



Planning &
Environment

**STATE SIGNIFICANT DEVELOPMENT
ASSESSMENT
Bango Wind Farm
(SSD 6686)**



Assessment Report
Section 89E of the
Environmental Planning and Assessment Act 1979

February 2018

Cover Photograph: Sourced from Green Bean Design Pty Ltd, Bango Wind Farm Landscape & Visual Impact Assessment, May 2016.

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EXECUTIVE SUMMARY

Bango Wind Farm Pty Ltd (BWF), on behalf of CWP Renewables Pty Ltd, a wholly owned subsidiary of Continental Wind Partners and the Wind Prospect Group, proposes to develop a new wind farm (the project) generating up to 255 megawatts (MW) between the regional centres of Yass and Boorowa in the Southern Tablelands of NSW. The site is located in the Hilltops (formerly known as Boorowa) and Yass Valley local government areas.

During the assessment process, BWF significantly reduced the number of turbines proposed to be constructed from 122 to 75 to address biodiversity and visual impacts. The proposed project now involves the construction, operation, maintenance and decommissioning of up to 75 turbines with a tip height of up to 200 metres (m) and hub height of up to 128 m, located over two clusters (Kangiara and Mt Buffalo clusters). BWF is seeking approval for two marginally different layout options (Layout Options 1 and 2), with the key difference between the two options being the total number of turbines (i.e. up to 75 turbines for Layout Option 1 and up to 61 turbines for Layout Option 2).

The project also involves the development of associated ancillary infrastructure including temporary construction compounds, concrete batching plants, permanent access tracks, operation and maintenance facilities, on-site electrical infrastructure, and a grid connection with either one or both of the Yass to Cowra 132 kV transmission lines.

The project is classified as State Significant Development under the *Environmental Planning and Assessment Act 1979* (EP&A Act), and the consent authority for the project is the NSW Minister for Planning. Under the Minister's delegation of 14 September 2011, the NSW Planning Assessment Commission must determine the development application for the project as it attracted more than 25 public objections.

Consultation

The Department exhibited the Environmental Impact Statement (EIS) for the project from 27 September 2016 until 28 November 2016 (63 days) and received 101 submissions, including 50 objections, primarily from residents living within 5 kilometres of the project site.

The Department visited the site on several occasions, attended the project's Community Consultative Committee meetings, held a Community Information Session, and met with a number of the community members that lodged submissions. The Department has also consulted further with BWF and key government agencies and Hilltops and Yass Valley Councils throughout the assessment process. This has resulted in major changes to the project that have led to better outcomes for the community and the environment.

None of the government agencies or local Councils objected to the project, but have provided advice and recommendations that have been addressed in the Department's assessment and incorporated into the recommended conditions of consent.

The key issues raised in submissions and considered in the Department's assessment include visual, noise and biodiversity impacts, and the impacts of the project on the road network.

Assessment

Visual

In relation to visual impacts, the sensitivity of the landscape and the proximity of residences, and hence the nature and extent of the impacts of the project, vary considerably across the site.

The regional setting is not characterised by areas identified as having high scenic value or that have been zoned for recreation, tourism, environmental management or conservation, and the area surrounding the project site is characterised by an undulating pastoral and agricultural landscape.

The predominant views to the project from non-associated residences occur to the south of the site. In contrast, the views from non-associated residences to the north, east and west of the project site are largely shielded by intervening hills and ridgelines.

The Department, with the assistance of an independent visual expert, undertook an assessment of the visual impact of the project on the landscape character and key non-associated residences located within approximately 4 km of a proposed turbine.

The Department considers that the project would not fundamentally change the broader landscape characteristics surrounding the project site. However, the assessment found that 11 non-associated residences could experience either medium/high or high visual impacts as a result of the project. Of these 11 residences, 10 would be affected by turbines located in the southern portion of the Kangiara and/or Mt Buffalo clusters.

While the impact on each of these 10 non-associated residences would be different depending on their distance to the nearest turbines, the local topography, and any existing vegetation screening, the Department considers the impacts on 7 of these 10 residences would be substantially reduced by removing 4 turbines in Layout Option 1 in the southern Kangiara cluster (and the corresponding turbines in Layout Option 2), as this would remove the dominance impacts of the closest turbines and decrease the cluttering effect along the horizon associated with the number of visible turbines.

The Department considers that the medium/high or high visual impacts on the remaining 3 residences could be mitigated to a reasonable extent through additional visual screening, although the Department acknowledges this could be further reduced by removing additional turbines, and recommends the Commission consider this issue in more detail prior to determining the project.

In regard to the remaining non-associated residence with high visual impacts, the Department considers the impact on this residence is primarily due to 2 turbines in Layout Option 1 (and the corresponding turbine in Layout Option 2) in the northern Kangiara cluster.

As the turbines are 200 m high and located in relatively close proximity to the residence (2.2 km and 2.4 km respectively), the Department considers the impact on this residence would not be able to be effectively mitigated by visual screening. As such, the Department has recommended that BWF should not be allowed to construct these turbines unless it is able to formalise an agreement with the landowner in regard to visual impacts.

Consistent with standard practice, the Department has also recommended conditions requiring BWF to further reduce the visual impacts of the project by providing the owners of all non-associated residences within 4 km of a turbine the ability to ask for visual mitigation measures (i.e. vegetation screening or landscaping) at the residence.

The Department, with the assistance of the independent visual expert, also undertook an assessment of the cumulative visual impacts from the approved, but not yet constructed, Rye Park Wind Farm, and found that a small number of non-associated residences located south of Rye Park village along Wargeila Road could experience cumulative visual impacts.

However, due to the distance to the turbines and the intervening topography, the Department considers these impacts could be sufficiently mitigated through the provision of additional visual impact mitigation.

With the recommended changes to the proposed layout and the implementation of additional mitigation, the Department considers the residual visual impacts of the project on the landscape and local residents would be acceptable.

Noise

In relation to noise impacts, the project site is located in a relatively quiet rural area with low background levels. Using conservative assumptions, the noise modelling found that the project would be able to comply with the relevant operational noise criteria at all non-associated residences, except for non-associated residence 238.

The noise level at residence 238 is predicted to exceed the criterion (i.e. 35 dB(A)) by 2 dB(A). However, the conservative assumptions in the assessment and the minor nature of the potential exceedance, the Department considers that the criterion could be readily achieved by operating the closest turbines in noise management mode or using sector management, and compliance with noise criteria could be confirmed through monitoring once the final turbine model is selected and commissioned.

Overall, both the Department and the NSW Environment Protection Authority consider that the noise criteria and the predicted noise levels have been correctly calculated for the project, and that the noise generated by the project would be able to comply with the applicable operational noise criteria at all non-associated residences, both on its own and taking into account any cumulative noise impacts from the nearby Rye Park Wind Farm.

Biodiversity

In relation to biodiversity impacts, based on the findings of the ecological assessments and concerns raised by OEH, BWF significantly revised the project layout to avoid disturbance of native vegetation where practicable, including removing 47 turbines from the project layout, revising the over-dimensional and heavy vehicle transport routes to avoid the need for clearing along local roads, and rationalising the site access points.

Using conservative assumptions, the project would still involve clearing of up to 138 hectares of vegetation, including 103.75 hectares of Box Gum Woodland endangered ecological community (EEC). However, the majority of the area assumed to be Box Gum Woodland EEC is comprised of a derived native grassland with sparsely distributed Yellow Box trees, that has been subject to past clearing, grazing and/or ploughing.

The Department's assessment found that despite this disturbance (which represents 3% of the project site), the project would not result in any significant impacts on threatened species or EECs, and would not pose a significant or unacceptable level of risk to bird and bat species in the vicinity of the proposed turbines. BWF proposes to further reduce the biodiversity impacts through additional micro-siting of turbines, and offset the residual impacts of the project in accordance with the *NSW Biodiversity Offsets Policy for Major Projects*.

Overall, both the Department and the NSW Office of Environment and Heritage consider that with the recommended conditions in place that require BWF to avoid impacts on threatened species, limit clearing of native vegetation, and implement a Biodiversity Management Plan, Bird and Bat Adaptive Management Plan, and biodiversity offset strategy, the residual biodiversity impacts of the project would be suitably minimised, managed and/or offset to maintain or improve biodiversity values in the region over the medium to long term.

Traffic and Transport

In relation to traffic and transport impacts, the potential impacts would be largely restricted to the project's 18 month construction period, and could be managed by undertaking suitable road upgrades prior to commencing construction, and implementing standard traffic controls and a driver's code of conduct.

BWF has agreed on a schedule of road upgrades with both Roads and Maritime Services and Hilltops and Yass Valley Councils, which includes upgrading the intersections of Lachlan Valley Way, Tangmangaroo Road, Wargeila Road and the site access points. The Department has recommended conditions formalising the agreed road upgrades and maintenance arrangements, and requiring the preparation and implementation of a comprehensive Traffic Management Plan.

With these measures in place, the Department is satisfied that the project would not result in any unacceptable impacts on the capacity, efficiency or safety of the road network.

Summary

The Department acknowledges there is some community opposition from local landowners and special interest groups to the project. However, the Department considers that with the removal of 47 turbines from the original layout, including the entire Langs Creek cluster, combined with the recommended removal of an additional 4 turbines, and a restriction on the construction of 2 turbines without the agreement of the affected landowner, the project would achieve a reasonable balance between maximising the use of the site's wind resources, and minimising the potential impacts on the local community and environment.

To address the residual impacts of the project, the Department has recommended a range of detailed conditions to ensure these impacts are effectively minimised and/or offset. These conditions use a risk-based approach that focuses on performance-based outcomes. This reflects current government policy, and the fact that wind farms require relatively limited ongoing environmental management once the turbines have been commissioned.

Importantly, while the removal of turbines would reduce the project's capacity, the project would still provide an installed capacity of approximately 240 MW, and make substantial contributions to the delivery of the Commonwealth Government's *Renewable Energy Target* and NSW's *Renewable Energy Action Plan*. It would also result in associated benefits to the wider community including job creation, capital investment, reductions in greenhouse gases, and community funding contributions of up to \$200,575 a year (plus CPI) through a voluntary planning agreement with each of the two Councils.

Based on its detailed assessment of the project, the Department considers that the project is approvable, subject to the recommended conditions of consent.

1. PROJECT

Bango Wind Farm Pty Ltd (BWF), on behalf of CWP Renewables Pty Ltd, a wholly owned subsidiary of Continental Wind Partners (CWP) and the Wind Prospect Group (WPG), proposes to develop the Bango Wind Farm (the project), located to the east of Lachlan Valley Way between the regional centres of Yass and Boorowa in the Southern Tablelands of NSW (see Figure 1).

The site is located in the Hilltops (formerly known as Boorowa) and Yass Valley local government areas (LGAs), and forms part of a larger rural area used primarily for grazing.

The project involves the construction, operation, maintenance and decommissioning of a wind farm of up to 75 turbines with a tip height of up to 200 metres (m) and hub height of up to 128 m.

The project also involves the development of associated ancillary infrastructure including:

- temporary construction compounds, concrete batching plants, and equipment storage; and
- permanent access tracks, operation and maintenance facilities, site offices and on-site electrical infrastructure, ultimately connecting to the grid via either one or both of the Yass to Cowra 132 kV transmission lines.

During the assessment process, BWF reduced the number of turbines proposed to be constructed from up to 122 to 75 to address biodiversity and visual impacts of the project.

A comparison of the key project changes are summarised in Table 1.

Table 1: Amendments to the project during the assessment process

<i>Detail</i>	<i>EIS September 2016</i>	<i>Amended DA/RTS May 2017</i>
<i>Number of wind turbines</i>	122	75
<i>Length of high voltage overhead power line</i>	9 km (up to 132kV)	5.5 km (up to 132 kV)
<i>Number of site substations</i>	2	2
<i>Maximum tip height</i>	200 m	200 m

The reduction in turbine locations were from 5 key areas, and most notably involved the removal of the Langs Creek cluster in its entirety, as illustrated in Figure 2.

Assuming all 75 proposed turbines are constructed, the project would generate up to 255 megawatts (MW) and 730 gigawatt hours (GWh) of electricity annually, which is enough to power about 125,000 homes.

The project is described in full in the Environmental Impact Statement (EIS) (see Appendix A) as amended by the Amended Development Application (DA) and Response to Submissions (RTS) (see Appendix B). The major components of the project are summarised in Table 2 and shown on Figures 3 and 4.

BWF is seeking approval for two marginally different layout options (Layout Options 1 and 2), as shown on Figures 3 and 4. The key difference between the two layout options is the total number of turbines, up to 75 turbines for Layout Option 1 and up to 61 turbines for Layout Option 2. Both layout options are roughly located within the same development corridor, with the turbines in Layout Option 2 more widely spaced.

Additionally, BWF wants the flexibility to be able to micro-site the turbines during the final design of the project, both to improve the efficiency of the project and also to further minimise any environmental impacts.

As such, BWF assessed a 200 m wide development corridor for both layouts, in which the footprint for the turbines and ancillary infrastructure would be located, as illustrated in Figures 3 and 4.

BWF also consulted with the Roads and Maritime Authority (RMS) and Hilltops and Yass Valley Councils (the Councils) further during the assessment process, and the project includes the road upgrades required for the development of the wind farm and voluntary planning agreements with both Councils for community contributions.

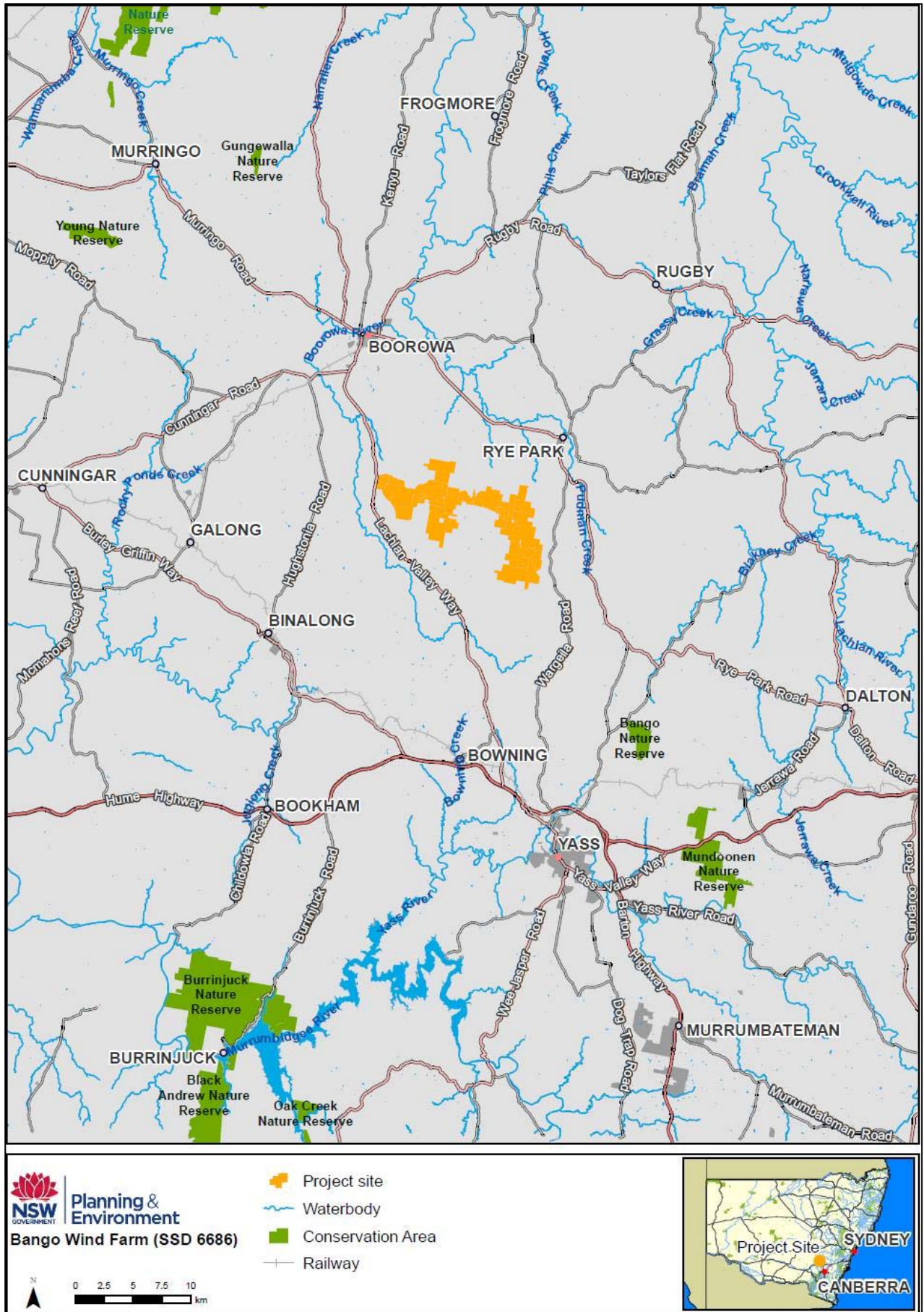


Figure 1: Project Location

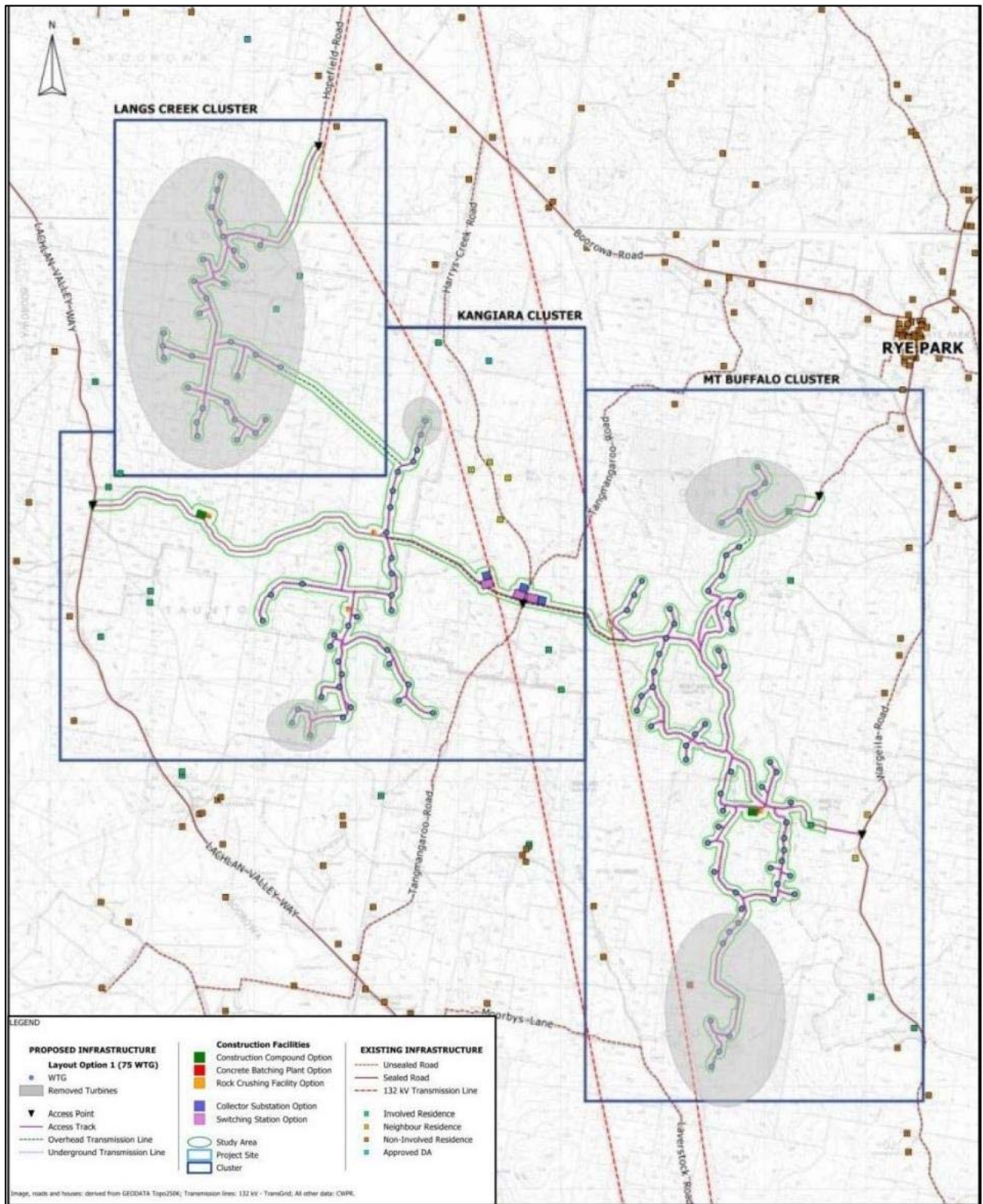


Figure 2: Amended Project Layout (with removed turbines shaded)

Table 2: Major Components of the Project

Aspect	Description
<i>Project summary</i>	Development of a wind farm including: <ul style="list-style-type: none"> • up to 75 turbines and associated infrastructure in 2 clusters: Kangiara cluster (29 turbines) and Mt Buffalo cluster (46 turbines); • temporary and permanent ancillary infrastructure on site to facilitate the construction and operation of the turbines; and • upgrades to a number of local roads to enable turbines to be delivered to the site using over-dimensional vehicles.
<i>Project area</i>	Approximately 5,200 hectares
<i>Disturbance area</i>	138 ha or 3% of the site
<i>Wind turbines</i>	Layout Option 1 <ul style="list-style-type: none"> • 75 turbines and crane hard stand areas • Maximum height (to blade tip) - 200 m • Tower heights - approximately 128 m • Blade lengths - approximately 72 m • Approximate capacity of 1.5 MW¹ Layout Option 2 <ul style="list-style-type: none"> • 61 turbines and crane hard stand areas • Maximum height (to blade tip) - 200 m • Tower heights - approximately 128 m • Blade lengths - approximately 72 m • Approximate capacity of 3.4 MW¹
<i>On-site ancillary infrastructure</i>	<ul style="list-style-type: none"> • Electrical infrastructure, including: <ul style="list-style-type: none"> • one 33/132 kV collection substation; • one 132 kV switching station; • approximately 5.5 km of up to 132 kV overhead transmission lines; • 22 kV or 33 kV underground power lines; • Up to 2 temporary construction compounds, including staging areas, storage and up to 4 concrete batch plants; • Up to 56 km of new internal access tracks; • Up to 2 permanent operation and maintenance facilities incorporating a control room and equipment storage; and • Up to 6 permanent meteorological masts.
<i>Off-site road works</i>	<ul style="list-style-type: none"> • Intersection upgrades at Lachlan Valley Way and the site access point, Tangmangaroo Road and Wargeila Road.
<i>Over-dimensional and heavy vehicle transport routes</i>	<ul style="list-style-type: none"> • Hume Highway and Lachlan Valley Way
<i>Employment</i>	<ul style="list-style-type: none"> • Construction - up to 160 people; and • Operations - up to 5 people.
<i>Capital investment value</i>	\$303 million
<i>Voluntary planning agreements</i>	<ul style="list-style-type: none"> • Contribute \$2,825 per turbine (plus CPI adjusted from 1 July commencing on the first anniversary of the operational date) each year to Hilltops and Yass Valley Councils to fund community projects in the surrounding area.

