass Valley Wind Farm supports the Draft NSW Renewable Energy Action Plan 2012 objective of 20% renewable energy by increasing the supply of electricity from wind, the most economical form of large-scale renewable energy.

1.3.2 Federal Renewable Energy Target

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

In August 2009 the Federal Government introduced a revised renewable energy scheme. The Renewable Energy Target (RET) is an expansion of the MRET and required an additional 45,000 GWh of electricity (approximately 20% of Australia's total electricity supply) to be sourced from renewable projects by 2020 (DCC, 2009). This requires an additional 8,000 - 10,000 MW of new renewable energy generators to be built across Australia in the next decade.

In February 2010 the Federal Government amended the RET scheme by dividing the renewable sources into two categories, the small-scale renewable energy generators and large scale renewable energy generators. The purpose of this move was to ensure continued ongoing investment in large scale renewable energy projects (i.e. those projects greater than 30 MW).

Epuron estimates that around one third of the renewable energy generation required to meet this target will need to be built in NSW, and predominantly be supplied by wind generation.

The Yass Valley Wind Farm would have a generation capacity of 315 MW (based on a 2.5 MW turbine) and would contribute directly to the RET.

1.3.3 Existing assessment documents

Three ecological assessment documents have been prepared by **ngh**environmental for the Yass Valley Wind Farm and include:

- Marilba Hills Precinct Biodiversity Assessment (Marilba BA) (July 2009a)
- Coppabella Hills Precinct Biodiversity assessment (Coppabella BA) (July 2009b)
- Supplementary Ecology Report (SER) – Yass Valley Wind Farm (November 2012)
    - This report assessed impacts on new areas added to the project area as well as updating impact area calculations for the entire project, based on the revised infrastructure layout.

2 Description of the Action

The main components of the proposed Yass Valley Wind Farm included in this application are:

- Up to 126 wind turbines located within the Coppabella and Marilba precincts. Each wind turbine consists of three blades, a rotor hub and nacelle mounted on a tubular steel tower together with the associated turbine foundation, turbine transformer and crane hardstand area.
- A 330kV switchyard enabling the connection of the wind farm to TransGrid's existing Yass to Lower Tumut 330kV transmission line. The switchyard will incorporate an auxiliary services building and a nearby microwave tower to provide communications to TransGrid's operational control centre.
- A high voltage (up to 330kV) pole mounted transmission line approximately 25km long to connect the switchyard to the two substations on the wind farm site.
- Up to two substations on the wind farm site. Each substation will include transformers to provide connection to the medium voltage electrical reticulation network.
- A medium voltage electrical reticulation network of above ground and underground cabling to connect the individual wind turbines to the site substations.
- Internal site access tracks and minor upgrades to existing public roads to allow the delivery of the wind turbine components and other equipment.
- A permanent operation and maintenance facility including offices, facilities, car parking and equipment storage.
- A number of permanent wind monitoring masts.
- Temporary construction facilities including offices, facilities, car parking, equipment laydown areas and concrete batching plants.

A range of wind turbines is being considered for the Project with a capacity between 1.5 and 3.6 megawatts. For consistency of presentation the calculations used throughout this EA assume an indicative wind farm capacity of 315 MW based on a typical 2.5 MW turbine.

2.1 Full Scope of Works

2.1.1 Permanent Infrastructure

2.1.1.1 Wind Turbine

Epuron has not yet selected the turbine model to be used for this project. A number of turbines are under consideration for the proposal, each with varying characteristics including physical dimensions and technical attributes, production capacity and cost considerations.

In general, different characteristics of turbine models require different turbine layouts, however to simplify the environmental assessment of the project, an indicative layout has been developed that reflects the characteristics of a large range of turbine models. For the purpose of assessing the wind farm impacts, Epuron bases its assessment on understanding both typical and worst-case impacts likely from the range of turbines under consideration.

Wind Turbines

The wind turbines under consideration have a typical hub height of 78 m – 100 m and a typical blade length of 40 m – 56 m (or 80 m – 112 m overall rotor diameter). The tallest wind turbine tip height combination under consideration is 150 m. An example of a wind turbine can see seen in Figure 2-1.

Each wind turbine would be a three bladed type of the "up-wind" design, meaning that the blades face into the wind and in front of the tower and nacelle. This design reduces noise levels generated during operation.

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

Nacelle

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

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

Tower

The tower is of tubular steel or concrete construction typically 78-100 m high, tapering from around 5-6 m in diameter at the base to around 3-4 m at the top. Exact dimensions would depend on the wind turbine design selected. The tower is constructed in up to five sections, each section bolted or welded together via an internal flange arrangement. Within the core of the tower are the power and control cables and an access ladder or mechanical person lift to the nacelle (with safety climb system).

Access Tracks, Hardstands and Footings

The tower would be mounted on a reinforced concrete footing and would require removal of rock and subsoil at the base of each turbine. A number of footing design options are under consideration including a gravity footing (where subsoil geology is less stable) and a rock-bolted footing (where subsoil geology provides good bedrock). A combination of these footing designs may be used on the site depending on the geology identified at each turbine location.

Each wind turbine would require an access track and electrical cabling to the site collection / connection substations. Access tracks would be a minimum of 5-6 m wide (wider at bends and passing lanes) and be all weather graded gravel tracks. Hardstand areas required beneath each turbine would be approximately 22 m x 40 m (880 m^2). The shape and exact size of the hardstand area is subject to final turbine selection and crane lifting requirements. The hardstand area is used for delivery and storage of turbine components, assembly of the turbine components and for the turbine installation cranes. A typical layout of a hardstand area can be seen in Figure 2-2.