¹ The project may use a mix of turbine models across the site to better utilise the on-site wind resource profile.

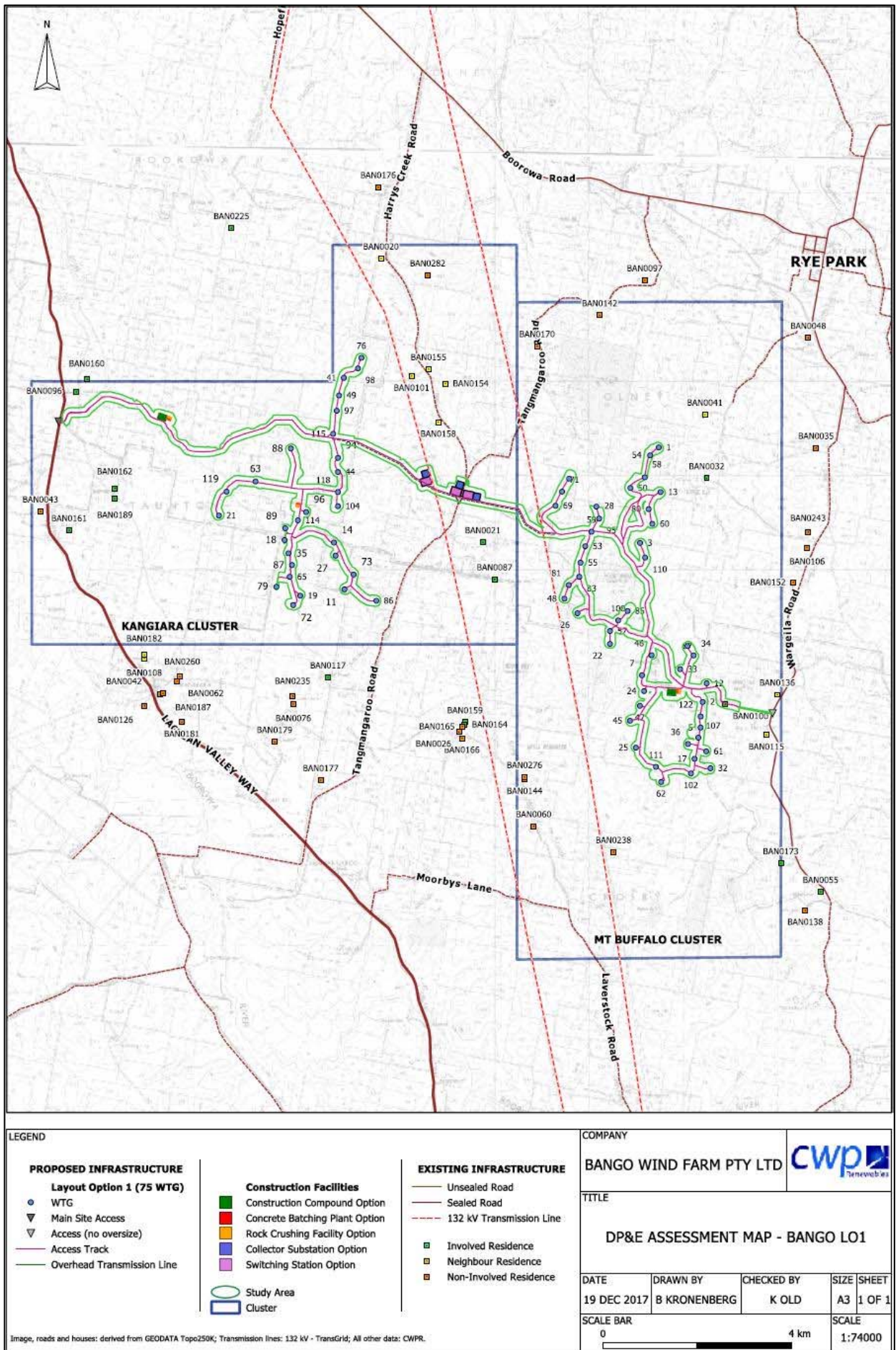
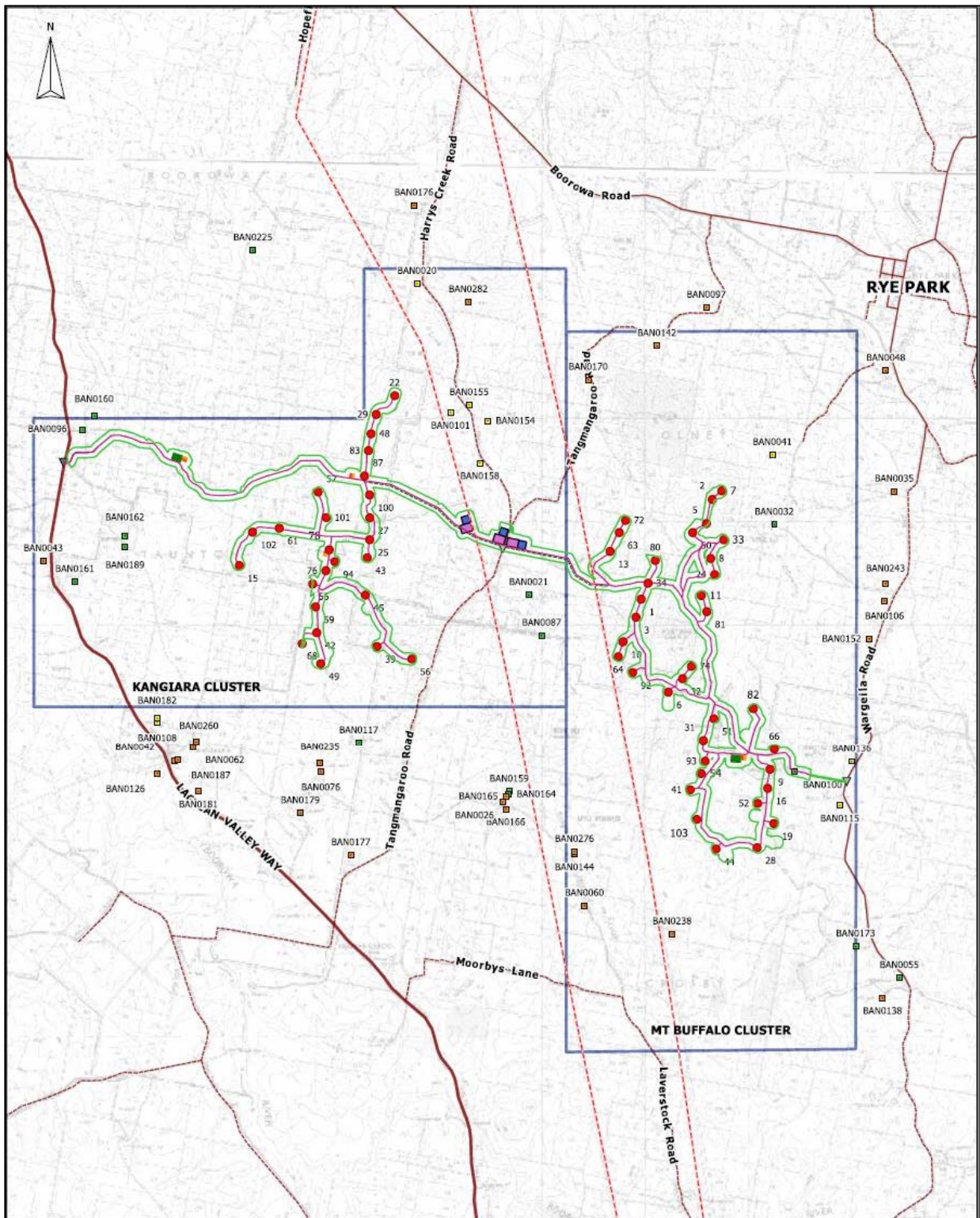


Figure 3: Project Layout (Option 1)




LEGEND PROPOSED INFRASTRUCTURE Layout Option 2 (61 WTG) ● WTG ▽ Main Site Access ▽ Access (no oversize) — Access Track — Overhead Transmission Line ■ Construction Facilities ■ Construction Compound Option ■ Concrete Batching Plant Option ■ Rock Crushing Facility Option ■ Collector Substation Option ■ Switching Station Option ○ Study Area □ Cluster		EXISTING INFRASTRUCTURE — Unsealed Road — Sealed Road - - - 132 kV Transmission Line ■ Involved Residence ■ Neighbour Residence ■ Non-Involved Residence		COMPANY BANGO WIND FARM PTY LTD 	
		TITLE DP&E ASSESSMENT MAP - BANGO LO2		DATE 19 DEC 2017	
		DRAWN BY B KRONENBERG		CHECKED BY K OLD	
		SCALE BAR 0 ————— 4 km		SIZE SHEET A3 1 OF 1 SCALE 1:74000	
Image, roads and houses: derived from GEODATA Topo250K; Transmission lines: 132 kV - TransGrid; All other data: CWP.					

Figure 4: Project Layout (Option 2)

2. STRATEGIC CONTEXT

2.1 Wind Energy

Renewable Energy Action Plan

In 2016, the vast majority of energy in NSW was derived from fossil fuels, including 80.4% from coal and gas, with only 19.6% derived from renewable energy sources. However, there are currently no plans for the development of new coal fired power stations in NSW, and the development of renewable energy sources, such as wind and solar, is experiencing rapid growth.

This is highlighted in the recently released *Independent Review into the Future Security of the National Electricity Market* (the Finkel Review), which outlines a strategic approach to ensuring an orderly transition from traditional coal and gas fired power generation to renewable energy with lower emissions. It notes that Australia is heading towards zero emissions in the second half of the century.

The United Nations Framework Convention on Climate Change (UNFCCC) has adopted the Paris Agreement, which aims to limit global warming to well below 2°C, with an aspirational goal of 1.5°C. Australia's contribution towards this target is a commitment to reduce greenhouse gas emissions by between 26% to 28% below 2005 levels by 2030.

One of the key initiatives to deliver on this commitment is the Commonwealth Government's *Renewable Energy Target* (RET). Under this target, more than 23.5% of Australia's electricity would come from renewable energy by 2020. It is estimated that an additional 5,400 MW of new renewable energy capacity will need to be built by 2020 to achieve the RET.

The NSW Climate Change Policy Framework, released in November 2016, sets an aspirational objective for NSW to achieve net zero emissions by 2050. The NSW Government also has a *Renewable Energy Action Plan*, which promotes the development of renewable energy in NSW.

With a capacity to generate up to 730 gigawatt hours (GWh) of electricity annually, the project would generate enough power for up to 125,000 homes, and is therefore consistent with and would contribute to the Commonwealth's RET and NSW's *Renewable Energy Action Plan*.

Other Wind Farms

The best wind resources in NSW are generally located along the Great Dividing Range and the Western Slopes, including the Southern and Central Tablelands. The site for the Bango Wind Farm falls within this area, and has strategic potential for wind development given its access to medium to high average wind speeds and its proximity to the Yass to Cowra 132 kV transmission lines.

As a consequence of the region's superior wind resources and proximity to major electricity transmission lines, there are 11 operational, approved and proposed wind farms within 60 km of the site (see Table 3 and Figure 5).

Table 3: Wind farms in the region

Wind farm	Approximate distance from project	Status	Number of turbines	Tip height
<i>Rye Park</i>	8 km east	Approved	92	157 m
<i>Conroy's Gap</i>	25 km southwest	Approved	15	126 m
<i>Cullerin Range</i>	25 km south	Operational	15	126 m
<i>Yass</i>	30 km southwest	Approved	79	150 m
<i>Biala</i>	45 km east	Approved	31	185 m
<i>Gunning</i>	50 km east	Operational	31	121 m
<i>Collector</i>	60 km southeast	Approved	55	150 m
<i>Crookwell 1</i>	60 km east	Operational	8	67 m
<i>Crookwell 2</i>	60 km east	Approved	46	128 m
<i>Crookwell 3</i>	60 km east	Proposed	29	151 m
<i>Gullen Range</i>	60 km east	Operational	73	135 m

The number of operational, approved and proposed wind farms in the region has given rise to growing community concerns about the cumulative impacts of wind energy development, and in particular, the visual impacts of these projects on the broader landscape in the Southern Tablelands and South-West Slopes.

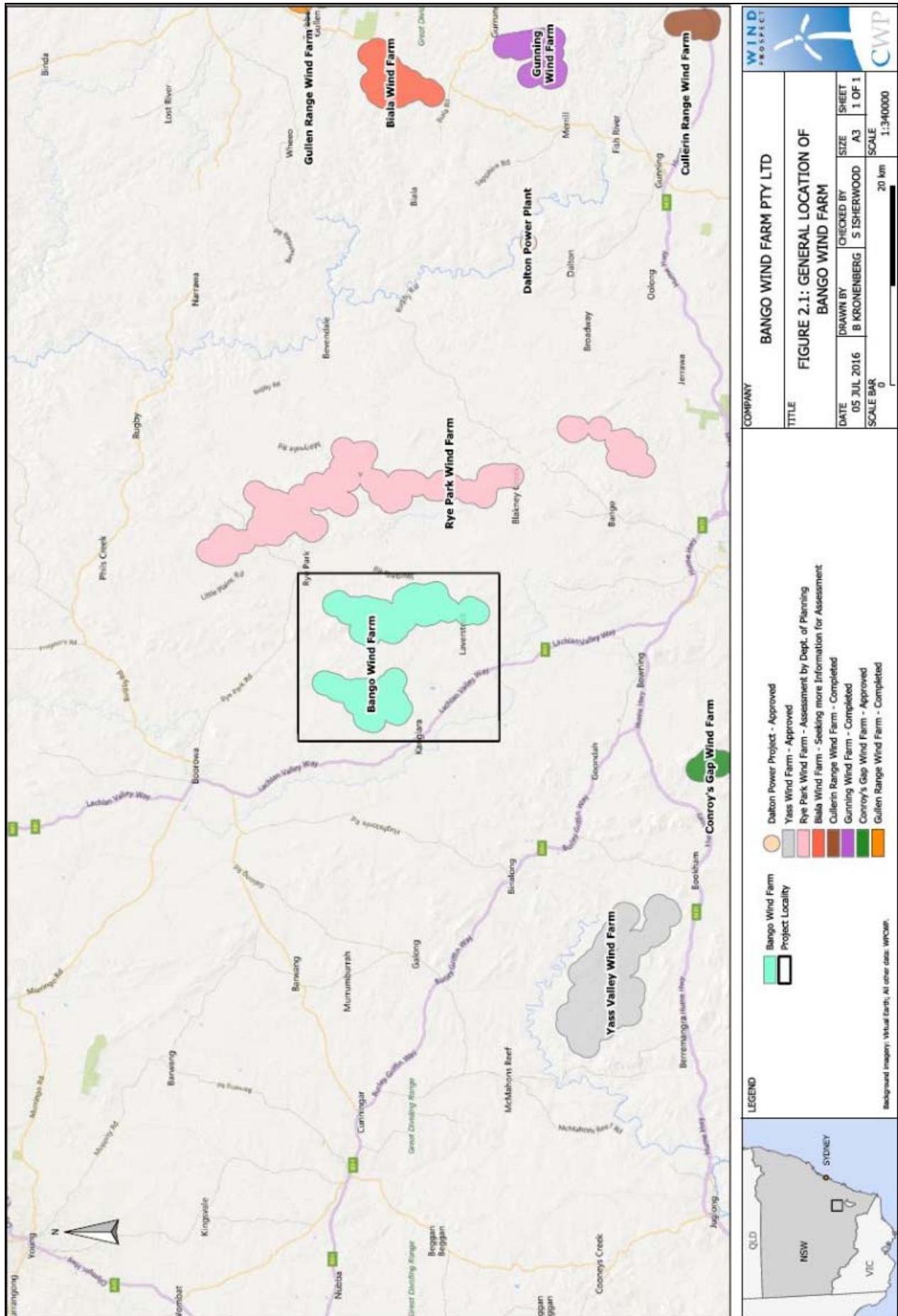


Figure 5: Wind Farms in the Region

With the exception of the approved, but not yet constructed Rye Park Wind Farm located 8 km to the project's east, all of these wind farms are located at least 25 km from the project site, and are not expected to cause any cumulative impacts with the project at individual residences. Impacts on the broader landscape would be mitigated to a large extent by the distance between wind farms and the rolling hills and scattered remnant vegetation that characterises the region.

The key issue for cumulative impact with the Rye Park Wind Farm is the visual impact, which is discussed further in Section 5.1. At this distance, cumulative impacts relating to noise are unlikely to be significant, although cumulative noise impacts have been considered in the noise assessment as discussed in Section 5.2. Additionally, if both projects were to be constructed concurrently, there would be cumulative traffic impacts. Potential cumulative construction traffic impacts have been assessed in Section 5.4.

NSW Wind Energy Framework

In December 2016, the Department released the new *NSW Wind Energy Framework* (the Framework).

The Framework replaces the draft wind farm planning guidelines, which were exhibited in 2011, and seeks to provide greater clarity, consistency and transparency for industry and the community regarding both assessment and decision-making on wind energy projects.

The Framework provides a merit-based approach to the assessment of wind energy projects, which is focused on the issues unique to wind energy, particularly noise and visual impacts. The key documents comprising the Framework include:

- *Wind Energy Guideline*;
- *Visual Assessment Bulletin*;
- *Noise Assessment Bulletin*; and
- *Standard Secretary's Environmental Assessment Requirements (SEARs)*.

However, it is important to note that the Framework only applies to new large-scale wind energy projects where SEARs have been issued after the date the Framework was published (i.e. December 2016). As the assessment requirements for the Bango Wind Farm were issued in 2011, the Framework does not apply.

Nonetheless, the Framework provides relevant guidance to decision-makers about the NSW Government's current policy position for assessing key impacts of wind energy developments, including in regard to visual and noise impacts on local communities.

2.2 Regional and Local Population

Associated Landowners

The project has 10 host or 'associated' landowners, who own land both on and adjoining the project site. They have provided landowner's consent for the development application and have entered into commercial agreements with BWF to facilitate the development of the project, including accepting the impacts of the project.

Additionally, BWF has obtained agreements with the landowners of 10 non-associated residences in which the landowners accept the visual impacts of the project. As such, these residences have been considered associated for the purposes of the Department's visual assessment.

Non-Associated Landowners

Within 4 km of the site there are 37 non-associated residences including:

- 8 non-associated residences within 2 km;
- 12 non-associated residences between 2 km and 3 km; and
- 17 non-associated residences between 3 km and 4 km.

The majority of these residences are located to the project's south along Lachlan Valley Way, Tangmangaroo Road and Laverstock Road (see Figures 3 and 4).

Regional Centres

The closest population centre to the project site is Rye Park village (see Figures 3 and 4), which is located approximately 5 km to the northeast of the project and has a population of 258 (2016 census). Based only on the distance from turbines, Rye Park village could be affected by the visual impacts of the project. However, due to the intervening topography, there would be limited visibility of the project from the village itself (see Section 5.1).

Other villages near the project site include Bowning and Rugby, which are both located more than 10 km from the site and comprise a relatively small number of rural residences and homesteads. These villages are shielded from views towards the turbines by intervening vegetation and topography.

The nearest regional centres include Boorowa (with a population of over 1,000), located 12 km to the northwest of the site, and Yass (with a population of over 6,000), located 25 km to the south of the site (see Figure 1). Due to the distance from the site and the intervening topography, these regional centres are unlikely to experience any visual or noise impacts as a result of the project.

2.3 Key Infrastructure

Road Network

The project is located in proximity to major transport routes including the Main Southern Railway and the Hume Highway, which both extend roughly east to west approximately 14 km south of the project site (see Figures 3 and 4).

The project has a designated over-dimensional and heavy vehicle route where vehicles would leave the Hume Highway at Lachlan Valley Way, a state road that provides access to the project site via the proposed main site access point on the Lachlan Valley Way (see Figure 21).

While no specific access route has been designated for light vehicles, it is anticipated that the majority of employees and contractors would also use Lachlan Valley Way, which provides the most convenient connection to Yass. However, a series of local roads may also be used by light vehicles to access the site, including Tangmangaroo Road, Wargeila Road and the Rye Park Dalton Road.

Electricity Transmission Lines

There are a number of existing electricity transmission lines in the vicinity of the project site (see Figures 3 and 4). The project would connect to either one or both of the Yass to Cowra 132 kV transmission lines which are parallel electricity lines running north to south through the site.

2.4 Surrounding Land Use

The Southern Tablelands region is characterised by areas of extensively cleared agricultural grazing land comprised of rolling hills and gentle ridgelines with scattered remnant vegetation (see Figure 6). Remnant stands of the original vegetation remain as roadside vegetation, paddock trees or larger scattered patches of woodland on the lower slopes with more extensive forested areas on the ridge tops.

Other than the remnant vegetation, there are limited areas of ecological sensitivity near the project site. The closest conservation area (Bango Nature Reserve, which covers an area of 409 hectares) is located 15 km southeast of the Mt Buffalo cluster. The regional setting is not characterised by areas identified as having high scenic value or that have been zoned for recreation, tourism, environmental management or conservation, however, the local community does place importance on the landscape as many residents have chosen to live in the area for the rural character of the landscape.

The project lies within the Lachlan River catchment and contains a number of high order creeks, lower order creeks and drainage lines. There are a number of access track crossings of waterways associated with the project. Of these, several are crossings of second order creeks or above, including Dry Creek, Fat Jack Creek, Kangiara Creek, Langs Creek and Hardiman Creek.

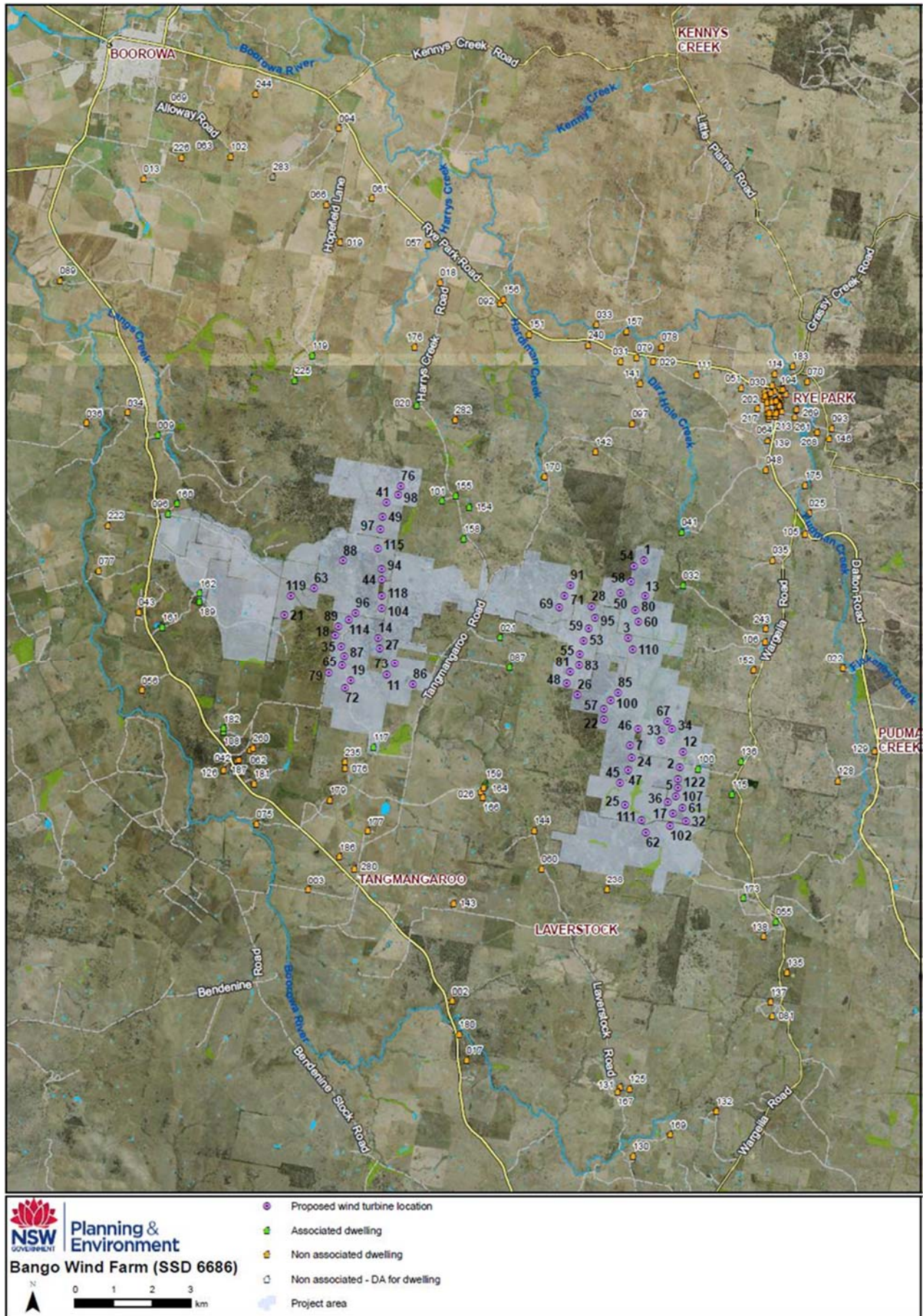


Figure 6: Site and Surrounds (Layout Option 1)

3. STATUTORY CONTEXT

3.1 State Significant Development

The project was declared a major project under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in March 2011.

Although Part 3A was repealed on 1 October 2011, the project remained a 'transitional Part 3A project' under Schedule 6A of the EP&A Act. On 21 March 2014, the project was transitioned to the State Significant Development (SSD) process under Part 4 of the EP&A Act. The previous assessment actions undertaken under the Part 3A assessment process were accredited under the SSD process.

The project is classified as SSD under Section 89C of the EP&A Act: it triggers the criteria in Clause 20 of Schedule 1 to *State Environmental Planning Policy (State and Regional Development) 2011*, as it is development for the purpose of electricity generating works using wind power that has a capital investment value of more than \$30 million.

Consequently, the Minister for Planning is the consent authority for the project. However, under the Minister's delegation dated 14 September 2011, the independent Planning Assessment Commission must determine the development application for the project as there were more than 25 public objections.

3.2 Permissibility

The project is located across the Hilltops and Yass Valley LGAs. The whole of the project site is zoned RU1 – Primary Production under the *Boorowa Local Environmental Plan (LEP) 2012* and *Yass Valley LEP 2013*.

Electricity generating works, which include a building or place used for the purpose of making or generating electricity, are permissible with development consent within land zoned RU1 under the *Boorowa LEP 2012*.

However, electricity generating works are prohibited within land zoned RU1 under the *Yass Valley LEP 2013*.

Under *SEPP (Infrastructure) 2007*, development for the purposes of electricity generating works may be carried out by any person with consent on any land in a prescribed rural, industrial or special use zone. Zone RU1 is a prescribed rural zone. As the proposal is for electricity generating works within a prescribed rural zone in the *Yass Valley LEP 2013*, it is therefore also permissible with consent in Yass Valley LGA.

3.3 Environmental Planning Instruments

Several other environmental planning instruments apply to the project, including:

- *SEPP (Infrastructure) 2007*;
- *SEPP (State and Regional Development) 2011*;
- *SEPP (Rural Lands) 2008*;
- *SEPP No.44 – Koala Habitat Protection*; and
- *SEPP No. 55 – Remediation of Land*.

The Department has assessed the project against the relevant provisions of these instruments (see this report and Appendix C), as well as BWF's consideration of these matters in the EIS.

Based on its assessment of these instruments and its broader environmental assessment in Section 5, the Department considers that the proposed development could be undertaken in a manner that is generally consistent with the aims, objectives and provisions of these instruments.

3.4 Integrated and Other NSW Approvals

Under Section 89J of the EP&A Act, a number of other approvals are integrated into the SSD approval process, and consequently are not required to be separately obtained for the proposal. These include:

- various approvals relating to heritage required under the *National Parks and Wildlife Act 1974* and the *Heritage Act 1997*;
- an authorisation under the *Native Vegetation Act 2003* for the clearing of native vegetation; and
- certain water approvals under the *Water Management Act 2000*.

Under Section 89K of the EP&A Act, a number of further approvals are required, but must be substantially consistent with any development consent for the proposal. These include:

- an environment protection licence (EPL) under the *Protection of the Environment Operations Act 1997*; and
- approvals for roads and intersection construction under the *Roads Act 1993*.

The Department has consulted with the relevant government authorities responsible for these integrated approvals (see Section 4) and considered their advice in its assessment of the project (see Section 5).

3.5 Commonwealth Approvals

BWF also needs to obtain approval from the Commonwealth Minister for the Environment and Energy under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This is because the project is a “controlled action” under that Act as it has the potential for significant impact to listed threatened species, vegetation communities and migratory species. The Commonwealth Department of the Environment and Energy (DoEE) has advised that the project would be assessed separately under the EPBC Act through preliminary documentation (rather than under the existing Bilateral Agreement), and would be determined separately by the Commonwealth Minister for the Environment and Energy following the Commission’s determination.

3.6 Section 5A-D Considerations

Section 5A-D of the EP&A Act outlines several matters that a consent authority must take into consideration, including whether the project is likely to have a significant effect on:

- threatened species, populations and ecological communities, and their habitats, having regard to the ‘7 part test of significance’ and the *Threatened Species Assessment Guidelines – The Assessment of Significance*, dated August 2007; and
- critical habitat, having regard to the relevant register.

The Department has considered these matters, and concluded that the project is unlikely to have a significant impact on any of these matters (see Section 5.3 and Appendix D).

3.7 Section 79C Considerations

Section 79C(1) of the EP&A Act outlines the matters that a consent authority must take into consideration when determining development applications. These matters can be summarised as:

- the provisions of environmental planning instruments (including draft instruments), development control plans, planning agreements, and the *Environmental Planning & Assessment Regulations 2000*;
- the environmental, social and economic impacts of the project;
- the suitability of the site;
- any submissions; and
- the public interest, including the objects in the EP&A Act and the encouragement of ecologically sustainable development.

These matters are considered throughout the assessment report, and more specifically in Appendix D.

4. CONSULTATION

4.1 Department’s Engagement

During the assessment process, the Department has visited the site on several occasions, attended Community Consultative Committee (CCC) meetings, hosted a Community Information Session, and consulted with local residents, Council, public authorities and BWF. This engagement is summarised in Table 4 below.

The CCC for the project was established in August 2013 comprising an independent chairperson, four members of the local community, a representative from each of the two Councils and a BWF representative. The CCC has met 7 times since it was established, with the most recent meeting being held on 22 November 2017.

Table 4: Department's engagement

Date	Description	Stakeholders
15 June 2016	<ul style="list-style-type: none"> Attend the CCC meeting 	<ul style="list-style-type: none"> Department planning officers BWF CCC chair and members
25 October 2016	<ul style="list-style-type: none"> Community Information Session in Boorowa 	<ul style="list-style-type: none"> Department planning officers Approximately 30 members of the local community
26 October 2016	<ul style="list-style-type: none"> Visit to site and surrounds to assess visual impacts 	<ul style="list-style-type: none"> Department planning officers Independent visual expert BWF
16 November 2016	<ul style="list-style-type: none"> Visit to site, surrounds and selected non-associated residences to assess visual impacts 	<ul style="list-style-type: none"> Department planning officers Independent visual expert
19 January 2016	<ul style="list-style-type: none"> Visit to site, surrounds and non-associated residences to assess visual impacts 	<ul style="list-style-type: none"> Department planning officers Independent visual expert
27 April 2017	<ul style="list-style-type: none"> Attend the CCC meeting 	<ul style="list-style-type: none"> Department planning officers BWF CCC chair and members
<i>During assessment process</i>	<ul style="list-style-type: none"> Consultation with agencies, particularly the Councils, to resolve residual concerns; and Consultation with BWF and its consultants. 	<ul style="list-style-type: none"> Department planning officers NSW Government agencies Hilltops and Yass Valley Council BWF

4.2 Exhibition

The Department:

- publicly exhibited the EIS from 27 September 2016 until 28 November 2016 (63 days);
- notified relevant State government authorities and the Councils;
- notified relevant electricity supply and transmission authorities, in accordance with *SEPP (Infrastructure) 2007*;
- notified affected landholders; and
- advertised the exhibition in the Canberra Times, Yass Tribune, Boorowa News and The Land.

In undertaking these processes, the Department has satisfied the notification requirements of Section 75H of the EP&A Act and *SEPP (Infrastructure) 2007*.

4.3 Summary of Submissions

During the exhibition period of the EIS, the Department received a total of 101 submissions, including:

- 12 from government agencies (all comments);
- 5 from special interest groups (1 object, 3 support and 1 comment); and
- 84 submissions from the general public (50 object, 34 support).

A summary of the submissions is provided in Table 5 and a full copy of the submissions is attached in Appendix E. BWF provided a detailed response to the issues raised in submissions on the EIS (see Appendix B).

Table 5: Summary of submissions on EIS

Submitters	Number	Objection / Support
Government Agency	12	
• Airservices Australia	√	
• Civil Aviation Safety Authority	√	
• Department of Defence	√	
• Department of Industry - Division of Resources and Energy	√	
• Department of Primary Industries	√	
• Environment Protection Authority	√	
• NSW Health, Murrumbidgee Local Health District	√	Comment
• Office of Environment and Heritage	√	
• Roads and Maritime Services	√	
• WaterNSW	√	
• Hilltops Council	√	
• Yass Valley Council	√	
Special Interest Group	5	
• Heron Resources Ltd	√	Comment
• Doctors for the Environment Australia	√	
• Ryde – Hunters Hill Flora and Fauna Preservation Society	√	Support
• Ryde Gladesville Climate Change Action Group	√	
• Boorowa District Landscape Guardians	√	Object
Community	84	50 Object 34 Support
• < 5 km	30	Object
	9	Support
• 5 – 10 km	8	Object
• > 10 km	12	Object
	25	Support
TOTAL	101	

4.4 Key Issues – Government Agencies

None of the government agencies objected to the project, and most of the issues raised by agencies have been addressed through the provision of additional information, or through the recommended conditions of consent.

The **Environment Protection Authority (EPA)** has no residual concerns with the project but recommended a number of conditions regarding blasting and noise criteria, which the Department has incorporated in the recommended conditions of consent as discussed in Section 5.2.

The **Office of Environment and Heritage (OEH)** raised concerns regarding a number of wind turbines, the majority of which were in the Langs Creek cluster and in areas used by threatened or 'at-risk' species. Additionally, OEH expressed concern about the extent of the proposed clearing along Tangmangaroo Road. In response, BWF removed all of the turbines in the Langs Creek cluster and refined the over-dimensional and heavy vehicle transport route to avoid the use of Tangmangaroo Road. To manage the residual biodiversity impacts, the Department has recommended a number of conditions as discussed in Section 5.3.

Roads and Maritime Services (RMS) requested BWF design the proposed site access point on Lachlan Valley Way to comply with the *Austrroads Guide to Road Design*, which includes a Basic Right Turn (BAR) and Basic Left Turn (BAL) intersection treatment. BWF has redesigned the site access point to meet RMS's requirements, as discussed in Section 5.4.

Hilltops Council and **Yass Valley Council** both raised concerns in regard to the potential impacts on the local road network during construction of the project. The Department has agreed required intersection upgrades and road maintenance provisions with the Councils and has recommend conditions of consent to ensure that the required upgrade and maintenance works are undertaken to the satisfaction of the Councils and RMS as discussed in Section 5.4.

Airservices Australia undertook an assessment of the impact of the project on airspace procedures and Communications/Navigation/Surveillance (CNS) facilities and determined that the project would not adversely affect any of its sector or circling altitude, instrument approach or departure procedures at Young Airport, and the performance of any of its CNS facilities. As such, the Department is satisfied that the project is unlikely to result in any significant hazards to airspace procedures and CNS facilities, and to ensure that any hazards are appropriately managed, has recommended standard conditions requiring BWF to provide the relevant authorities (including Airservices Australia) with the final details of the wind turbines and associated infrastructure as discussed in Section 5.5.

The **Civil Aviation Safety Authority (CASA)** recommends that the project should be lit at night consistent with the provisions of the *National Airports Safeguarding Framework Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation*. The Department has recommended that wind turbines have aviation hazard lighting installed in accordance with CASA's requirements and in a manner that minimises any adverse visual impacts, as discussed in Section 5.5.

The **Division of Resources and Geoscience** requested that BWF continue to undertake consultation with the mineral titleholders of Exploration Licence (EL) 8400 and EL 8573, both of which are within the project site, as the project may potentially impact future exploration within these tenements. As discussed in Section 5.5, the Department is satisfied that the project is unlikely to significantly constrain mining exploration and has recommended conditions requiring all above ground infrastructure to be decommissioned and removed once operations cease.

The **Department of Defence, Department of Primary Industries (DPI), Department of Industry – Crown Lands & Water (CL&W), NSW Health** and **Water NSW** did not raise any residual concerns about the project.

4.5 Key Issues - Community

Of the 84 submissions from the general public, 50 objected to the project and 34 supported the project.

As summarised in Table 5, the submissions from the general public were spread across residents residing locally (within 5 km of the project site), regionally (within 10 km of the project site) and across the state, with 5 from out of state (i.e. Australian Capital Territory). Of the 50 submissions that objected to the project, 30 were located within 5 km of the project site, and of the 34 submissions that supported the project, 25 were located greater than 10 km from the project site.

The key issues raised in submissions related to the visual, noise, biodiversity and traffic and transport impacts. The submissions also raised concerns regarding the quality of community consultation undertaken by BWF, and the potential social and economic impacts of the project, including impacts on property values, health and bushfire risk.

As detailed in Table 4, the Department has met with a number of nearby residents who lodged a submission to get an appreciation of the potential impacts on their property and further understand their concerns.

A breakdown and summary of the key issues raised by the general public is provided in Figure 7 and described below.

Visual:

- size and scale of the project;
- change to the landscape character;
- perceived underestimation of the visual impacts of the project; and
- potential cumulative visual impacts with the approved Rye Park Wind Farm.

BWF removed 47 turbines from the originally proposed 122 turbines in the project layout, including all of the Langs Creek cluster, which removed and/or minimised the visual impacts on several neighbouring residences, as well as Rye Park village and Boorowa.

Also, the Department commissioned an independent visual expert to peer review and verify the visual impacts of the project. Based on this assessment, the Department has considered further removal of turbines to reduce the visual impacts of the project on the local community (see Section 5.1).

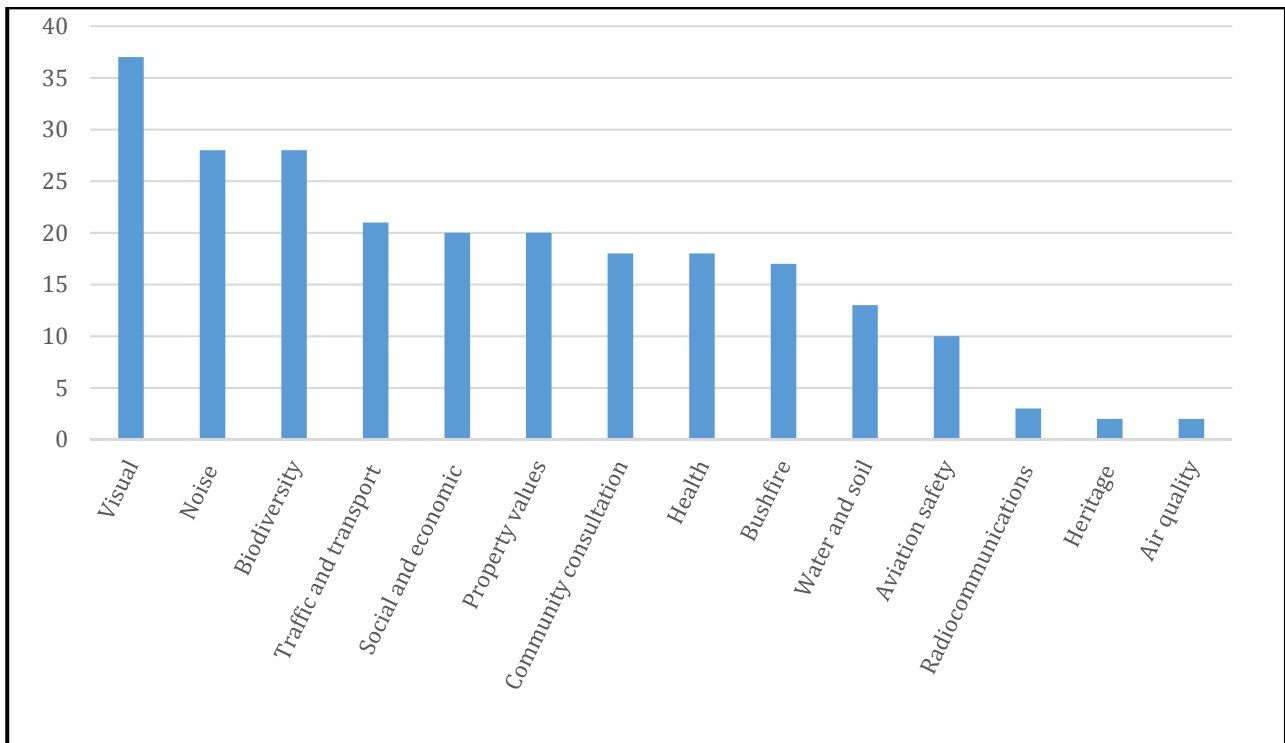


Figure 7: Key issues raised in public submissions

Noise:

- noise from both the construction and operation of the wind farm; and
- low frequency noise and infrasound from wind turbines.