Access tracks and hardstands areas would generally be left in situ after construction to allow for any required maintenance and repairs.

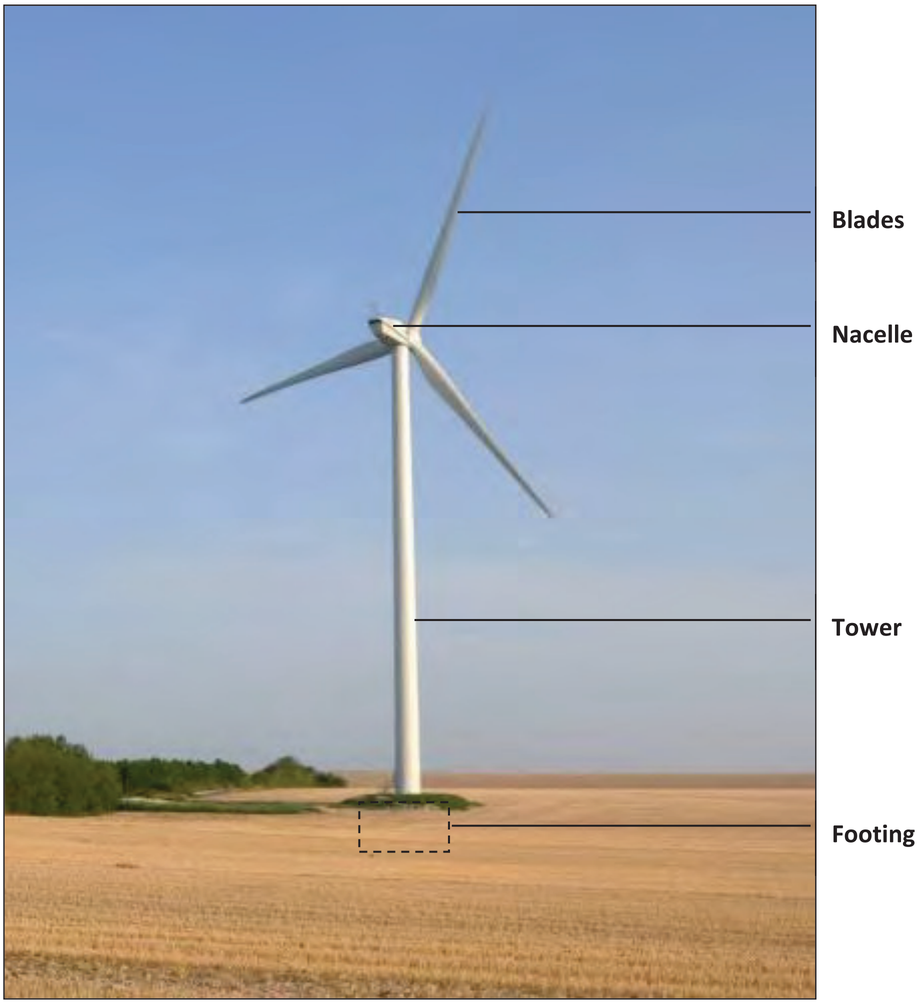

Figure 2-1 Typical wind turbine installed on an 80m tower (Photo courtesy REpower Systems AG)