Both the EPA and the Department have undertaken a detailed assessment of the predicted noise impacts of the project, in accordance with applicable guidelines and policies. This assessment found that the project would be able to meet applicable noise criteria (with the implementation of noise management or sector management mode on specific turbines), and the Department has recommended strict noise limits provided by the EPA to protect the amenity of nearby residents (see Section 5.2).

Biodiversity:

- amount of vegetation clearing required;
- impacts on threatened fauna and flora species and ecological communities; and
- potential for birds and bats to be struck by the wind turbines, particularly in regard to the flight paths of the Superb Parrot (*Polytelis swainsonii*).

BWF removed 47 turbines from the project layout, including the entire Langs Creek cluster, which removed and/or minimised impacts to sensitive ecological features, including potential breeding habitat for the Superb Parrot.

The residual biodiversity impacts of the project have been considered in detail by OEH and the Department in accordance with the *NSW Biodiversity Offsets Policy for Major Projects and Framework for Biodiversity Assessment*.

The Department has recommended a range of conditions to further avoid impacts on threatened species, limit clearing of native vegetation, implement adaptive management measures to reduce the risk of blade strike on birds and bats, and compensate for the residual impacts of the project by retiring credits under the biodiversity offsets scheme (see Section 5.3).

Traffic and transport:

- increased traffic; and
- damage to the transport route road network.

Both the Department and BWF have undertaken extensive consultation with the local Councils and RMS on the proposed transport routes, and have agreed on intersection upgrades and road maintenance requirements for the local and classified road network. The Department has also recommended that BWF be required to implement a detailed Traffic Management Plan for the project to address concerns about road safety (see Section 5.4).

Other issues:

- *Social and economic* – impacts on the social fabric of the local community, and impacts on infrastructure and services;
- *Property values* – depreciation of property values, and impacts on the potential to sub-divide land into rural-residential lots;
- *Community consultation* - dissatisfaction with the community consultation undertaken by BWF, with many residents feeling that they had been left out of, or ignored, in the consultation process;
- *Health* - health impacts from wind turbines, including impacts from electro-magnetic fields;
- *Bushfire* – increased risk of bushfires;
- *Water and soil* – impacts on soil and water resources, particularly with the highly erodible soils in the area;
- *Aviation safety* – interference with aerial agricultural activities and fire-fighting operations;
- *Radio communications* - interference with telecommunication signals;
- *Heritage* – potential impacts on Aboriginal heritage sites and cultural heritage values; and
- *Air quality* – potential impacts from the dust which would be generated during construction.

Sections 5.5 of the assessment report provides a summary of the Department's consideration of these matters and recommended conditions.

4.6 Key Issues - Special Interest Groups

Of the 5 different special interest groups that made a submission, 1 objected to, 3 supported and 1 commented on the project.

The **Boorowa District Landscape Guardians** objected to the project and has concerns regarding noise, health, biodiversity, property values, and the potential impact on aerial agricultural and fire-fighting activities. It produced a detailed submission on the project, including a peer review of BWF's noise assessment by The Acoustic Group Pty Ltd and a peer review of BWF's biodiversity assessment by Australian Wildlife Services. These peer reviews have been specifically addressed in Sections 5.2 and 5.3, respectively.

Doctors for the Environment Australia, Ryde – Hunters Hill Flora and Fauna Preservation Society and **Rye Gladesville Climate Change Action Group** support the project on the grounds of the economic benefits it would provide for the local area and the contribution it would make towards Australia's renewable energy target.

Heron Resources Ltd is the titleholder of EL 8400 and EL 8573, both of which are partially overlain by the project's Kangiara cluster. It has advised that several turbines in the Kangiara cluster would significantly impact its proposal to explore mineral resources, and would obstruct any potential mine development in the area of interest. However, as discussed above and in Section 5.5, BWF has consulted with the title holder and the Department considers that future exploration would not be unduly restricted by the presence of the wind farm, and has recommended a condition requiring turbines and other infrastructure be removed once operations cease to avoid any potential sterilisation of mineral resources in the longer term.

The Department has considered all the issues raised by the community and special interest groups in its assessment of the project.

5. ASSESSMENT

In its assessment of the merits of the project, the Department has considered the:

- EIS, submissions, and the Amended DA and RTS;
- advice from Commonwealth, State and local government agencies;
- advice of the independent visual expert commissioned by the Department;
- findings of its site visits and consultation with the local community;
- relevant environmental planning instruments, policies and guidelines; and
- relevant provisions of the EP&A Act, including the objects of the Act.

The following is a summary of the findings of the Department's assessment.

5.1 Visual

Concerns about visual impacts were raised in a number of public submissions, particularly regarding the size and scale of the wind farm and criticism of the methodologies used in BWF's assessment.

Concerns were also expressed that there would be cumulative visual impacts due to the proximity of the project to the other operational, approved and proposed wind farms in the region as listed in Table 3, most notably, the approved Rye Park Wind Farm.

BWF commissioned a Landscape and Visual Impact Assessment, which was prepared by Green Bean Design in May 2016, and provided a supplementary visual assessment in May 2017, which accompanied the Amended DA and RTS.

In response to the community concerns, the Department commissioned O'Hanlon Design Pty Ltd – Landscape Architects (OHD) to undertake an independent peer review and verify the visual assessments commissioned by BWF (see Appendix F).

Visual Context

The project is located on low ridgelines and rolling hills intersected by drainage lines, and spans approximately 17 km from north to south and 14 km east to west, at its widest points. The sensitivity of the landscape and the proximity of residences, and hence the nature and extent of the impacts of the project, vary considerably across the site (see Figure 8).

The regional setting is not characterised by areas identified as having high scenic value or that have been zoned for recreation, tourism, environmental management or conservation, and the closest conservation area, Bango Nature Reserve, is located approximately 15 km southeast of the project.

The area surrounding the project site is an undulating pastoral and agricultural landscape, with drainage lines located to the north and west of the site that flow into Pudman Creek and the Boorowa River, respectively, and hills and ridgelines located to the south of the site.

To the north of the site there is a dispersed settlement pattern with rural farm homesteads that are generally located along Boorowa Rye Park Road and are oriented to face north, with views across the drainage lines that flow into Pudman Creek. The density of residences along Boorowa Rye Park Road increases in proximity to the nearest regional centres of Rye Park village and Boorowa.

With the reduction in the number of turbines proposed from 122 to 75, the distance between the project and both Rye Park village and Boorowa has increased. Rye Park village is now located approximately 5 km to the northeast of the project (opposed to 4 km), and Boorowa is now located approximately 12 km to the northwest of the project (opposed to 7 km). Due to intervening topography, there would be limited visibility of the project from Rye Park Village, and Boorowa is unlikely to experience any visual impacts from the project.

To the south of the site there is a larger number of rural homesteads in proximity to the wind farm. The majority of residences in this area are located on lower undulating slopes, and are oriented to take advantage of views to the north and northeast across the project site.

There are also a number of rural residences located to the east and west of the site, along Wargeila Road and Lachlan Valley Way, respectively. Those residences to the west of the site off Lachlan Valley Way are generally oriented to the west with views across the Boorowa River, except for those residences in Kangiara, which are located on a slight hill and have views across the project site to the northeast. Residences along Wargeila Road are generally oriented to the north and northeast.

Between the project's two clusters, there is a scattering of rural residences located along Tangmangaroo Road which would have views across the project site, however, all of these residences are either associated or have a neighbour agreement with BWF.

As such, the predominant views to the project from non-associated residences occur to the south of the site. Intervening hills and ridgelines shield the views from the majority of non-associated residences located to the north, east and west of the project site, as well as Rye Park village, located 5 km northeast of the project.

Avoidance and Mitigation Measures

As discussed in Section 1, BWF has significantly reduced the maximum number of proposed turbines (i.e. from 122 to 75). While this was not necessarily done to reduce visual impact in all cases, the Department acknowledges that it results in a reduced visual impact on landscape values and at a number of non-associated residences.

Importantly, BWF has obtained agreements with the landowners of 10 non-associated residences (20, 41, 101, 108, 115, 136, 154, 155, 158 and 182), in which the landowners accept the visual impacts of the project. As such, these residences have been considered 'associated' for the purposes of the Department's visual assessment (see Figure 8).

BWF is also proposing to implement a range of mitigation measures to further minimise visual impacts, including:

- painting wind turbine generators off-white/grey and finishing the blades with a treatment that minimises potential for any glare or reflection;
- providing vegetation screening around substations and control buildings where they are visible from neighbouring residences;
- locating powerlines, substations and control buildings in areas which minimise the visual impact, where practical; and
- using building materials and treatments for associated infrastructure which visually complement the surrounding environment.

BWF has committed to implementing appropriate visual mitigation (e.g. landscaping and screening) at any non-associated residences within 4 km of a wind turbine commensurate with the level of visual impact on the residence, where the applicable landowner requests such mitigation.

The Department supports the proposed avoidance and mitigation measures and has recommended conditions formalising these measures.

Assessment

BWF adopted a zone of visual influence of 10 km to assess the visual impacts of the project. The assessment concluded that residences greater than 10 km from the project would be unlikely to experience any visual impacts due to a combination of distance and screening from topography and vegetation.

In addition to undertaking a quantitative analysis of visibility, BWF undertook a qualitative assessment of visual impact from 71 viewpoints, including:

- 20 viewpoints within 2 km;
- 26 viewpoints between 2 km and 3 km; and
- 25 viewpoints between 3 km and 5 km, including those in the Rye Park village.

Of the 71 viewpoints, photomontages were prepared for 23 locations within 4 km of the proposed turbines (in Layout Option 1 as presented in the EIS), to demonstrate the scale and impact of the project. The RTS included additional photomontages for 4 locations (including Rye Park village and residences 76, 235 and 238) and wireframe analysis for 8 locations (including residences 20, 41, 60, 144, 152, 166, 260 and 282).

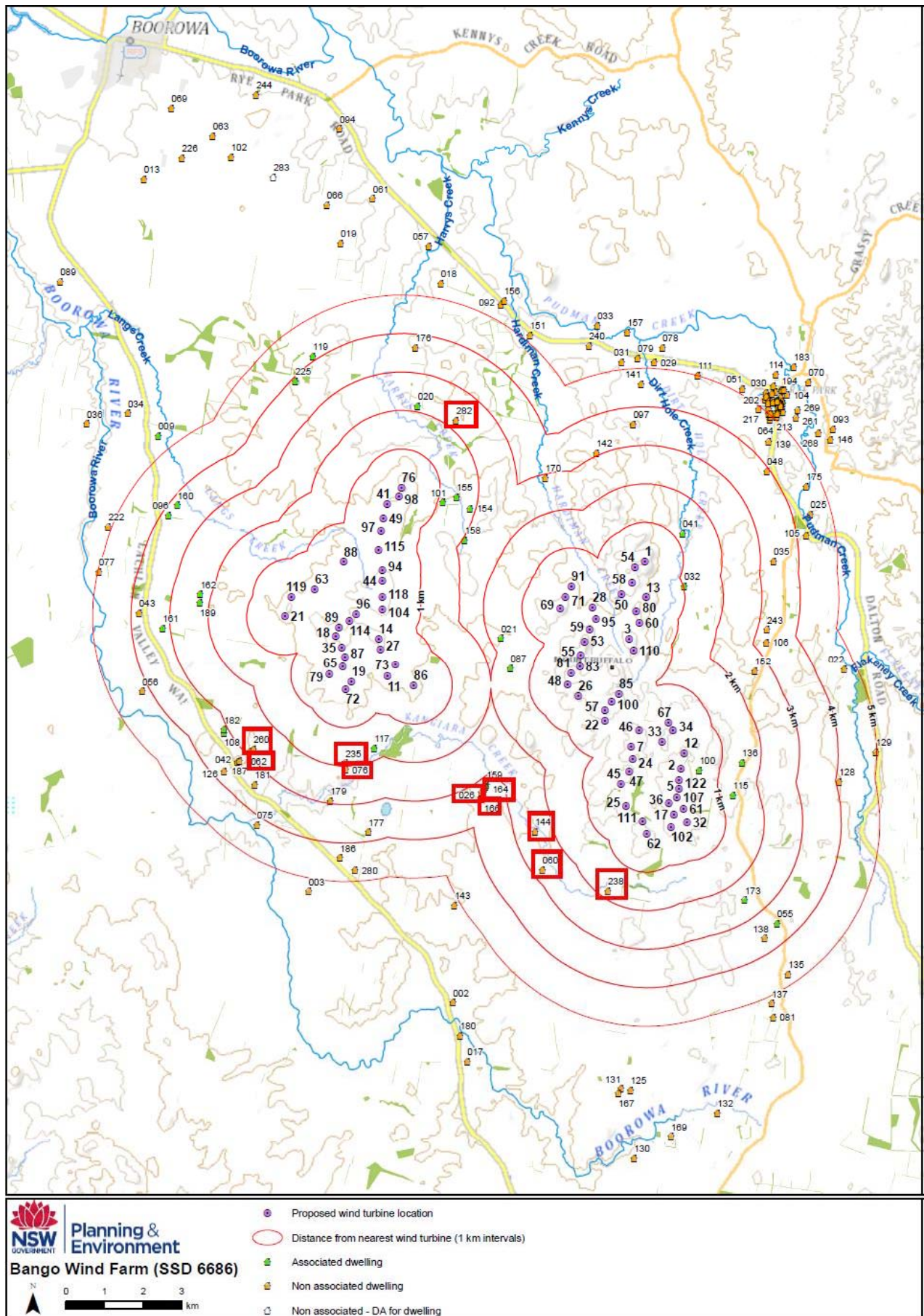


Figure 8: Residences with Medium/High or High Visual Impacts (Layout Option 1)

The majority of non-associated residences located within 4 km of the project are located to the project's south along the Lachlan Valley Way, Tangmangaroo Road and Laverstock Road (see Figure 8). While there are residences located to the project's north, east and west, particularly in proximity to Rye Park village and Boorowa as discussed previously, the landscape character is such that the predominant views to the site occur from the residences located to the south of the site.

BWF's LVIA found that 3 non-associated residences located to the south of the Kangiara cluster (i.e. 62, 235 and 260) have the potential to experience either medium/high or high visual impacts from the revised project layout. All of these residences are primarily affected by turbines in the southern Kangiara cluster.

The Department, with the assistance of the independent visual expert, undertook an assessment of the visual impact of the project on key non-associated residences located within approximately 4 km of a turbine.

The Department's assessment agreed with BWF's LVIA as it found the same 3 non-associated residences (62, 235 and 260) would have medium/high to high impacts from the project.

However, in addition to these 3 non-associated residences, the Department's assessment found that a further 8 residences have the potential to experience either medium/high or high visual impacts from the project, for a total of 11 residences. The location of these 11 residences are shown on Figure 8 (denoted by red squares).

The 11 most impacted non-associated residences can be split into 4 groups:

- those affected by the northern Kangiara cluster (282)
- those affected by the southern Kangiara cluster (62, 76, 235, 260);
- those affected by the southern Mt Buffalo cluster (60, 144, 238); and
- those with horizontal cumulative impacts from both clusters (26, 165, 166).

With the exception of residence 282, all of the residences the Department considers would have medium/high or high visual impacts from the project are considered to be primarily affected by turbines in the southern Kangiara cluster and/or in the southern Mt Buffalo cluster.

The Department also found that 5 non-associated residences located to the east of the site (i.e. 35, 48, 106, 152 and 243) could experience cumulative visual impacts when taking into consideration the approved, but not yet constructed, Rye Park Wind Farm (see below).

Table 6 summarises BWF's assessment, the Department's consideration and recommendations for non-associated residences within 4 km of the proposed turbines. The Department notes that while residences greater than 4 km of a proposed turbine may have views of the turbines, the impacts would be low due to a combination of distance and screening from intervening topography and vegetation.

Northern Kangiara cluster

With BWF's removal of the 2 northernmost turbines in the Kangiara cluster to reduce visual impacts, the Department considers that the majority of non-associated residences with visual impacts primarily attributed to the northern Kangiara cluster would have low to medium impacts, which could be mitigated with visual impact mitigation measures (such as landscaping and screening) and has recommended conditions accordingly.

However, even with BWF's removal of the 2 northernmost turbines, the Department considers there is one non-associated residence, 282, that would have high visual impacts. Figure 9 provides a wireframe from this residence looking south towards the turbines in the northern Kangiara cluster. Note that wireframes do not include vegetation and other intervening structures that may affect visibility.

The landowner of this residence objected to the project and raised particular concerns about the visual impacts of the turbines located nearest to them, specifically in regard to the dominance impacts associated with the height and proximity of the turbines.

The turbines nearest to residence 282 (i.e. Turbine Nos. 76 and 98 in Layout Option 1) would be located on a ridgeline approximately 90 m above the residence. As such, the tip of the turbines would be approximately 290 m above the residence. As these turbines range in distance from the residence between 2.2 km and 2.4 km, and there is no intervening topography to shield their view, the visual magnitude of these turbines would be high and they would dominate the views from the residence.

Table 6: Visual Impact Assessment for Bango Wind Farm

Residence	Distance to closest turbine (km)	Closest Turbine No. (Layout Option 1)	BWF's assessed impact	Department's assessed impact	Most impacting turbines (Layout Option 1)																			Recommended mitigation strategy	
					Kangiara cluster						Mt Buffalo cluster														
					19	65	72	76	79	98	1	3	13	25	32	34	45	50	54	58	60	62	67		80
Northern Kangiara cluster																									
170	2.8	91	Low	Low				√		√															Visual mitigation measures
176	3.6	76	Low	Medium				√		√															Visual mitigation measures
282	2.2	76	Medium	High				√		√															Visual agreement
Southern Kangiara cluster																									
42	3.3	79	Low	Low/Medium	√	√	√		√																Visual mitigation measures
62	2.9	79	Medium/High	Medium/High	√	√	√		√																Remove most impacting turbines
76	2.1	72	Medium	Medium/High	√	√	√		√																Remove most impacting turbines
126	3.7	79	Low	Low	√	√	√		√																Visual mitigation measures
177	3.7	72	Low	Low	√	√	√		√																Visual mitigation measures
179	2.9	72	Low	Low/Medium	√	√	√		√																Visual mitigation measures
181	3.4	72	Low	Low/Medium	√	√	√		√																Visual mitigation measures
187	3.3	79	Low	Low/Medium	√	√	√		√																Visual mitigation measures
188	3.3	79	Not assessed	Low/Medium	√	√	√		√																Visual mitigation measures
235	1.9	72	High	High	√	√	√		√																Remove most impacting turbines
260	2.8	79	Medium/High	Medium/High	√	√	√		√																Remove most impacting turbines
Northern/Central Mt Buffalo cluster																									
35*	3.3	1	Low	Medium						√		√				√		√	√			√			Visual mitigation measures
48*	3.9	1	Low	Medium						√		√				√		√	√			√			Visual mitigation measures
142	3.0	1	Low	Low						√						√	√	√							Visual mitigation measures
106*	3.3	67	Low	Medium							√	√			√			√		√	√		√		Visual mitigation measures
152*	2.6	67	Low/Medium	Medium							√	√			√			√		√	√		√		Visual mitigation measures
243*	3.2	13	Low	Medium							√	√			√			√		√	√		√		Visual mitigation measures
Southern Mt Buffalo cluster																									
60	2.7	25	Medium	Medium/High									√			√				√				√	Visual mitigation measures
144	2.5	25	Low	Medium/High	√	√	√		√				√		√			√						√	Visual mitigation measures
138	3.6	32	Low	Low									√									√			Visual mitigation measures
238	1.8	62	Low	High									√		√			√						√	Visual mitigation measures
Both Southern Kangiara and Mt Buffalo clusters																									
26	3.3	86	Low/Medium	Medium/High	√	√	√		√				√			√				√				√	Remove most impacting turbines in Southern Kangiara cluster
165	3.2	86	Low/Medium	Medium/High	√	√	√		√				√			√				√				√	Remove most impacting turbines in Southern Kangiara cluster
166	3.4	86	Low/Medium	Medium/High	√	√	√		√				√			√				√				√	Remove most impacting turbines in Southern Kangiara cluster

*Assessed impact is based on Bango Wind Farm alone. There may also be cumulative impacts from Rye Park Wind Farm, which are discussed below.