Transformer

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

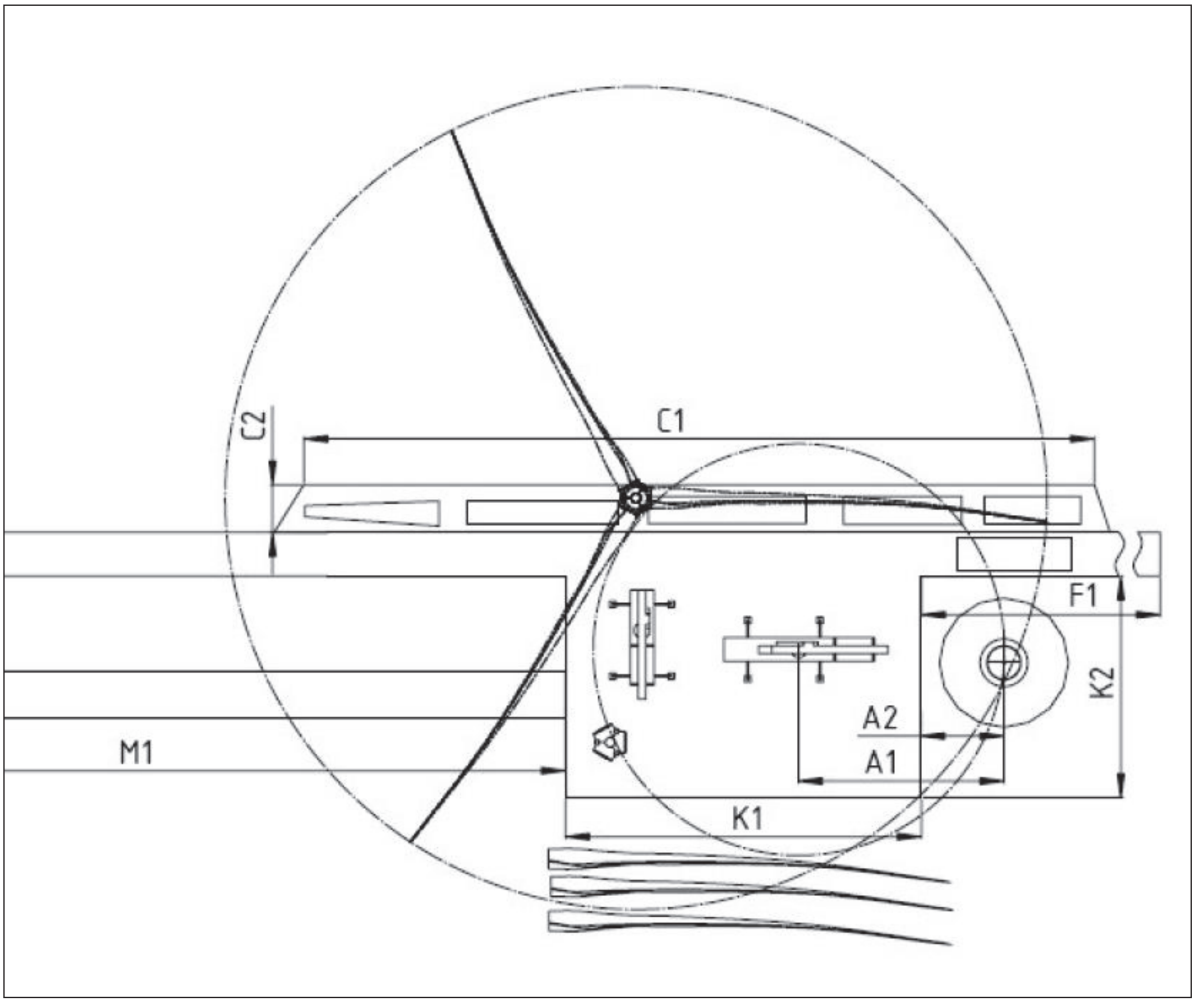

Figure 2-2 Example crane hardstand area (Source: REpower)

2.1.1.2 Grid Connection and Substations

The preferred 330kV grid connection option for the wind farm will consist of:

- A 330kV switchyard enabling the connection of the wind farm to TransGrid's existing Yass to Lower Tumut 330kV transmission line located to the south. The switchyard will incorporate an auxiliary services building and a nearby microwave tower to provide communications to TransGrid's operational control centre.
- A high voltage (up to 330kV) pole mounted transmission line approximately 25km long to connect the switchyard to the substations on the wind farm site. The easement would be up to 60m wide.
- Two substations on the wind farm site, one for the Coppabella precinct and one for the Marilba precinct. An option of a single substation located between the Coppabella and Marilba precincts is also being considered.

Each substation will include all necessary ancillary equipment such as a control room and amenities, communication equipment, control cubicles, voltage and current transformers, and circuit breakers for control and protection of the substation. The collection substation also requires telecommunications (cable, optic fibre and/or microwave links) and low voltage electricity connections (415 V – 11,000 V) from local services.

The perimeter of each collection substation area would be marked by a security fence to prevent trespassers and stock ingress. The ground would be covered partly by crushed rock and partly by concrete pads for equipment, walkways and cable covers, and would have an earth grid extending outside of the boundary of the security fence.

Typically each collection substation would occupy an area of approximately 150 m x 150 m. The proposed locations for each collection substation have been identified and are shown in Figure 2-6.

2.1.1.3 Onsite Electrical Reticulation

From each wind turbine, the power voltage is stepped up from generation voltage to either 22 kV or 33 kV for either underground or overhead reticulation cabling from each group of turbines to the collection substations.

In general, overhead cabling offers benefits as it minimises ground disturbance and is significantly lower in cost. There are practical limitations installing overhead cabling on ridges where turbines are located, as well as increased visual impact.

Typically underground cabling is used to connect turbines along the ridgelines and overhead cabling is used to transport power between adjacent ridges and from groups of turbines to the collection substations. Cable trenches would, where practical, be dug within or adjacent to the onsite access tracks to minimise any related ground disturbance. Short spur connections would diverge from the main cable route which would approximately follow the main access route at each group of turbines. Subject to ground conditions underground cables would require a trench of 0.75 – 1 m deep and be typically 0.3 – 1 m wide. Parts of the underground network will cross existing roads such as Coppabella Road at the western end of the site.

2.1.1.4 Communications

A suitable communications network will be established across the wind farm site to enable appropriate operation and control including the required interaction with the TransGrid electricity grid. This may involve underground, overhead or microwave communication systems.

2.1.1.5 Operation and Maintenance Facilities

A permanent operations and maintenance facility will be constructed on the wind farm site and requires connection to low voltage electricity supply (415 V – 11,000 V) from local services. A permanent operations and maintenance facility will be constructed on the wind farm site for managing operations and maintenance activity. The facility would likely be located near to the central collection substation on the wind farm. The facility will include car parking, offices and amenities for the maintenance staff, a control room and storage facilities for spares and equipment needed for the maintenance and operation of the wind turbines.

2.1.1.6 Control and Communication Cabling

In addition to the electrical cabling, control and communications cabling is required from the maintenance facility to each wind turbine, and to the various substations. This communication cabling is typically optical fibre cable and would be installed using the same method and route as the power cabling described above, that is, strung from the same poles as overhead lines, or buried in the same cable trench as the electrical cables.

2.1.1.7 Wind Monitoring Equipment

Epuron is currently operating five temporary wind monitoring masts on the site to assess wind speeds at or near proposed turbine locations. Following construction, a number of permanent wind monitoring masts would be required to assist the control and operation of the wind farm. These would be either static guyed or un-guyed structures and will be to a minimum height of the wind turbine hubs with remotely operated wind monitoring equipment installed at multiple heights on each mast.

Pending final wind turbine placements, it may be necessary to move or install additional temporary wind monitoring masts to verify wind speeds across the site.

2.1.2 Temporary Infrastructure

During the construction phase up to two construction compounds will be established on the site. The compounds will include car parking, site offices, and amenities for the construction work force, and lay down areas for the temporary storage of construction materials, plant, equipment and wind turbine components. A temporary power supply will be required to be connected to the construction compounds.

Site Offices

During the construction phase up to 346 staff would be working on site at any time. Suitable locations for site offices would be selected, avoiding areas that are regarded as having environmental constraints. The site offices may include several demountable buildings and amenities blocks located on site for the duration of construction. Sufficient parking would be provided for the expected usage.

Rock Crushing

Materials excavated during the construction of wind turbine footings may be able to be reused for other purposes such as road base for the access roads and upgrades. Mobile rock crushers would be used for these purposes during construction.

Concrete Batch Plants

During construction up to two concrete batching plants would be required on site and are typically located proximate to the construction compounds. A typical concrete batch plant would involve a level area of approximately 75 x 100 m to locate the loading bays, hoppers, cement and admixture silos, concrete truck loading hardstand, water tank and stockpiles for aggregate and sands. The batching plant would include an in-ground water recycling / first flush pit to prevent dirty water escaping onto the surrounding area, and would be fully remediated after the construction phase. The concrete batching plant would produce around 400 m^3 of concrete per day when a turbine foundation is being poured. The operational period would be for 18-24 months and each plant would produce around 850 tonnes of concrete per day. This is equivalent to around 110,000 tonnes of concrete during the construction phase for foundations.

2.1.3 Fencing

New gates will be provided where turbine access tracks cross existing fence lines to enable existing farming practices to continue as before the construction of the wind farm. Some temporary fencing will be required during the construction period to minimise disruption to farming practices during construction. Appropriate security fencing will be provided at substation and switchyards and at the main access points to the wind farm from the public road network.

2.1.4 Stockpiles of Materials

Generally construction materials (road base and gravel) for the construction of access tracks and concrete for wind turbine foundations will be sourced from the materials excavated from turbine foundations and cut in the preparation of the access tracks. Depending on the geotechnical conditions encountered on the site, some temporary storage of construction materials will be required.

2.1.5 Stormwater Diversions & Erosion Control

An Erosion and Sediment Control Plan will be developed as part of the Construction Environment Management Plan prior to the commencement of any construction activities.

2.1.6 Environment Rehabilitation Works

A draft Decommissioning and Rehabilitation Plan has been prepared which sets out the process for environment rehabilitation works to be carried out at the end of the operational life of the wind farm which is expected to be 30 years.

2.2 Locations of Off-Site Infrastructure

2.2.1 Connection to the Electricity Grid

To export power from the wind farm, it is necessary to connect the wind turbines to the national electricity grid. This is achieved through a combination of underground and overhead electricity cables connecting the turbines to the collection substations, which then connects into the electricity grid via an overhead powerline to the wind farm switchyard.

The primary onsite electrical works would include:

- A new 330 kV wind farm connection switchyard and connecting transmission line, will be located adjacent to the existing 330 kV TransGrid transmission 12 km to the south of the wind farm.
- A new overhead powerline, approximately 25 km long, running between the Coppabella and Marilba precincts' two collection substations to a central junction and then south to the existing TransGrid 330 kV transmission line (Yass – Lower Tumut). The new overhead powerline will be rated at up to 330 kV (nominal)

capacity and mounted on a single pole type structure. The powerline may be single-circuit or double-circuit as required.

- Up to two new collection substations will be located on the wind farm site. The two new collection substations will collect power generated by the turbines in each precinct and deliver to the new overhead powerline. A network of underground and overhead electrical cables, at 22 kV or 33 kV, reticulating power from the turbines to the collection substations. The underground and overhead electrical reticulation network will include the crossing of existing roads, such as the Hume Highway at Conroy's Gap and Coppabella Road.
- Associated communications network necessary for site operations and control.
- An operations and maintenance facility including wind farm controls and power supply.

An alternative grid connection consisting of a number of 132 kV switchyards and associated infrastructure connecting the wind farm at multiple locations to the existing TransGrid 132 kV line (Yass – Wagga Wagga) bordering the site to the north. Up to 3 separate overhead 132 kV powerlines would be used to connect the wind farm to the existing electricity grid. Whilst approval is being sought for both options, only one grid connection design would be constructed.

Wind Farm Connection Switchyard and Connection to TransGrid Transmission Line

A new 330 kV wind farm connection switchyard will be constructed to connect the wind farm into the existing 330 kV TransGrid Yass – Lower Tumut transmission line located at the south of the site. This connection switchyard would cover an area approximately 4 hectares plus an access road.

The connection switchyard will include all necessary ancillary equipment including a span of 330 kV connecting transmission line, control room and amenities, communication equipment, control cubicles, voltage and current transformers, and circuit breakers for control and protection of the switchyard. The connection switchyard also requires telecommunications (cable, optic fibre and/or microwave links) and low voltage electricity connections (415 V – 11,000 V) from local services.

The connection switchyard area would be marked by a security fence to prevent trespassers and stock ingress. The ground would be covered partly by crushed rock and partly by concrete pads for equipment, walkways and cable covers, and would have an earth grid extending outside of the boundary of the security fence.