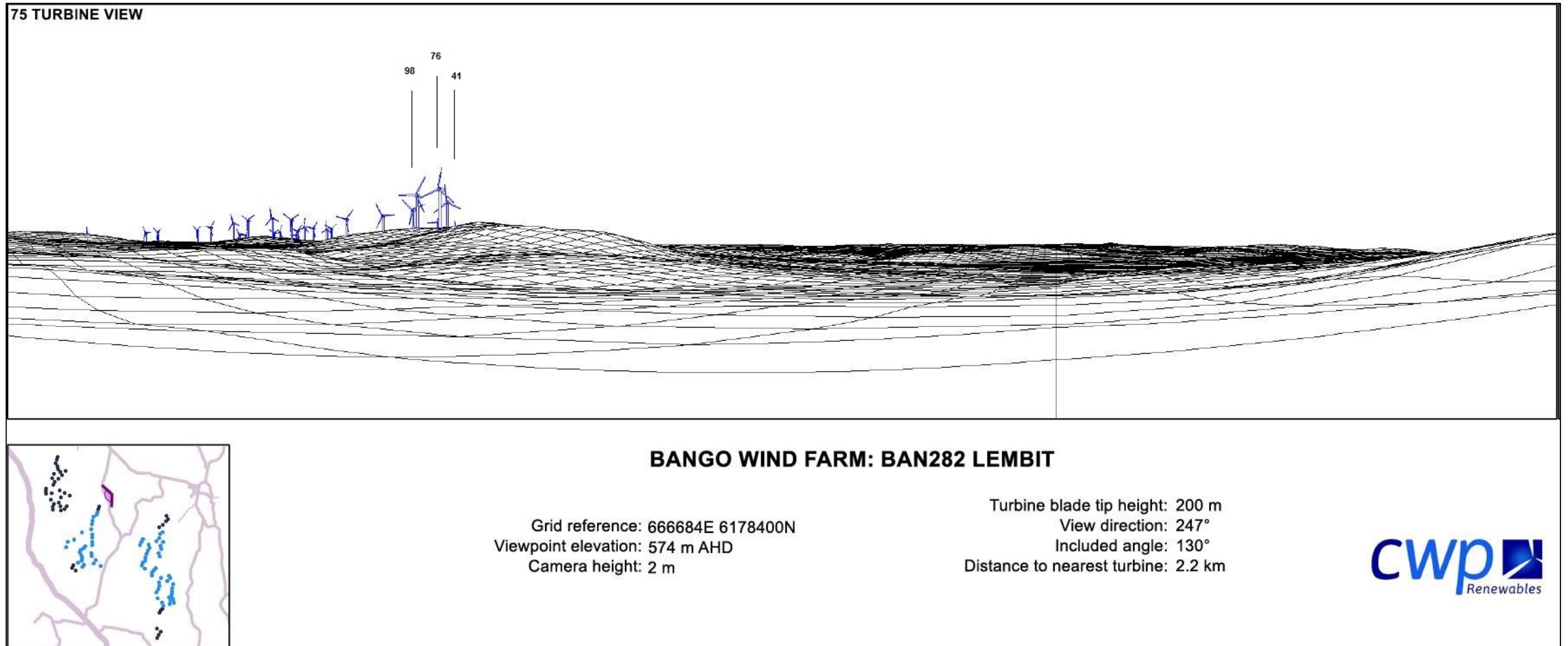


Figure 9: Residence 282 wireframe looking southwest towards turbines in the northern Kangiara cluster

The Department considers the impact on this residence would be substantially reduced by removing these 2 turbines in Layout Option 1 (and the corresponding turbine in Layout Option 2). With the removal of these turbines, the distances between residence 282 and the nearest remaining turbine (i.e. Turbine No. 41 in Layout Option 1) would be approximately 2.8 km.

As such, the Department has recommended that BWF should not be allowed to construct Turbine Nos. 76, and 98 (and the corresponding turbine in Layout Option 2) unless it is able to formalise an agreement with the landowner of residence 282 in regard to visual impacts. However, the Department recognises that the removal of the most visually prominent turbines in proximity to this residence would not completely mitigate the visual impacts of the project, and as such, the Department considers that landscaping should also be offered to this residence.

Southern Kangiara and Mt Buffalo clusters

Despite BWF's removal of 3 of the southernmost turbines in the Kangiara cluster to reduce visual impacts, both BWF and the Department concluded the residual impacts from the southern Kangiara cluster would be medium/high to high at 4 non-associated residences (62, 76, 235 and 260).

Additionally, even with BWF's removal of 3 of the southernmost turbines in the Mt Buffalo cluster to reduce visual impacts, the Department's assessment found that a further:

- 3 non-associated residences (i.e. 60, 144 and 238) could experience either medium/high or high visual impacts primarily attributed to turbines in the southern Mt Buffalo cluster; and
- 3 non-associated residences (i.e. 26, 165 and 166) could experience medium/high impacts attributed to turbines in both the southern Kangiara and Mt Buffalo clusters, as they would have wide ranging horizontal views (>120°) of turbines across both clusters.

The landowners of 5 of the 10 residences that the Department considers would have medium/high or high impacts from turbines in the southern portion of the project objected to the project due to visual impacts (including 60, 76, 166, 238).

Residences 62, 76, 235 and 260

As stated previously, despite BWF's removal of the 3 southernmost turbines in the Kangiara cluster, the views of these 4 residences would still be dominated by Turbine Nos. 19, 65, 72 and 79 in Layout Option 1 (and the corresponding 3 turbines in Layout Option 2), as these turbines would be located on the southern end of an elevated ridgeline in a position with no intervening topography.

Of these 4 residences, residences 62, 235 and 260 have primary views to the north/northeast towards Turbine Nos. 19, 65, 72 and 79, and all 4 of these turbines would be located within 2.7 km of residences 235 and 76. Figure 10 provides a wireframe analysis looking northeast from residence 260 and Figure 11 provides an example of the predicted views looking north from residence 235.

Residence 76 is unique as it has primary views to the northeast/east, and in addition to having impacts from the 4 most visually prominent turbines to its north, would have turbines visible within three 60° sectors of its horizontal view, including distant turbines in the southern Mt Buffalo cluster. Figure 12 provides an example of the predicted view looking northeast/east from residence 76, towards turbines in the southern Kangiara and Mt Buffalo clusters.

As can be seen in the wireframe analyses and photomontages, turbines located further north and to the northeast in the Kangiara cluster, including Turbine Nos. 11 and 86 which are located 2.5 km and 2.7 km from residence 235, respectively, would have some shielding created by the southern edge of the ridgeline and intervening topography and/or vegetation when viewed from the 4 residences.

The Department considers that to reduce the impact on these 4 residences to an acceptable level, Turbine Nos. 19, 65, 72 and 79 in Layout Option 1 (and the corresponding 3 turbines in Layout Option 2) should be removed. The removal of these 4 turbines would both remove the dominance impacts of the turbines at these residences, particularly residences 76 and 235, as well as reducing the cluttering impacts of turbines.

As such, the Department has recommended that BWF should not be given consent to construct Turbine Nos. 19, 65, 72 and 79 in Layout Option 1 (and the corresponding 3 turbines in Layout Option 2). However, the Department recognises that the removal of the most visually prominent turbines in proximity to these residences would not completely mitigate the visual impacts of the project, particularly in regards to residence 76, and as such, the Department considers that landscaping and/or screening should also be offered to these residences.

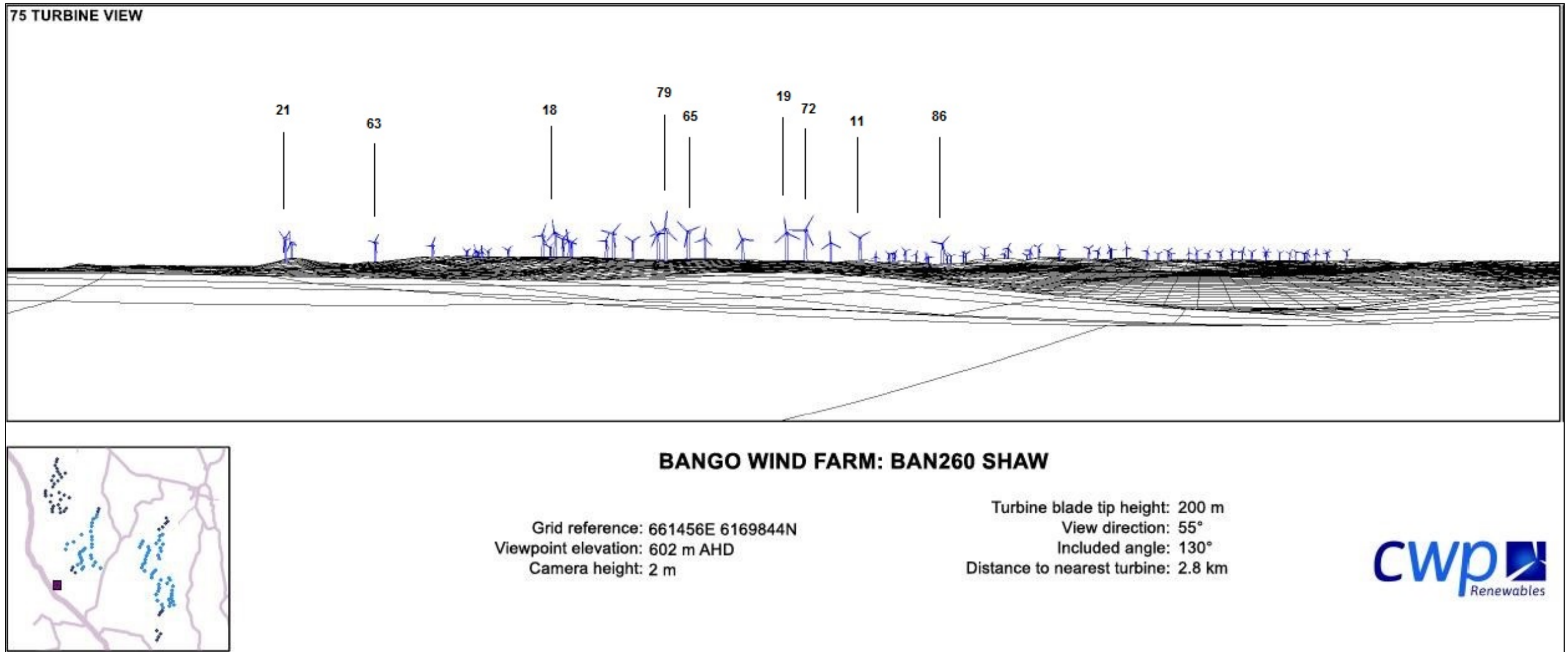


Figure 10: Residence 260 wireframe analysis looking northeast towards turbines in the southern Kangiara cluster

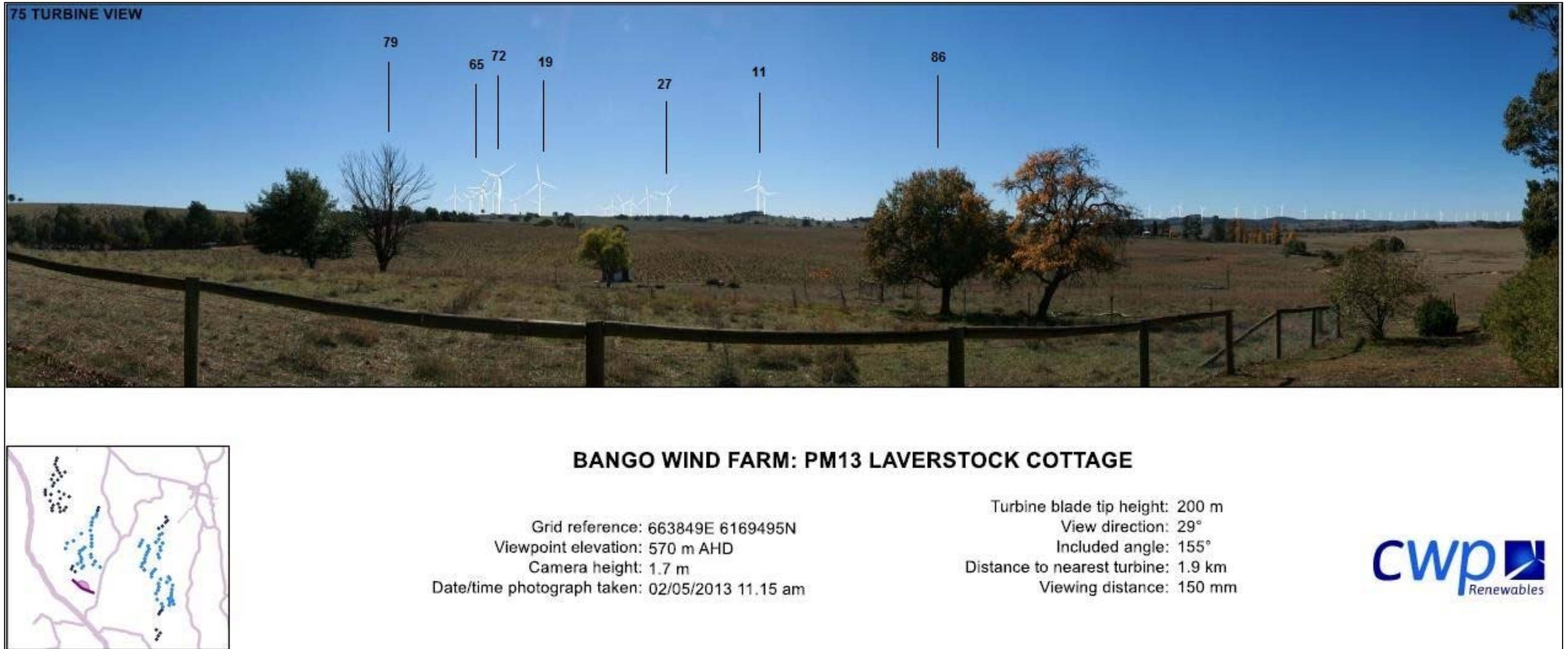
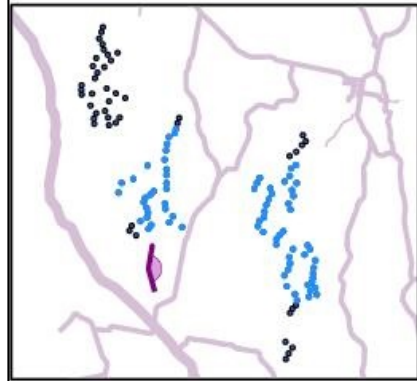


Figure 11: Residence 235 photomontage (PM 13) looking north towards turbines in the southern Kangiara cluster



BANGO WIND FARM: PM12 LAVERSTOCK

Grid reference: 663894E 6169298N
Viewpoint elevation: 570 m AHD
Camera height: 1.7 m
Date/time photograph taken: 02/05/2013 10:30 am

Turbine blade tip height: 200 m
View direction: 87°
Included angle: 155°
Distance to nearest turbine: 2.1 km
Viewing distance: 150 mm



Figure 12: Residence 76 photomontage (PM 12) looking northeast/east towards turbines in the southern Kangiara and Mt Buffalo clusters

Residences 60, 144 and 238

While the views from residences 60, 144 and 238 are very different, and despite BWF's removal of the 3 southernmost turbines in the Kangiara cluster, all 3 of these residences would have visual impacts primarily attributed to the magnitude of the same 3 nearest turbines in the southern Mt Buffalo cluster (i.e. Turbine Nos. 25, 62 and 111 in Layout Option 1 and the corresponding 2 turbines in Layout Option 2).

Figure 13 provides a wireframe analysis looking east from residence 60, Figure 14 provides wireframe analyses looking both west towards turbines in the southern Kangiara cluster and east towards turbines in the southern Mt Buffalo cluster from residence 144, and Figure 15 provides an example of the predicted views looking north from residence 238. As can be seen in the wireframe analyses and photomontages, the turbines with the most significant impacts are Turbines Nos. 25, 62 and 111 from each of these 3 residences, even though they have different views of the turbines.

In regard to residence 238, Turbine Nos. 25, 62 and 111 are located within 2.3 km of the residence, with the nearest turbine (i.e. Turbine No. 62) being located 1.8 km away. There is some screening of these turbines from existing vegetation. However, given their elevation on a ridgeline approximately 70 m above the location of the residence, these turbines have the potential to dominate the view from this residence. The turbines located further to the north and northeast in the Mt Buffalo cluster (i.e. Turbine Nos. 17, 45 and 102) would be shielded to some extent by the southern edge of the ridgeline and intervening topography.

In regard to both residences 60 and 144, while Turbines Nos. 25, 62 and 111 would be located slightly further away than at residence 238, with the nearest turbine (i.e. Turbine No. 25) being located 2.5 km away, these turbines would still have the potential to dominate the view from these residences.

These 3 turbines would be located along the nearest ridgeline to the northeast of these residences, elevated approximately 90 m above the residences. There would also be turbines located along a second ridgeline, approximately 3.5 km to the northeast. As such, in addition to creating dominance impacts at these residences, these 3 turbines along the first ridgeline would contribute to turbine cluttering on the horizon.

Given the above, the Department has considered whether these turbines should be removed to reduce the visual impacts at these residences. However, it is not clear that removing these turbines would materially reduce the overall visual impacts as a relatively large number of turbines would remain visible from these residences with some turbines situated at distances not significantly greater than those proposed for removal.

BWF argues that it has already made significant concessions on a macro and micro scale to reduce the visual impacts of the project, including removing 3 turbines in the southern portion of the Mt Buffalo cluster. The Department acknowledges these refinements to the proposed layout through the assessment process, and considers that the visual impacts on these residences could be mitigated to a reasonable extent through additional visual screening. Based on these considerations, the Department is not recommending the removal of these turbines. However, it acknowledges this issue is finely balanced and if the Commission considers that these turbines should be removed, it would amend the conditions accordingly.

Residences 26, 165 and 166

Figure 16 provides a wireframe analysis from residence 166 looking towards turbines in both the Kangiara and Mt Buffalo clusters. The wireframe analysis from residence 166 can be taken to represent the views from residences 26 and 165, as they are located in close proximity to each other within similar topography. As demonstrated in the wireframe analyses, turbines would be visible within the horizontal views from residences 26, 165 and 166 in three 60° sectors.

The removal of Turbine Nos. 19, 65, 72 and 79 in the Kangiara cluster in Layout Option 1 (and the corresponding turbines in Layout Option 2), would reduce the visual impacts on these residences by setting the nearest turbines back further from the residences and reducing cluttering effects. However, the Department recognises that the removal of these turbines would not completely mitigate the visual impacts of the project, and as such, the Department considers that visual mitigation measures should also be offered to these residences.

In summary, the Department considers that the only way to substantially mitigate the impacts on the 4 residences with medium/high and high impacts from the southern Kangiara cluster would be to remove a number of turbines. Accordingly, the Department has recommended that Turbine Nos. 19, 65, 72 and 79 in Layout Option 1 (and the corresponding Turbine Nos. 42, 49 and 68 in Layout Option 2) in the Kangiara cluster be removed. This key recommendation would significantly reduce the visual impacts of the project on residences 62, 76, 235 and 260, with peripheral benefits for residences 26, 165 and 166.

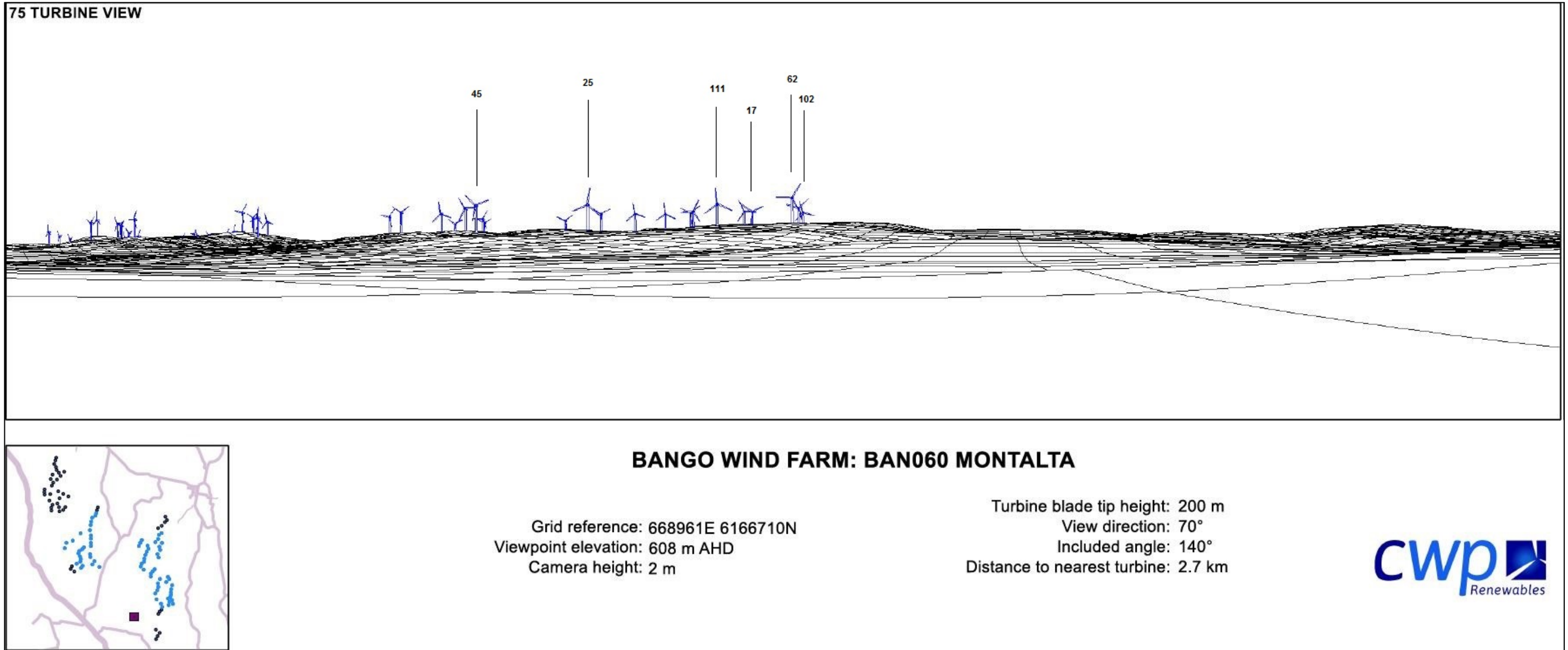


Figure 13: Residence 60 wireframe analysis looking east towards turbines in the southern Mt Buffalo cluster

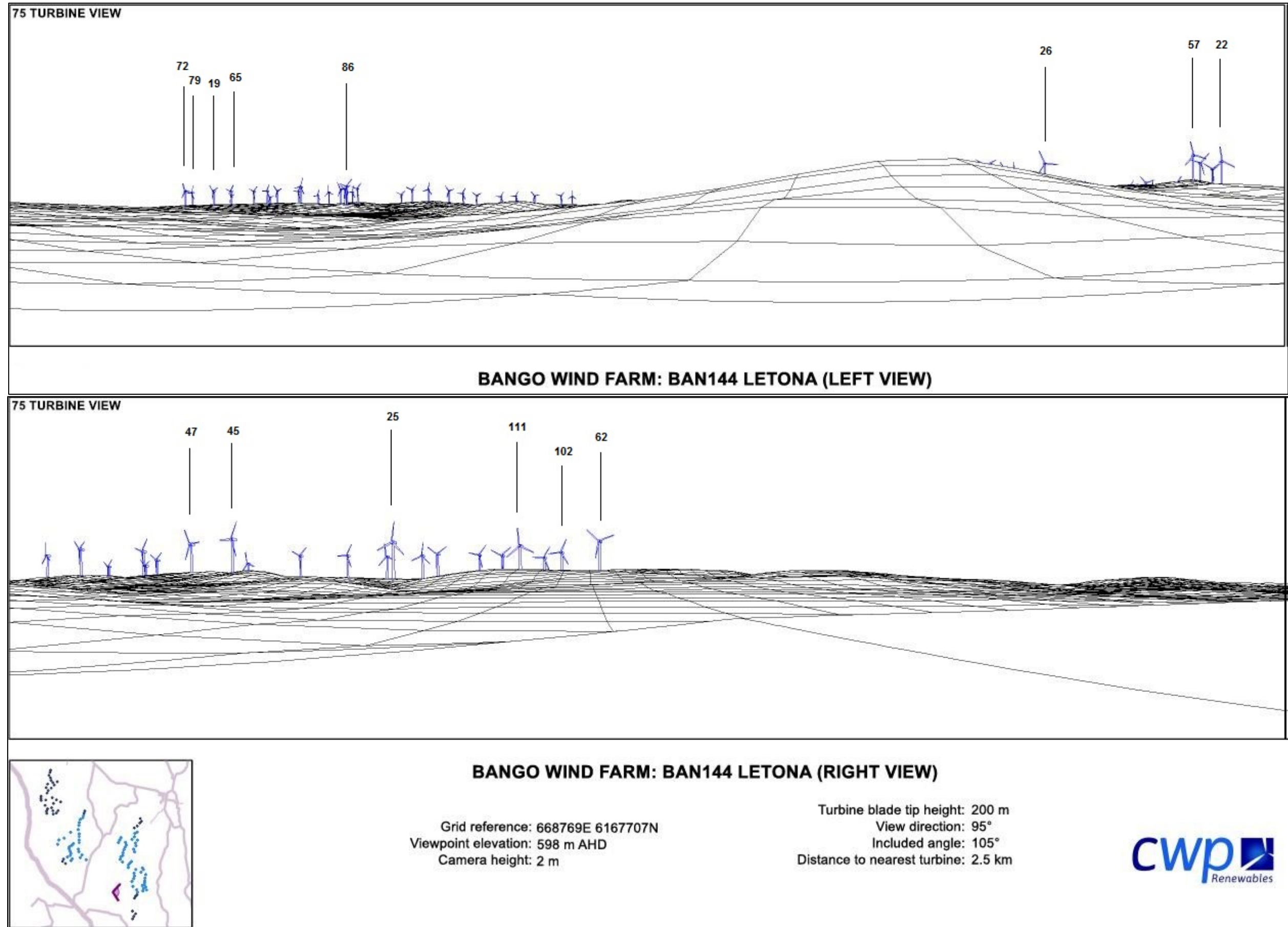


Figure 14: Residence 144 wireframe analyses looking west towards turbines in the southern Kangiara cluster (left view) and east towards turbines in the southern Mt Buffalo cluster (right view)



Figure 15: Residence 238 photomontage (PM 22) looking north towards turbines in the southern Mt Buffalo cluster

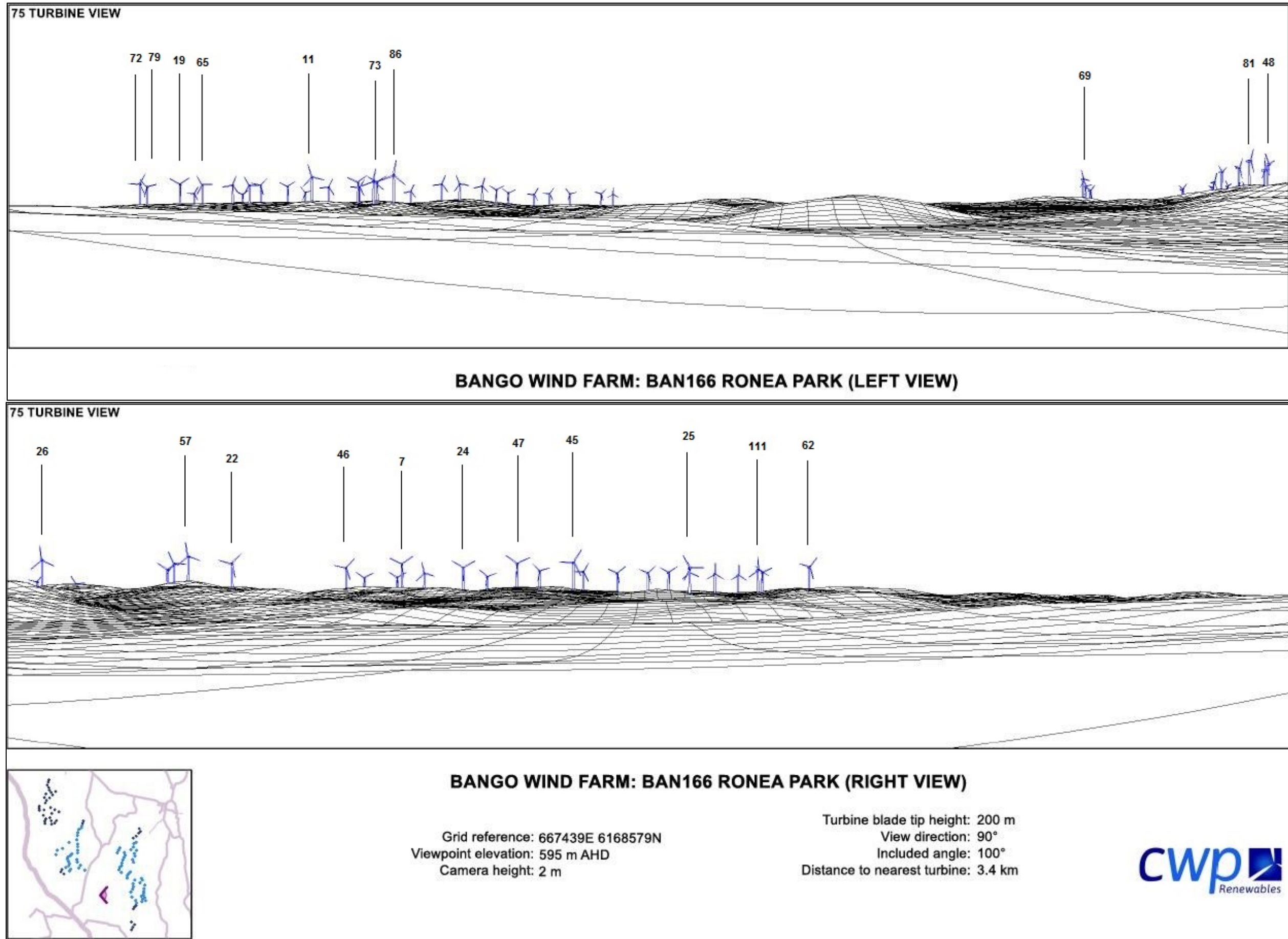


Figure 16: Residence 166 wireframe analyses looking west towards turbines in the southern Kangiara cluster (left view) and east towards turbines in the southern Mt Buffalo cluster (right view)

Additional Visual Mitigation

The Department has also recommended that the landowner of any non-associated residence located within 4 km of a turbine be entitled to request visual impact mitigation measures (such as landscaping and visual screening) to further minimise visual impacts. For residences located beyond 4 km from the nearest turbine, the Department is satisfied that it is unlikely that the turbines would dominate the landscape and/or have a significant visual impact.

Cumulative Impact Assessment of Rye Park Wind Farm

The Department found that 5 of the non-associated residences located south of Rye Park village assessed in Table 6 would have the potential to experience cumulative visual impacts from the approved, but not yet constructed, Rye Park Wind Farm, as summarised in Table 7.

Figure 17 provides a wireframe analysis looking west from residence 152 towards the turbines in the Mt Buffalo cluster.

The Department notes that there are a number of other residences located in proximity to Rye Park village that would have views of turbines in both the Bango Wind Farm and Rye Park Wind Farm, but that these impacts were assessed as low due to the distance from both projects.

Table 7: Cumulative impact assessment of Rye Park Wind Farm

Residence	Distance to closest turbine (km)		Assessed cumulative impact		Recommended mitigation strategy
	Bango Wind Farm	Rye Park Wind Farm	BWF	Department	
35	3.3	4.6	Nil/Low	Medium/High	Visual impact mitigation measures
48	3.9	3.5	Low	Medium/High	Visual impact mitigation measures
106	2.7	> 5	Not assessed	Medium/High	Visual impact mitigation measures
152	2.6	> 5	Not assessed	Medium/High	Visual impact mitigation measures
243	2.9	> 5	Not assessed	Medium/High	Visual impact mitigation measures

The Department's independent visual expert found that 5 residences (35, 48, 106, 152, 243) would have medium/high cumulative visual impacts, as they would have turbines in up to 240° of their view. However, due to the distance to the turbines and the intervening topography, the Department considers these impacts could be sufficiently mitigated through the provision of visual impact mitigation measures (such as landscaping and visual screening).

As all 5 residences would be located within 4 km of a turbine of the Bango Wind Farm, they would be captured by the Department's recommended condition for all landowners located within 4 km of a turbine to be offered visual impact mitigation measures.

Public Viewpoints

As there are no public lookouts in the area, public viewpoints would generally be limited to road users. The Department notes that Lachlan Valley Way is the only major road near the project site with high volumes of traffic, as both Boorowa Rye Park Road and Rye Park Dalton Road are located more than 5 km from the project site. Any views of the project from Lachlan Valley Way would be transient. Motorists on local unsealed roads, including Tangmangaroo Road and Wargeila Road, may experience open views of the turbines. However, given the largely transient nature of these views from moving vehicles and the low traffic volumes on these roads, potential impacts on road users would not be significant.

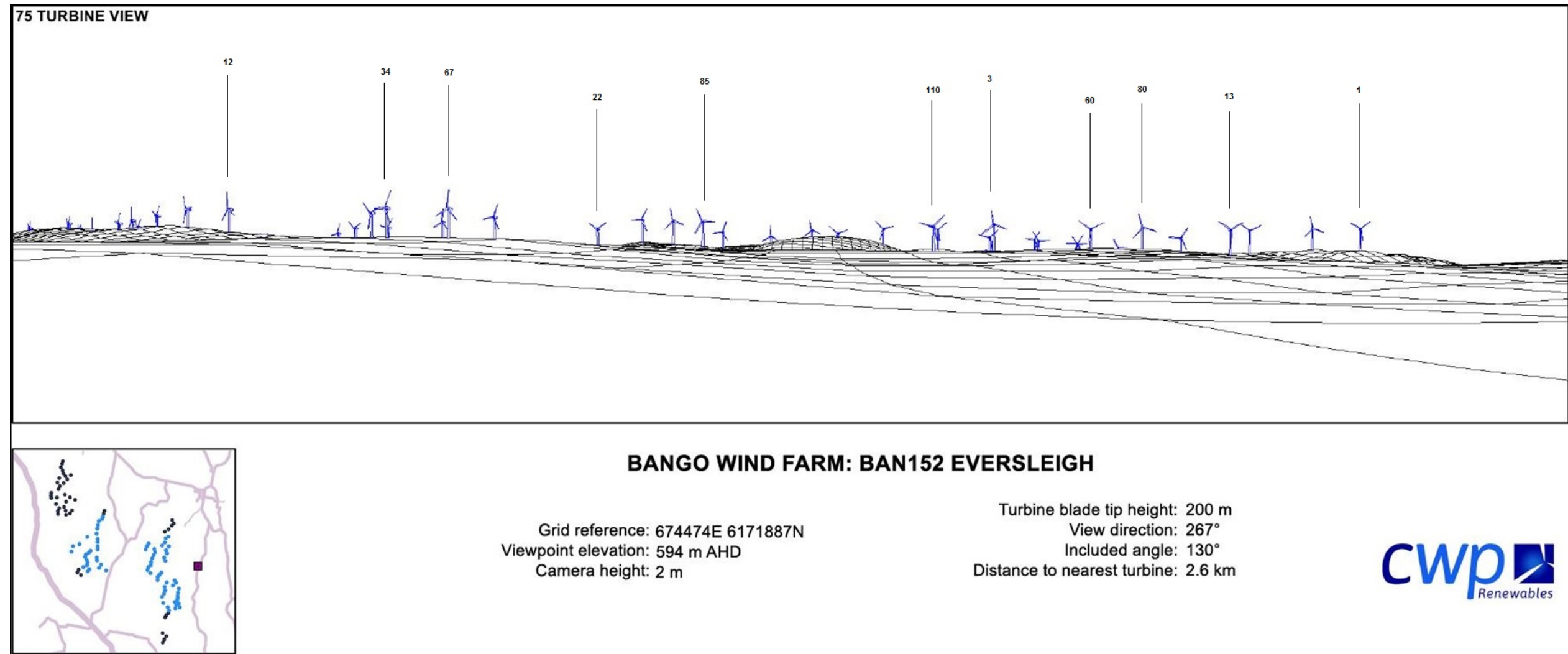


Figure 17: Residence 152 wireframe analysis looking west towards turbines in the Mt Buffalo cluster

Ancillary Infrastructure

In general, BWF has sited the project's ancillary infrastructure (e.g. collection substation, connection substation, 132 kV transmission line and cabling) to minimise its visual impacts by locating it in areas screened by local topography and vegetation.

BWF has identified 3 potential locations for the collector substation and connection substation. Subject to detailed design, only 1 of the locations would be selected for construction. Refer to Figures 3 and 4 for the location of the ancillary infrastructure.

BWF's LVIA identified 6 residences located within 2km of the project's ancillary infrastructure that could have views of this infrastructure. Two of the residences are associated, and BWF has an agreement in place with the owners of the other 4 residences. Notwithstanding, BWF's LVIA assessed the impact of the ancillary infrastructure and determined that it would not have a significant visual impact on any residences, as it would largely be screened by topography and existing vegetation.

The Department, with the assistance of the independent visual expert, also undertook an assessment of the visual impact associated with the project's ancillary infrastructure and agrees with the findings of BWF's LVIA. As such, the Department is satisfied the visual impact of the ancillary infrastructure would be low to negligible, however, has recommended a condition formalising BWF's commitment to implement vegetation screening comprised of suitable native species around substations and control buildings where they are visible from neighbouring residences and public viewpoints.

Other Visual Effects - Shadow Flicker and Blade Glint

Shadow flicker occurs when rotating blades momentarily block the sun's path. BWF conducted a shadow flicker assessment having regard to the *Policy and Planning Guidelines for the Development of Wind Energy Facilities in Victoria* (Department of Planning and Community Development, 2012), which recommends a maximum shadow flicker duration of 30 hours per year.

BWF's assessment concluded that no non-associated residences would experience over 30 hours of shadow flicker per year, and the Department has incorporated this limit in its recommended conditions.

Blade glint (reflection of sunlight off the turbine blade) could also have temporary effects at a given location, depending on the orientation of the blades and nacelle in relation to the sun. While there are no guidelines for blade glint, the 2012 Victorian guidelines recommend that blades are finished with a surface treatment of low reflectivity to ensure that glint is minimised.

The Department is satisfied that blade glint could be effectively managed through appropriate turbine treatments, such as the use of low sheen and matte finishes, to ensure negligible impacts, and has recommended a condition accordingly.

Obstacle Lighting

Under the *National Airports Safeguarding Framework, Guideline D – Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms) / Wind Monitoring Towers*, National Airports Safeguarding Advisory Group (NASAG), 2012 (NASAG guidelines) CASA is required to be notified if a proposed wind turbine or wind monitoring tower is greater than 150 m in height or infringes on the Obstacle Limitation Surfaces of an aerodrome. CASA would then determine whether obstacle lighting is required.

If such lighting is required, the guidelines recommend that to minimise visual impacts “*obstacle lights may be partially shielded, provided it does not compromise their operational effectiveness. Where obstacle lighting is provided, lights should operate at night, and at times of reduced visibility. All obstacle lights on a wind farm should be turned on simultaneously and off simultaneously.*”

BWF's Aviation Impact Statement determined that as aircraft are permitted to fly as low as 152 m, it would be prudent to provide obstacle lighting on the turbines, as they would be greater than 152 m in height.

Further, CASA determined that obstacle lighting is required on the turbines as the maximum height of the turbines would only be 6 feet (1.83 m) below the 25 nautical mile minimum safe altitude protected airspace surface. As such, CASA has recommended BWF install lighting consistent with the NASAG guidelines.

BWF undertook an assessment of the visual impacts of obstacle lighting, and concluded that although lighting mounted on turbines could be visible at night for a number of kilometres, the actual intensity of the lighting appears no greater than other sources of night time lighting, such as vehicle head and tail lights. Further, the impacts could be minimised through the use of LED lights instead of conventional incandescent lights.

The Department accepts that there are a range of measures to minimise the visibility and impacts associated with obstacle lighting, but considers that the residual impacts of obstacle lighting at 200 m above ground level are likely to remain noticeable in a 'dark' rural context, and would therefore increase the overall visual impacts of the project.

Nonetheless, the Department must adhere to CASA advice in regard to aviation safety, and has recommended conditions requiring BWF to consult with CASA and ensure that any lighting is installed in accordance with CASA requirements and in a manner that minimises any adverse visual impacts on local residents.

Conclusion

The Department is satisfied that the project would not fundamentally change the broader landscape characteristics surrounding the project site. This is primarily due to the nature of the undulating topography and remnant vegetation in the region which along with the substantial changes made by BWF to reduce visual impacts in key locations around the site through the assessment process.

Cumulative impacts from the approved, but not yet constructed, Rye Park Wind Farm, would be limited to residences located between the two projects on Wargeila Road, and the Department considers these impacts would be able to be mitigated through the provision of visual impact mitigation measures (such as landscaping and visual screening).

However, the Department considers that a number of turbines, primarily in the Kangiara cluster, would impact the visual amenity of a number of nearby non-associated residences.

The nature of these visual impacts would dominate these residences and effectively transform the current rural character of the landscape in the immediate surrounds.

Accordingly, the Department has recommended that Turbine Nos. 19, 65, 72 and 79 in Layout Option 1 (corresponding to Turbine Nos. 42, 49 and 68 in Layout Option 2) in the southern Kangiara cluster be removed, and that 2 turbines in the northern part of the Kangiara cluster (Turbine Nos. 76 and 98 in Layout Option 1 (and the corresponding Turbine No. 22 in Layout Option 2) be linked to reaching agreement with the owner of residence 282.

The Department has also considered removing turbines in the southern part of the Mt Buffalo cluster to reduce visual impacts on a number of nearby residences. However, the Department considers that these impacts could be mitigated through visual screening to achieve a reasonable level of environmental performance. Nonetheless, it is acknowledged that this matter is finely balanced, and the Planning Assessment Commission should consider whether additional mitigation is warranted prior to determination of the project.