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

Typically the 330 kV connection switchyard would take up an area of approximately 4 hectares. The proposed location for the connection substation has been identified and is shown in Figure 2-4. A short span of 330 kV connecting transmission line would connect the connection substation to the existing 330 kV TransGrid transmission line.

Figure 2-3 **TransGrid's 330 kV Macarthur Substation in southwestern Sydney**

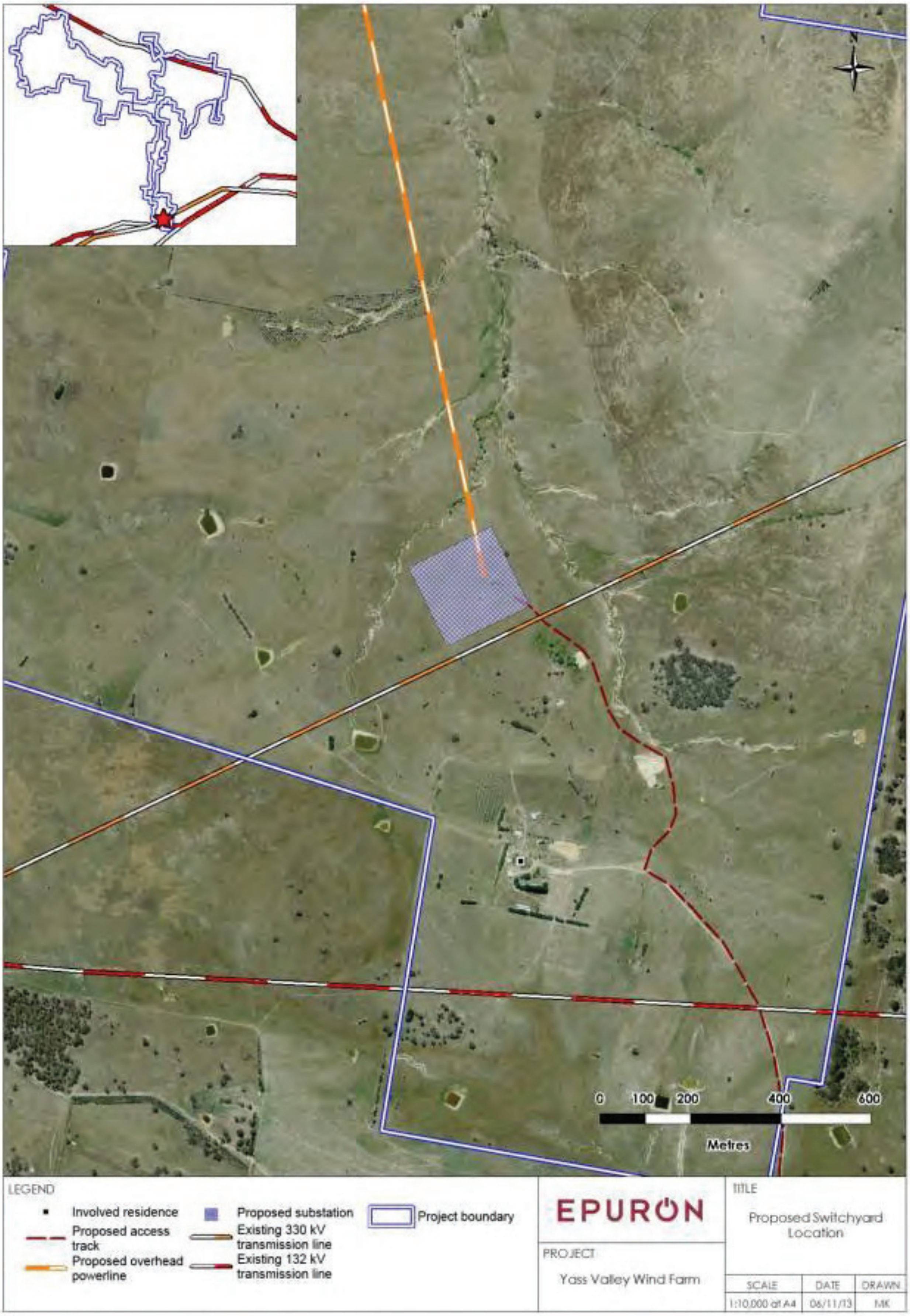

Figure 2-4 Proposed 330 kV switchyard location and existing TransGrid transmission lines

2.2.2 Transmission Lines

Overhead Powerline

The proposed overhead powerline design is approximately 25 km long and will connect the Coppabella and Marilba precincts' substations with the TransGrid 330 kV transmission 12 km to the south. The alternative overhead powerline design would consist of up to three 132 kV overhead powerlines with a combined approximate length of 22 km, connecting to a separate TransGrid transmission line to the north. Approval is sought for the two overhead powerline routes, proposed and alternate, identified on the site although only one route or a mix thereof will be constructed.

Powerline structures come in many designs however most are either steel or concrete pole design or a steel lattice tower design. The type of design used may vary depending on the preferred voltage, different ground conditions, carrying weights, strain angles, clearance requirements as well as local environmental conditions including local constraints (e.g. archaeological) and visual amenity.

Based on electrical design assessments for the wind farm it is proposed the new overhead powerline will be rated at up to 330 kV (nominal) capacity and will be mounted on a single pole type structure as shown below and would be up to 45 m high. The new overhead powerline would be either single-circuit or double-circuit design.

Figure 2-5 Example of a double circuit 330 kV overhead powerline mounted on a single pole type structure

2.2.3 Road Upgrades

2.2.3.1 Site Access

Two primary access points have been identified, one for the Coppabella precinct off Whitefields Road and one for the Marilba precinct of Illalong Road. Minor upgrades to the intersections with the Hume Highway and a short section of Whitefields Road will be required.

2.2.3.2 Access Tracks

On site access tracks required for construction and operation would be unsealed formations with a minimum width of 5 - 6 m. Access tracks are required to the base of each wind turbine location and to the location of the connection substation, collection substations, overhead powerline route and operation and maintenance facility. New gates and possibly new or realigned fences may also be required to protect stock during the construction phase and at property boundary crossings.

Once the construction phase has finished, the crane hardstands and access tracks would be maintained to allow maintenance and repairs to the wind turbines. These tracks can also be used for normal farm access and for emergency or fire vehicle access.

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

- minimise the number and length of access tracks;
- locate access tracks along the route of existing farm tracks;
- locate access tracks to minimise clearing of native vegetation;
- locate access tracks to minimise impact on sensitive ecological or heritage areas;
- construct access tracks with due regard to erosion and drainage; and
- construct access tracks with due regard to landowners ongoing farming practises

A detailed view of the proposed access tracks can be seen below in Figure 2-6.

2.3 Description of Construction Methods, Techniques and Materials

Prior to the commencement of construction works a Construction Environmental Management Plan (CEMP) will be prepared to the satisfaction of the relevant authorities to manage and mitigate environmental impacts on the wind farm site. The CEMP will incorporate all relevant processes and mitigation measures for development activity and will include:

- Traffic and Transport;
- Erosion & Sediment Control Plan;
- Landscape Management Plan;
- Soil & Water Management;
- Chemical and Fuel Storage - to avoid pollution of surface and ground waters;
- Fire Management;
- Rail Safety Management Plan;
- Waste Generation and Disposal; and
- Additional measures mentioned in the Statement of Commitments.

Prior to the commencement of permanent wind farm operations an Operational Environmental Management Plan (OEMP) will be prepared to the satisfaction of the relevant authorities to manage and mitigate environmental impacts on the wind farm site. The OEMP will incorporate all relevant processes and mitigation measures for wind farm operations and will include:

- Health and Safety;
- Community and Communications

- Waste Generation and Disposal; and
- Additional measures mentioned in the Statement of Commitments.

2.4 Description of Operational Requirements and Maintenance Works

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

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

Routine Maintenance

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

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

Major Repairs

It is possible that major unexpected or unscheduled equipment failures could take place during the life of the wind farm. While wind turbines and electrical components are designed for a 20 - 30 year life, failures can occur, for example due to lightning strike.

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

Replacement of wind turbine blades, if necessary, would require bringing new blades to the affected turbine and installation of these blades using large cranes. The requirements are similar to the construction phase, and the access tracks established for construction would be used.

Replacement of wind turbine generators or gearboxes may require a crane and low loader truck to access the wind farm.

Replacement of substation transformers would require a low loader truck to access the site.

Site monitoring program

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

2.5 Anticipated Duration and Timing

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

2.5.1 Phase 1: Wind Farm Construction

The construction phase of the wind farm is likely to occur over an 18-24 month period and would include activities such as:

- transportation of people, materials and equipment to site;
- civil works for access track construction, turbine and monitoring mast footings and trenching for cables;
- establishment, operation and removal of any required construction equipment such as rock breaking equipment and concrete batching plants;
- potential use of blasting in foundation excavation, if required;
- installation of wind turbines using large mobile cranes;

- construction of site substations, connection to on-site 330kV transmission line, and onsite overhead powerlines and electrical cables;
- construction of additional facilities (temporary and permanent) as required;
- construction, use and removal of temporary offices and facilities;
- temporary storage of plant, water, aggregates and other equipment; and
- restoration and revegetation of disturbed onsite areas on completion of construction works.

In general, construction would commence with site establishment, construction of access tracks and all other site civil works, including preparation of hardstand areas, and laying of cables. This would be followed by preparation of concrete footings, which must be cured prior to installation of wind turbines and monitoring masts.

Wind turbine construction and erection can be relatively fast once the footings are prepared, with wind turbines installed at a rate of approximately 2-3 per week, subject to weather. The towers are erected in sections, the nacelles lifted to the top of the towers, and finally blades lifted and bolted to the hub or preassembled on the ground and lifted as a unit.

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

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

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

2.5.2 Phase 2: Wind Farm Operation

Ongoing wind farm operations have been detailed in Section 2.4.

2.5.3 Phase 3: Wind Turbine Refurbishment / Replacement

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

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

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

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

2.5.4 Phase 4: Wind Farm Decommissioning

Decommissioning the wind farm at the end of its commercial life is the proponent’s obligation and cost. It would involve reinstating similar road access arrangements to construction, and would require access for large cranes and transport vehicles to dismantle and remove the turbines and associated infrastructure. All underground infrastructure such as foundations and cable trenches would remain in situ and all above ground infrastructure would be removed. Some infrastructure such as access roads and buildings may be required by the landowner to remain in place after decommissioning and will not be removed. The decommissioning period is likely to be significantly shorter and with significantly fewer truck movements than the construction phase.

2.5.5 Staging of Works

It is possible that not all turbines, access tracks or other equipment outlined in this EA would be ultimately required for the project. Likewise, market, seasonal, or operational requirements may mean that the actual construction of the wind turbines may occur in stages or groups over a number of years.