In contrast, the Department considers that the residual visual impacts of the turbines throughout the remainder of the project site are comparatively low, noting that BWF has removed 47 turbines from the proposed layout and has reached agreement with a number of the most significantly impacted residences.

To minimise and manage the residual visual and lighting impacts as far as practicable, the Department has also recommended conditions requiring BWF to:

- offer visual impact mitigation measures, such as landscaping and/or vegetation screening, to all non-associated residences within 4 km of any approved wind turbine;
- implement all reasonable and feasible measures to minimise the impacts of the visual appearance of the project, including providing vegetation screening comprised of suitable native species around substations and control buildings where they are visible from neighbouring non-associated residences and public viewpoints;
- implement all reasonable and feasible measures to minimise the off-site lighting impacts of the project; and
- ensure that shadow flicker associated with wind turbines does not exceed 30 hours per year at any non-associated residence.

5.2 Noise

BWF commissioned 3 noise impact assessments throughout the assessment period, including:

- Bango Wind Farm Environmental Noise Assessment, Sonus, May 2016;
- Bango Wind Farm and Rye Park Wind Farm Cumulative Environmental Noise Assessment, Sonus, April 2016; and
- Bango Wind Farm Supplementary Environmental Noise Assessment, Sonus, May 2017.

These assessments were all prepared in accordance with the applicable guidelines, including South Australia's *Environmental Noise Guidelines: Wind Farms (2003)* (SA Guidelines), which provides the accepted methodology for assessing wind farm noise in NSW.

The EPA has indicated that it is satisfied that both the noise criteria and the predicted noise levels have been correctly calculated for the project, and that it would be able to issue an EPL for the project subject to the recommended noise limits.

A number of public submissions raised concerns about potential adverse noise impacts from the project.

Wind Turbines

Noise monitoring was undertaken from 16 August 2012 to 5 December 2012 at 14 locations to determine background noise levels.

Background noise levels were found to be relatively quiet, as expected for receivers in a rural environment isolated from other extraneous noise sources (e.g. traffic noise). The monitoring results were used to assign background noise levels for all residences within approximately 5 km of a proposed turbine.

The noise assessment model was based on conservative input conditions, which included modelling each residence as being downwind of all turbines, even when these residences would be upwind. Despite this conservative approach, the predicted noise levels were found to be within the noise criteria established under the noise criteria of background plus 5 dB for all integer wind speeds, at all non-associated residences except for residence 238.

The noise levels at residence 238 were predicted to exceed the criterion by 2 dB at wind speeds of 9 m/s and 10 m/s.

However, the Department considers that the minor nature of the predicted exceedances means that the criterion could be readily achieved using either noise management mode or sector management at the closest turbines to residence 238, which are accepted methods of either reducing rotor speeds or turning turbines off during noise enhancing meteorological conditions, and can be easily audited and verified by regulators.

The Department also notes that following selection of the final turbine model and subsequent noise monitoring, the noise emissions of the turbines are likely to be able to comply with the noise criterion without further mitigation.

Alternatively, this issue would be addressed if the Planning Assessment Commission decides to remove the turbines nearest to this residence to reduce visual impacts, as discussed above.

Whichever option is imposed, the Department and the EPA are satisfied that the noise generated by the project would be able to comply with the applicable operational noise criteria at all non-associated residences.

Cumulative Impacts

As stated previously, BWF also undertook a cumulative noise assessment for the original project layout as part of the EIS, taking into account the approved Rye Park Wind Farm.

The assessment took a conservative approach (resulting in a potential overestimate of cumulative noise levels), and predicted the noise levels based on the highest sound power level produced by the modelled turbines for each project. This assumes that a residence located between the two projects would be downwind from both projects at the same time, which would be highly unlikely to occur.

The conservative cumulative effect is determined based on how much the noise from one project increases the predicted noise from the other project, and vice versa.

If the noise from one project is at the limit of 35 dB(A), then the second project would need to contribute 25 dB(A) or more to increase the predicted noise from that project to exceed the criteria. Based on this assumption, the cumulative noise assessment produced a 35 dB(A) and 25 dB(A) noise contour for both the Bango and Rye Park Wind Farms (see Figure 18).

The cumulative noise assessment predicted that the 25 dB(A) contour for the Rye Park Wind Farm would not cross the 35 dB(A) contour for the Bango Wind Farm, and as such, concluded that the predicted noise levels for the project would not be influenced by the predicted noise from the approved Rye Park Wind Farm.

The Department is satisfied that the noise generated by the project could comply with the applicable operational noise criteria at all non-associated residences, both on its own and taking into account any cumulative noise impacts from the approved Rye Park Wind Farm.

The Department notes that the final noise assessment predictions, and ultimately the noise generated by operation of the project, would be subject to the final turbine selection and layout. Should BWF select more efficient wind turbines than those modelled in the EIS, this would further reduce the typical noise levels generated by the wind turbines.

BWF has committed to verifying the EIS noise assessment predictions following selection of the final wind turbine model and layout design.

In order to protect the amenity of surrounding residents, the Department has recommended conditions requiring BWF to:

- comply with noise limits at non-associated residences surrounding the project for noise generated by the operation of both the wind turbines and ancillary infrastructure;
- comply with a range of standard noise conditions, including implementing all reasonable and feasible measures to minimise the noise impacts of the project; and
- undertake noise monitoring following commencement of operation of the wind turbines to determine compliance with the noise limits.

Low Frequency Noise

Potential health impacts from low frequency noise (noise in the frequency range below 200 Hz) and infrasound (a subset of low frequency noise in the frequency range below 20 Hz) were identified as concerns in a number of community submissions.

The noise assessments indicate that the aerodynamic noise from a wind turbine is not dominant in the low frequency range and is generally in the mid-frequency (200 Hz to 1,000 Hz). The assessments predict that low frequency noise from the project would be no greater than 60 dB(C) at all non-associated residences.

By way of comparison, this level is well below the low frequency noise triggers in the Department's *Wind Energy Framework: Noise Assessment Bulletin*, which recommends a more detailed low-frequency noise assessment if measured noise levels are repeatedly greater than 65 dB(C) during the daytime or 60 dB(C) during the night time.

Notwithstanding, to ensure surrounding residents are protected from any potential impact from low frequency noise, the Department has recommended conditions which require a 5 dB(A) penalty to be added to the measured noise levels if low frequency noise from the wind farm is repeatedly greater than 65 dB(C) during the daytime or 60 dB(C) during the night time (for more than 10% of the 24 hour assessment period) at any relevant receiver.

The EPA has advised the Department that it is satisfied with this approach.

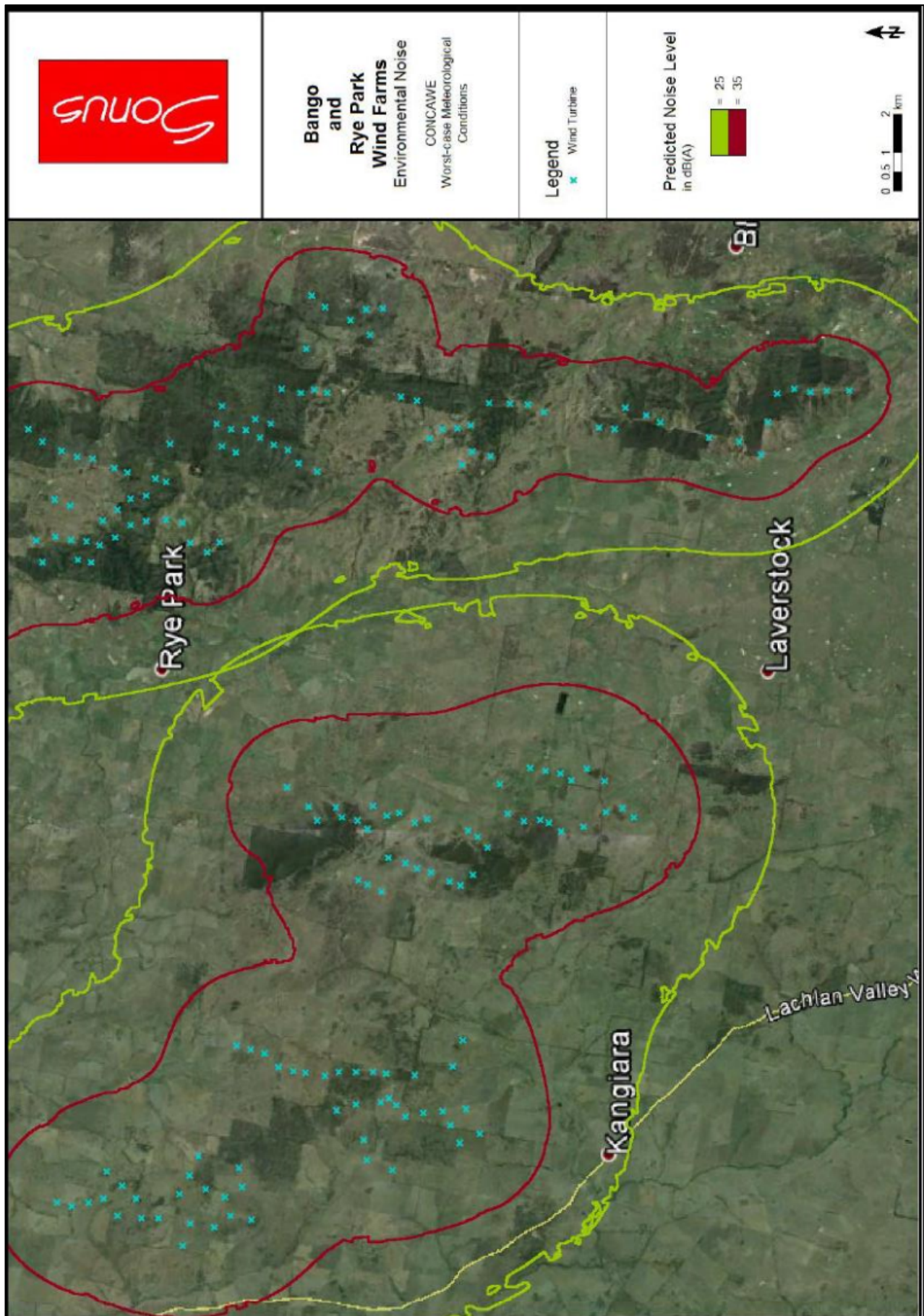


Figure 18: Predicted Noise Contours for the Bango and Rye Park Wind Farms

In regards to infrasound, the Department acknowledges the community's concern regarding potential health effects from wind farms. However, the Department is guided by the literature reviews undertaken by the National Health and Medical Research Council (NHMRC) that uses a robust evidence-based approach, supported by NSW Health, regarding human health effects from wind farms.

In 2015, the NHMRC concluded that *"there is no direct evidence that exposure to wind farm noise affects physical or mental health"*. More specifically, it stated that, *"while exposure to environmental noise is associated with health effects, these effects occur at much higher levels of noise than are likely to be perceived by people living in close proximity to wind farms in Australia"*. The statement also suggested that further health based studies should concentrate on exposure in close proximity to wind farms (i.e. less than 1.5 km).

The Department notes that BWF does not propose to construct any turbines closer than 1.8 km from non-associated residences, and that the noise assessment found the project would not generate excessive levels of low frequency noise or infrasound. Consequently, the Department considers the health risks of the project to be negligible.

Nonetheless, the Department will continue to monitor contemporary scientific research outcomes to ensure its position reflects robust evidence on any health effects, including any advice releases regarding potential health effects associated with low frequency noise or infrasound from the National Wind Farm Commissioner and the Independent Scientific Committee.

Construction Noise and Vibration

The noise assessment indicates that construction noise associated with the project would be well below the 'highly noise affected' criterion (i.e. 75 dB(A)) in the EPA's *Interim Construction Noise Guideline (2009)* for all non-associated residences for construction activities during standard hours (i.e. 7 am to 6 pm Monday to Friday, and 8 am to 1 pm Saturday).

Up to 17 non-associated residences may be subject to temporary noise above the 'noise affected criterion' (i.e. 40 dB(A)) primarily during the construction of turbine foundations, road and hardstand construction and electrical installation, but this exceedance would be temporary (i.e. up to 6 dB(A) above the criterion for 1 to 2 weeks during the day time only).

Four (4) concrete batching plants are proposed on the site (see Figures 3 and 4). All non-associated residences are located greater than 3 km from the nearest concrete batching plants and noise levels are predicted to comply with the applicable criteria at all non-associated residences.

Notwithstanding, BWF has committed to implementing a number of standard measures to minimise construction noise from the project, which may include construction of temporary acoustic barriers, use of proprietary enclosures around machines (i.e. rock crushing and concrete batching plants), use of silencers, substitution of alternative construction processes and the fitting of broadband reversing signals.

The Department has recommended conditions requiring BWF to implement all reasonable and feasible measures to minimise construction noise in accordance with the best practice requirements outlined in the EPA's *Interim Construction Noise Guideline (2009)*, or its latest version.

As such, the Department considers that the proposed construction activities are unlikely to result in significant adverse impacts during daytime hours and has recommended conditions restricting construction works to standard hours (i.e. 7 am to 6 pm Monday to Friday, and 8 am to 1 pm Saturday) with no work on Sundays or NSW public holidays.

However, the Department acknowledges that there may be some instances where construction activities may be required to be undertaken outside of these hours (such as emergency works or other works that are inaudible at any non-associated residence) and has recommended conditions allowing for these activities to be undertaken in accordance with these pre-conditions.

Importantly, construction noise would also be regulated by the EPA under the EPL for the project, and the EPA has recommended a number of conditions to manage construction noise impacts from the project, which the Department has incorporated into the recommended conditions.

The noise assessments also considered vibration impacts from construction with reference to *Assessing Vibration: A Technical Guideline* (DECC, 2006). The assessments found that typically, the distances required to achieve the construction vibration criteria provided in the Technical Guideline between the source of vibration and the receiver are in the order of 20 m to 100 m. The assessment noted that vibration from construction activities was unlikely to be detectable to humans at a distance of 100 m.

Given the proposed construction activities would be well over 100 m from the closest residence, the noise assessment concluded that the project construction activities would comply with the relevant construction vibration criteria.

Notwithstanding, the Department has recommended conditions requiring BWF to implement best management practice to minimise construction vibration generated by the project.

Traffic Noise

During construction, the general increase in daily traffic has the potential to increase the short-term traffic noise levels along the proposed access route. The level of disturbance to residents would be directly related to the proximity of the residence to the access roads.

Potential traffic noise impacts from increased project-related traffic were assessed against the *NSW Road Noise Policy (2011)*.

Construction related traffic noise impacts would be limited to the construction period of 18 months, including a shorter peak traffic period of up to 4 months where over-dimensional vehicles would be used. On a daily basis, the frequency of vehicle movements would vary depending on the construction activities occurring at the time.

The transport assessment identified the light, heavy and over-dimensional vehicle transport requirements, including the vehicle type and the number that would be required to transport all wind turbine and infrastructure components to the project site. Based on the revised project layout, the estimated vehicle transport movements per hour (i.e. two-way trips) for both the average and peak construction periods are shown in Table 8.

Table 8: Traffic generation summary

Vehicle type	Vehicle movements per hour	
	Average	Peak
<i>Light</i>	65	108
<i>Heavy</i>	35	39
<i>Over-dimensional</i>	0	4
Total	100	150

In order for the noise criteria to be met for non-associated residence along the transport route during the average predicted traffic volumes, they would need to be located a minimum of 115 m from the roadside.

There are 6 residences located along the proposed transport route on Lachlan Valley Way within 115 m from the road. As such, they would be subject to construction traffic noise levels above the criterion when the traffic generated is equivalent to the average predicted volumes.

In order for the noise criteria to be met for non-associated residences along the transport route during the peak predicted traffic volumes, they would need to be located a minimum of 150 m from the roadside.

There are 5 residences located along the proposed transport route on Lachlan Valley Way between 115 m and 150 m from the road. As such, during the 4 month peak construction traffic period, 11 residences would be subject to traffic noise levels above the criterion.

The Rye Park Wind Farm is approved to use Lachlan Valley Way as part of its over-dimensional and heavy vehicle transport route. If construction of the Rye Park Wind Farm were to occur concurrently with the project, there would be cumulative traffic noise impacts.

Similar to the project, the Rye Park Wind Farm would have a construction period of 18 months, including a shorter period of up to 9 months using over-dimensional vehicles. The average predicted hourly traffic volumes for the Rye Park Wind Farm based on an 18 month construction period are:

- 37 light vehicle movements per hour; and
- 14 heavy vehicle movements per hour.

Deliveries of the long loads during the Rye Park Wind Farm's 9 month peak construction period would involve 1 over-dimensional vehicle movement per hour.

As such, in the worst-case scenario where the peak construction periods for both projects occur concurrently, the maximum predicted hourly traffic volumes along Lachlan Valley Way would be:

- 5 over-dimensional vehicle movements per hour;
- 53 heavy vehicle movements per hour; and
- 145 light vehicles movements per hour.

With the combined traffic of both projects, even in the worst-case scenario, no additional residences other than the 11 impacted by the Bango Wind Farm would be subject to traffic noise levels above the criterion, as they are all located a sufficient distance from the roadside.

Nevertheless, BWF has committed to liaising with the applicant of Rye Park Wind Farm to minimise the impacts of the traffic noise, if construction of the projects were to occur concurrently.

In accordance with the general principles of dealing with temporary construction noise impacts, BWF proposes to apply a range of mitigation measures to reduce construction-related traffic noise, including communicating with impacted residences, scheduling of construction activities and deliveries to minimise road noise.

The EPA acknowledged that any traffic noise impacts would be generally limited to the construction period and is satisfied that these impacts could be adequately managed through the implementation of measures contained in the *Interim Construction Noise Guidelines (2009)*.

The Department is satisfied that BWF's proposed mitigation measures would be sufficient to minimise traffic noise impacts from the project.

Notwithstanding, the Department has recommended conditions requiring BWF to restrict construction activities to the day time, and implement best management practice to minimise road traffic noise as part of a Traffic Management Plan for the project, including consideration of potential interaction with Rye Park Wind Farm in consultation with the applicant of that project.

Ancillary Infrastructure

The noise assessments also considered potential noise generation from the proposed substations and the overhead 132 kV transmission lines.

The predicted levels indicate that the noise generated by the substations would be well below the *NSW Industrial Noise Policy* intrusiveness criteria at all non-associated residences, and would most likely be inaudible at all non-associated residences at all times.

In regards to transmission lines, corona noise (conductor induced noise under wet conditions) and aeolian noise (vortex shedding from the lines under specific wind conditions) are typically only an issue for transmission lines rated 345 kV and above, and rarely an issue at distances greater than 50 to 100 m.

Given the proposed transmission line is below this voltage and the nearest non-associated residences are over 4 km from the proposed 132 kV transmission line alignment, the Department accepts that any noise impacts would be negligible. Notwithstanding, BWF has committed to incorporating standard noise control measures into the design of the transmission line.

5.3 Biodiversity

The project site and surrounds is characterised by cleared farmland mostly derived from Apple Box – Yellow Box Grassy Woodland on the lower slopes and flats with Inland Scribbly Gum Dry Forest vegetation on the steeper sheltered slopes, which has been largely disturbed by historic grazing and is of limited conservation value. However, remnant stands of the original vegetation remain as paddock trees or larger scattered patches of woodland along roadsides and on the lower slopes of the ridges, with more extensive forested areas on the ridge tops.

The site includes habitat for some threatened species and endangered ecological communities (EEC), which would potentially be impacted by the project through direct habitat loss from clearing of vegetation, and bird and bat strike during operation of the wind turbines.

BWF has undertaken a number of ecological assessments to assess the project's biodiversity impacts, including:

- Ecological Impact Assessment, Environmental Resources Management Australia Pty Ltd, May 2013;
- Woodland Birds and Superb Parrot Supplementary Information Report, Environmental Resources Management Australia Pty Ltd, September 2013;
- Endangered Ecological Communities and Golden Sun Moth, Environmental Resources Management Australia Pty Ltd, November 2013;
- Turbine Setback Analysis, Environmental Resources Management Australia Pty Ltd, November 2013; and
- Bango Wind Farm – Biodiversity Response to Submissions, Environmental Resources Management Australia Pty Ltd, May 2017.

The NSW Government's policies in relation to biodiversity impact assessment and offsetting have changed during the assessment of this project, including changes to the classification of native vegetation condition and the introduction of new procedures.

As BWF's assessment was undertaken prior to the commencement of the *Biodiversity Conservation Act 2016*, under the transitional arrangements, the project may still be assessed and determined under the *NSW Biodiversity Offsets Policy for Major Projects*. Accordingly, the offset credit requirements have been calculated in accordance with using the *Framework for Biodiversity Assessment (FBA)* credit calculator.

A number of public submissions raised concerns about potential adverse impacts on biodiversity from the project. As noted in Section 4, the submission from the Boorowa District Landscape Guardians included a peer review of BWF's biodiversity assessment by Australian Wildlife Services (AWS). The AWS report primarily focused on the adequacy of the assessment in regards to the impacts on koalas and their habitat.

Both OEH and the Department are satisfied that the assessment adequately addresses the requirements of the *NSW Biodiversity Offsets Policy for Major Projects* and areas of core koala habitat would not be impacted. As such, the AWS report did not raise any issues that would materially change the findings of the biodiversity assessment.