Construction works packages, such as civil and electrical works, may be required to commence at different times or in stages as a result of receiving certain final development approvals or certifications to commence at different times.

2.5.6 Construction hours

In general, construction activities associated with the project that would generate audible noise in excess of the requirements of the NSW Industrial Noise Policy at any residence would be undertaken during the daylights hours of:

Monday – Friday: 7am – 6pm

Saturday: 7am – 3pm

Sunday and public holidays: Not currently proposed

These working hours have been proposed to allow reasonable efficiencies of effort to achieve maximum productivity and to minimise the overall construction duration but should not be restricted to daylight hours. Variations to these hours may be required subject to weather and seasonal impacts.

However, some activities (including delivery to site of major equipment, and turbine installation) may occur outside of these hours due to logistic or weather related reasons.

Turbine crane lifts, for example, can only be carried out during periods of lower wind speeds because of operational limitations with the tall cranes and it is possible that out of hours work would be required for this purpose. This scenario has occurred at other wind farms (for example Cape Bridgewater, Victoria) where night crane operations have been required because of strong winds occurring during the day.

Likewise, the requirements of NSW Police or roads authorities may limit transport of major equipment to and from the site to outside of normal working hours.

2.6 Location, Boundaries and Size of Disturbance Footprint

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

During the construction activities, additional areas of the site would be impacted to provide construction compounds, concrete batching plants and storage areas. These areas can be rehabilitated and restored following the completion of the construction program. Table 2-1 presents the calculated area of the site impacted by the project based on the turbine layout. Some of these impacts would be for the duration of the wind farm operation and some are temporary impacts during the construction phase.

Table 2-1 Development footprint and site disturbance areas

Project Components	Typical Dimensions	Quantity	Total Area (ha)
Turbine Footing and Hardstand#	25 x 25 m	126	7.9
Crane hardstand	22 x 40 m	126	11.1
Access and spur roads*#	10 m	102.3 km	102.3
Underground powerlines onsite**	1 m	55.6 km	5.6
Overhead Powerline^	16 m	16.7 km	26.7
Connection Switchyard	200 x 200 m	1	4.0
Collection Substations	150 x 150 m	2	4.5
Operations and Maintenance facilities and Control Building	100 x 100 m	1	1.0
Concrete batch plants	100 x 75 m	2	1.5
Construction compound, staging and storage areas	300 x 100 m	2	6.0

* Access tracks around the site are anticipated to be 5-6 metres in width, however, a 10 metre width has been used to assess the likely impact due to cut and fill operations in order to achieve the required slope and increased width needed at bends.

**The impact area associated with underground cables has been incorporated into the figures for access tracks.

Habitat permanently removed
^ Habitat would be modified for underground and overhead electrical cabling and overhead powerline maintenance. This would include clearing and trimming vegetation for each power pole and maintaining clearance from electrical conductors between poles.

2.7 Indicative Layout Plan of the Area

Refer map on following page.

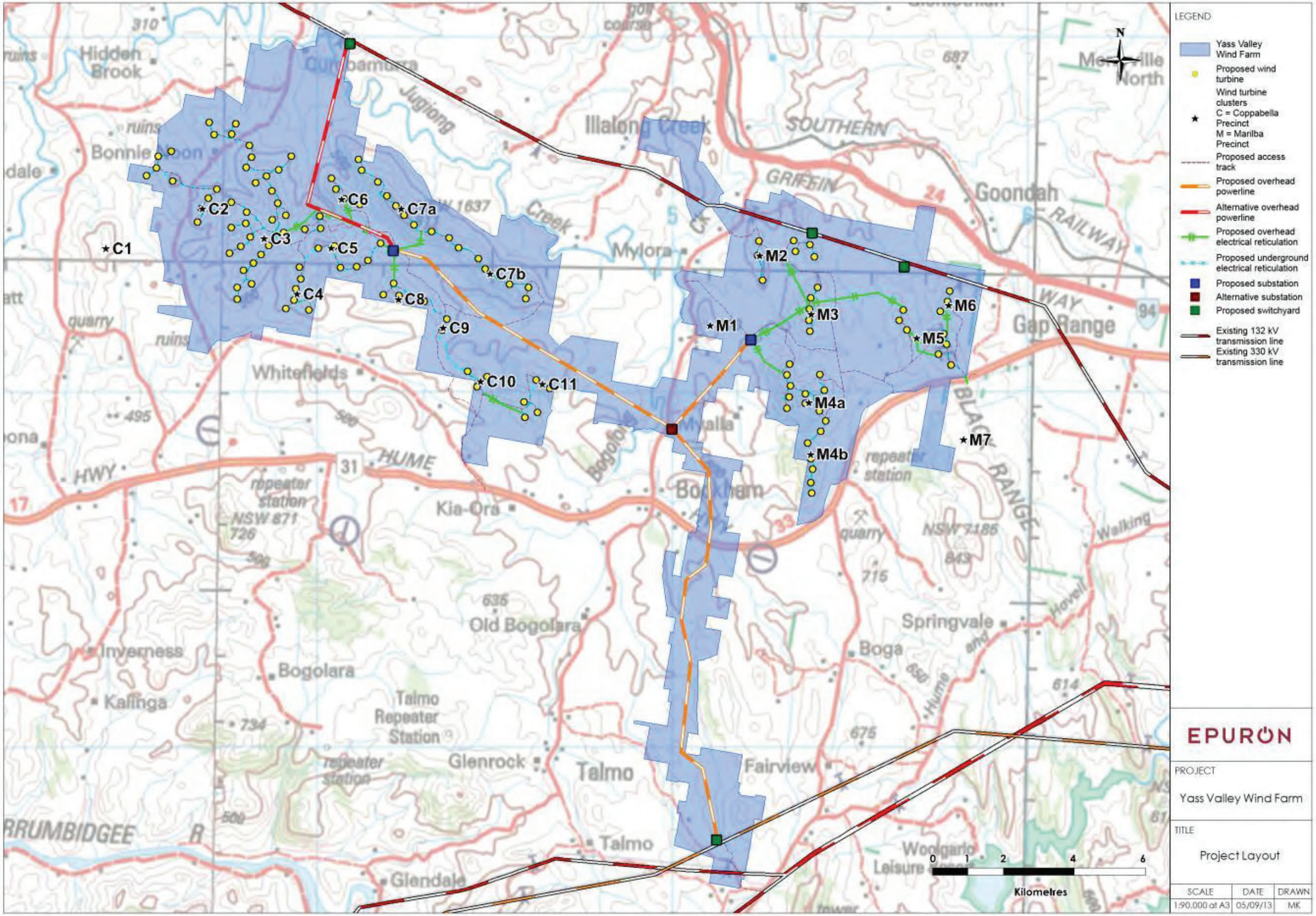

Figure 2-6 Yass Valley Wind Farm proposed project layout

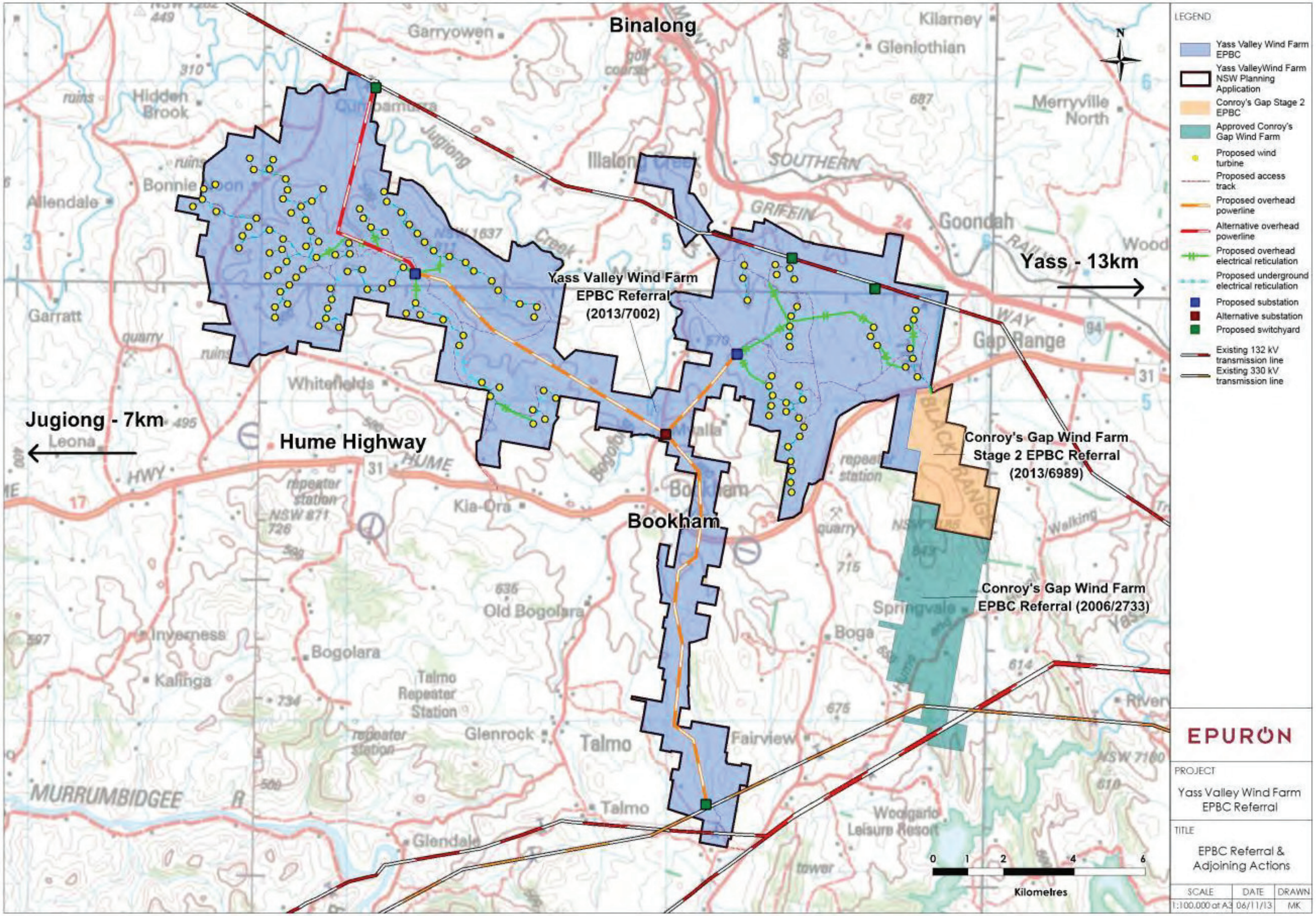

Figure 2-7 EPBC referral and adjoining actions