Avoidance and Mitigation

The ecological assessments are based on a number of measures to avoid and/or mitigate impacts, including:

- designing the project to avoid disturbance of EECs, threatened species and woodland areas, as far as practicable;
- committing to undertaking micro-siting of turbines during the detailed design stage of the project to further avoid impacts on ecological resources and ecologically sensitive areas, as far as practicable; and
- locating ancillary infrastructure outside of ecologically sensitive areas, where practicable.

Based on the findings of the ecological assessments and concerns raised by OEH, to minimise the environmental impacts of the project, including biodiversity impacts, BWF significantly revised the project layout, including:

- removing the Langs Creek cluster;
- revising the over-dimensional and heavy vehicle transport routes to avoid the need for clearing along Tanmangaroo Road; and
- rationalising the site access points.

Refer to Figures 3 and 4 for the location of the development corridor. The revised over-dimensional and heavy vehicle transport route is discussed further in Section 5.4.

Vegetation Community Impacts

In order to calculate the worst-case impacts on vegetation communities across the project site, BWF conservatively assumed all areas mapped as 'cropping', 'pasture' and Apple Box – Yellow Box Grassy Woodland EEC (Box Gum Woodland EEC) in low condition to be Box Gum Woodland EEC in moderate to good condition (refer to Figure 19).

Under this worst-case scenario, the project would require up to 138 ha of vegetation to be cleared, including 126.54 ha of native vegetation, as summarised in Table 9. It is important to note that the majority of the area assumed to be Box Gum Woodland EEC required to be cleared comprises derived native grassland with sparsely distributed Yellow Box trees, that has been subject to past clearing, grazing and/or ploughing.

Table 9: Native vegetation community impacts

Biometric vegetation type (BVT)	BVT Code	Conservation Significance ²		Impact (ha)
		TSC Act ³	EPBC Act ⁴	
Apple Box – Yellow Box Grassy Woodland	LA103	EEC	-	103.75
Red Stringybark Open Forest	LA182	-	-	22.79
Total				126.54

The Department notes that once additional survey effort is undertaken to verify the vegetation mapping across the project site as required under the FBA, the actual impacts on native vegetation are likely to be substantially lower.

Flora Impacts

Five (5) threatened flora species listed under the TSC Act could be present at the project site based on potential or known habitat. These threatened species and their conservation significance are listed in Table 10. Targeted surveys were undertaken as part of the ecological assessments to confirm the presence of these 5 threatened species in the project site.

Table 10: Threatened flora species with potential to occur on the project site

Species	Conservation Significance	
	TSC Act	EPBC Act
Hoary Sunray (<i>Leucochrysum albicans</i> var. <i>tricolor</i>)	-	Endangered
Omeo Stork's Bill (<i>Pelargonium</i> sp. <i>Striatellum</i>)	Endangered	Endangered
Silverleaf Candlebark (<i>Eucalyptus canobolensis</i>)	Vulnerable	Endangered
Tarengo Leek Orchid (<i>Prasophyllum petilum</i>)	Endangered	Endangered
Yass Daisy (<i>Ammobium craspedioides</i>)	Vulnerable	Vulnerable

The targeted surveys identified only 1 threatened flora species in the study area, the Yass Daisy, of which a population comprising over 200 individuals was recorded 750 m to the west of the southern Mt Buffalo cluster, outside of the project's development corridor. The ecological assessments include tests of significance for all of the species listed in Table 10, as well as the Box Gum Woodland EEC, against the criteria in Section 5A of the EP&A Act and the NSW *Threatened Species Assessment Guidelines: The Assessment of Significance*. The tests of significance concluded that the project is unlikely to result in any significant impacts on the abundance, range and distribution of the EEC and any threatened flora species.

Notwithstanding, the impacts on Box Gum Woodland EEC would need to be offset in accordance with the FBA, as discussed below.

² EEC – Endangered Ecological Community; CEEC – Critically Endangered Ecological Community

³ TSC Act – NSW Threatened Species Conservation Act 1995

⁴ EPBC Act – Commonwealth Environment Protection Biodiversity Conservation Act 1999

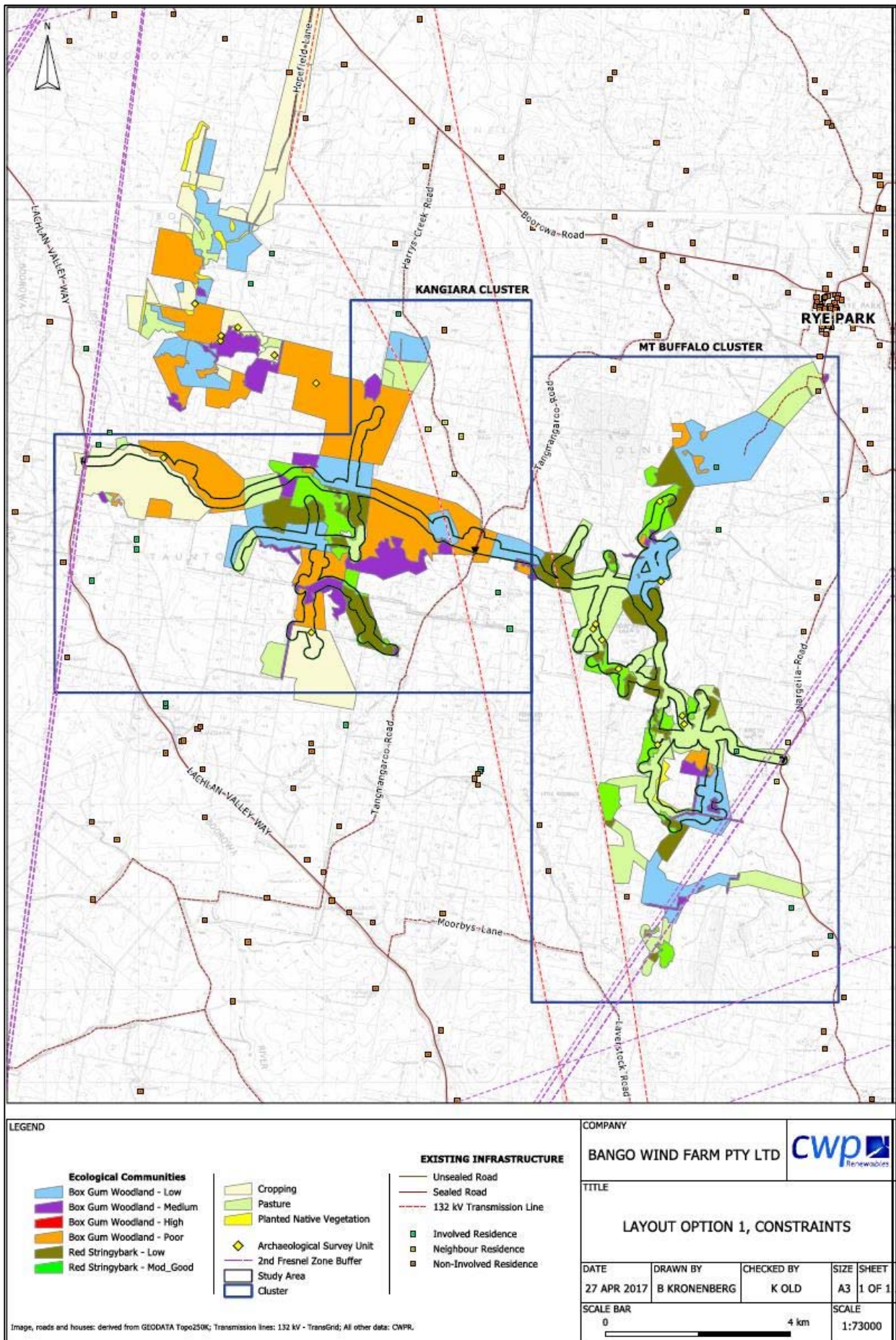


Figure 19: Vegetation Types

Fauna Impacts

The project could affect fauna in a number of ways, including direct habitat loss through the clearing of vegetation, and bird and bat strike during operation of the wind turbines.

Hollow bearing trees are used for shelter and as breeding sites for a wide range of fauna species, including gliders, owls, birds and bats. As such, OEH recommends a buffer of at least 50 m from the canopy of hollow bearing trees to the tip of the turbine blade, in order to reduce the risk of strike.

In accordance with OEH's recommendation, BWF has located the majority of turbines so that the blade tip of the turbines is at least 50 m from the canopy of hollow bearing trees. As such, with the Department's recommendation to remove additional turbines to address visual impacts, only 7 hollow bearing trees have the potential to be impacted by Turbine Nos. 18, 67, 80, 86, 97, 111, 115 in Layout Option 1 (and Turbine Nos. 8, 56, 82, 83, 87 in Layout Option 2). In comparison with other wind farms in the region of a similar scale, the number of hollow bearing trees that could be impacted is quite low.

BWF has committed to micro-siting these wind turbines as far as practicable from hollow-bearing trees during detailed design of the project.

Thirty-nine (39) threatened or migratory fauna species listed under the TSC Act and/or the EPBC Act have the potential to be present at the project site based on available habitat, known ecological requirements, local distribution records and the results of online database searches.

The ecological assessment surveys recorded 14 threatened fauna species in the whole project area (i.e. including the Langs Creek cluster), including 10 birds, 2 bats, 1 mammal (excluding bats) and 1 invertebrate. Of the 10 threatened bird species recorded, the Superb Parrot (*Polytelis swainsonii*) was recorded most frequently, and was most commonly observed in areas with grain crops or Box Gum Woodland EEC.

However, the surveys identified that only potential habitat for 3 threatened species would be affected by the project. These species and their conservation significance is listed in Table 11.

Table 11: Threatened Fauna Species Impacts

Species	Conservation Significance		Impacts on habitat (ha)
	TSC Act	EPBC Act	
Golden Sun Moth (<i>Synemon plana</i>)	Endangered	Critically Endangered	39.54
Little Eagle (<i>Hieraaetus morphnoides</i>)	Vulnerable	-	9.13
Spotted Harrier (<i>Circus assimilis</i>)	Vulnerable	-	9.13

The Department notes that despite the Superb Parrot being the most frequently recorded threatened species during the bird utilisation surveys undertaken, the ecological assessments concluded that with the removal of the Langs Creek cluster, potential habitat for the Superb Parrot would not be affected.

Nevertheless, the ecological assessment included tests of significance for the Superb Parrot, as well as the species listed in Table 11, and all the threatened species, known, likely or with the potential to occur in the project site against the criteria in Section 5A of the EP&A Act and the NSW Threatened Species Assessment Guidelines: The Assessment of Significance. The tests of significance concluded that the project is unlikely to result in any significant impacts on the abundance, range and distribution of any threatened fauna species.

Notwithstanding, impacts on the Golden Sun Moth, Little Eagle and Spotted Harrier habitat will need to be offset in accordance with the FBA, as discussed below.

Biodiversity Offset

The FBA does not require offsets for vegetation that is not identified as an EEC where it does not contain threatened species habitat. As Red Stringybark Open Forest – which is not an EEC - has been identified as containing habitat for a number of threatened woodland bird species, it requires an offset in accordance with the FBA.

Table 12 summarises the estimated worst-case biodiversity impacts, and credit and offset requirements under the FBA, for the project.

Table 12: Summary of Biodiversity Offset Requirements

<i>EEC/species</i>	<i>Impacts (ha)</i>	<i>Credits required</i>	<i>Area of land required (ha)</i>	<i>Area of land available in potential offset sites (ha)</i>
Apple Box – Yellow Box Grassy Woodland (LA103)	103.75	1,772	190.5	1,689
Red Stringybark Open Forest (LA182)	22.79	431	46.3	214
Golden Sun Moth habitat	39.54	989	165	1,689
Little Eagle habitat	9.13	128	21	1,689
Spotted Harrier habitat	9.13	128	21	1,689

The Department and OEH are satisfied that the offset credit requirements have been correctly calculated using the FBA, noting that these credits would need to be re-calculated once the final layout design of the project is known in order to confirm the final number and class of biodiversity offset credits to be retired.

The Department notes that with further avoidance measures during detailed design, the number and class of credits that would need to be retired is likely to be substantially lower than the worst-case calculations presented in Table 12.

While BWF has not proposed specific land-based offsets for the project, it has identified potential offset sites within the project area (comprising a total of 2,341 ha) to demonstrate that it can meet the estimated credit requirements to compensate for the worst-case scenario loss of native vegetation and habitat to be cleared for the project, in accordance with the *NSW Biodiversity Offsets Policy for Major Projects*.

This assessment shows that the potential offset sites would comfortably meet the offsetting requirements of OEH's policy.

The Department notes that the *NSW Biodiversity Offsets Policy for Major Projects* allows for the retirement of biodiversity offset credits to be achieved by a number of mechanisms (not just through land-based offsets), namely:

- acquiring or retiring 'biodiversity credits' within the meaning of the *Biodiversity Conservation Act 2016*⁵;
- making payments into an offset fund that has been developed by the NSW Government; or
- providing supplementary measures.

The Department has recommended conditions requiring BWF to:

- confirm the number and class of biodiversity offset credits required to be retired prior to the commencement of construction; and
- retire the required biodiversity offset credits in accordance with the *NSW Biodiversity Offsets Policy for Major Projects* within 2 years of the commencement of construction.

This approach also provides a significant incentive for BWF to avoid and minimise impacts on biodiversity values of the locality during the detailed design and construction of the project.

With the retirement of the required biodiversity offset credits, both the Department and OEH are satisfied that the project could be undertaken in a manner that improves or at least maintains the biodiversity values of the locality over the medium to long term.

Bird and Bat Strike

As discussed previously, BWF has sought to minimise the bird and bat strike risks of the project, principally by locating the turbines as far as practicable from hollow bearing trees and other important bird and bat habitat on site. It is also proposing a number of mitigation measures to avoid or minimise bird and bat strike, including:

- selecting obstacle lighting that minimises the attraction of insects; and
- preparing and implementing a Bird and Bat Monitoring Program that includes adaptive management techniques to allow a species-specific approach to mitigation should unacceptable impacts be identified during operations.

⁵ Following repeal of the TSC Act on 25 August 2017, credits created under that Act are taken to be 'biodiversity credits' under the *Biodiversity Conservation Act 2016*, in accordance with clause 22 of the *Biodiversity Conservation (Savings and Transitional) Regulation 2017*.

The ecological assessment includes a risk assessment to identify which species would be most at risk of strike. The risk assessment considered conservation status, flight character, distribution across the site, and whether the species is migratory. Those species that would be at the greatest risk of strike are provided in Table 13.

Table 13: Bird and Bat Species Considered at Risk of Blade Strike

Species	Conservation Significance	
	TSC Act	EPBC Act
Bird		
Superb Parrot (<i>Polytelis swainsonii</i>)	Vulnerable	Vulnerable
Spotted Harrier (<i>Circus assimilis</i>)	Vulnerable	-
Square-tailed Kite (<i>Lophoictinia isura</i>)	Vulnerable	-
Little Eagle (<i>Hieraaetus morphnoides</i>)	Vulnerable	-
Wedge-tailed Eagle (<i>Aquila audax</i>)	-	-
Bat		
Eastern Bentwing Bat (<i>Miniopterus schreibersii oceanensis</i>)	Vulnerable	-
Yellow-bellied Sheath-tail-bat (<i>Saccolaimus flaviventris</i>)	Vulnerable	-

Notwithstanding these potential risks, the EIS predicted that mortality rates would likely be between 1 to 2 birds/bats per turbine per year (or between 75 to 150 bird/bat strikes per year for the 75 wind turbines proposed for the project).

These predictions are supported by monitoring data from operational wind farms in the Southern Tablelands⁶, which indicate that mortality rates range from 0.1 to 2.0 bird/bat strikes per turbine per year, averaging approximately 1.0 bird/bat strikes per turbine per year. This monitoring data also indicates that the vast majority of affected species are commonly occurring, with only around 5% of mortalities comprising threatened species.

If these predictions are correct, then the project is unlikely to result in any significant impacts to total populations of threatened or 'at risk' bird and bat in the locality. However, the Department notes the data sets used to underpin these predictions is still small, and consequently the predictions should be treated with some caution.

Nonetheless, the Department considers that BWF has provided a suitably robust assessment of the potential risks of the project on bird and bat species from blade strike, and recognises that adaptive management techniques including minimising the availability of raptor perches, swift carcass removal, pest control and sector management of turbines, would help reduce any impact.

Consequently, the Department has recommended conditions requiring BWF to carry out detailed monitoring of the bird and bat strike impacts of the project, and carry out adaptive management if these impacts are higher than predicted or result in adverse impacts on any threatened bird or bat species in the locality (see below).

OEH remains concerned about the proximity of a number of turbines to existing Wedge-tailed eagle (*Aquila audax*) nests on the project site. With the removal of the additional turbines to address visual impacts, 4 nests would be within 500 m of a turbine, including Turbine No. 81 in Layout Option 1 (and Turbine No. 10 in Layout Option 2) in the Mt Buffalo cluster, which would require the removal of the nest to enable this turbine to be constructed.

To minimise impacts on breeding Wedge-tailed eagles using the nest in proximity to Turbine No. 81 in Layout Option 1 (and Turbine No. 10 in Layout Option 2), the Department has recommended conditions limiting BWF to removing this nest outside of Wedge-tailed eagle breeding season (April to September).

Further, the Department has recommended that the Applicant may only micro-site those remaining turbines located within 500 m of a nest (i.e. Turbine Nos. 14, 25, 27, 76 and 98 in Layout Option 1 and Turbine Nos. 22, 45 and 103 in Layout Option 2) if the revised location of the turbine is not any closer to the Wedge-tailed eagle nest.

⁶ Including the Gullen Range, Capital 1, Woodlawn, Taralga and Cullerin wind farms.

Additionally, the Department notes that for visual impact reasons, it has recommended conditions requiring BWF to reach agreement with the landowner of non-associated residence 282 linked to turbines 76 and 98 in the northern Kangiara cluster. If BWF does not reach agreement with this landowner, it would not be able to construct these turbines, and impacts on one of the 3 nests would be entirely avoided.

With these measures in place, the Department is satisfied that the project would not pose an overall significant or unacceptable level of risk to bird and bat species from rotor interaction, and that the bird and bat risks of the project can be suitably managed.

Conclusion

The Department acknowledges that the project site for the most part is covered in grassland and open woodland that has been largely disturbed by historic grazing and is of limited conservation value. However, the site does provide habitat for some threatened species and ecological communities. The Department is satisfied that BWF has designed the project to minimise impacts on these biodiversity values, and impacts would be able to be further minimised through micro-siting during the detailed design stage of the project. However, as with most wind farm proposals, the project would result in some residual biodiversity impacts.

Following its assessment, the Department is satisfied that these impacts are relatively minor and are able to be adequately mitigated, or at least compensated for, through a range of mitigation and offsetting measures.

In this regard, the Department has recommended conditions requiring BWF to:

- minimise disturbance of EEC and threatened species as far as practicable;
- if micro-siting turbines, ensure the revised location of Turbine Nos. 14, 25, 27, 76 and 98 in Layout Option 1 and Turbine Nos. 22, 45 and 103 in Layout Option 2 are not any closer to a Wedge-tailed eagle (*Aquila audax*) nest;
- undertake the removal of the Wedge-tailed eagle nest located in proximity to Turbine No. 81 in Layout Option 1 (and Turbine No. 10 in Layout Option 2) outside the Wedge-tailed eagle breeding season (April to September);
- prepare and implement a detailed Biodiversity Management Plan, which includes a Bird and Bat Adaptive Management Plan; and
- retire the applicable biodiversity offset credits in accordance with the *NSW Biodiversity Offsets Policy for Major Projects*.

With the implementation of all of these measures, both the Department and OEH are satisfied that the project could be undertaken in a manner that improves, or at least maintains, the biodiversity values of the locality over the medium to long term.

5.4 Traffic and Transport

Introduction

The key traffic and transport impacts of the project relate to the construction phase of the project due to the volume of traffic likely to be generated and the size of the components that need to be transported to the site.

Construction of the project involves the delivery of plant, equipment and materials including the movement of over-dimensional and heavy vehicles, which would affect the local and regional traffic network.

BWF engaged Samsa Consulting Pty Ltd to undertake a Transport Assessment in May 2016, which it included in its EIS.

Transport Routes

In response to a number of submissions received on the EIS from the local community, Councils, and OEH, BWF revised the proposed over-dimensional and heavy vehicle transport route to avoid passing through Boorowa and avoid using Tangmangaroo Road, Wargeila Road and Boorowa Rye Park Road.

Following additional feedback from RMS on the revised over-dimensional and heavy vehicle transport route, BWF has further revised the location of the main site access point on Lachlan Valley Way.

It is likely that the infrastructure components required for the project would be manufactured overseas and delivered to Port Kembla. They would be transported to the project site from Port Kembla via the Hume Highway. If infrastructure components are manufactured in Australia, they would be delivered via a similar route, depending on the manufacturing site location and their dimensions.

Once past Yass on the Hume Highway, the over-dimensional and heavy vehicle transport route heads north onto Lachlan Valley Way (see Figure 21). BWF is seeking approval to construct the main site access point off Lachlan Valley Way, as shown in Figure 20.

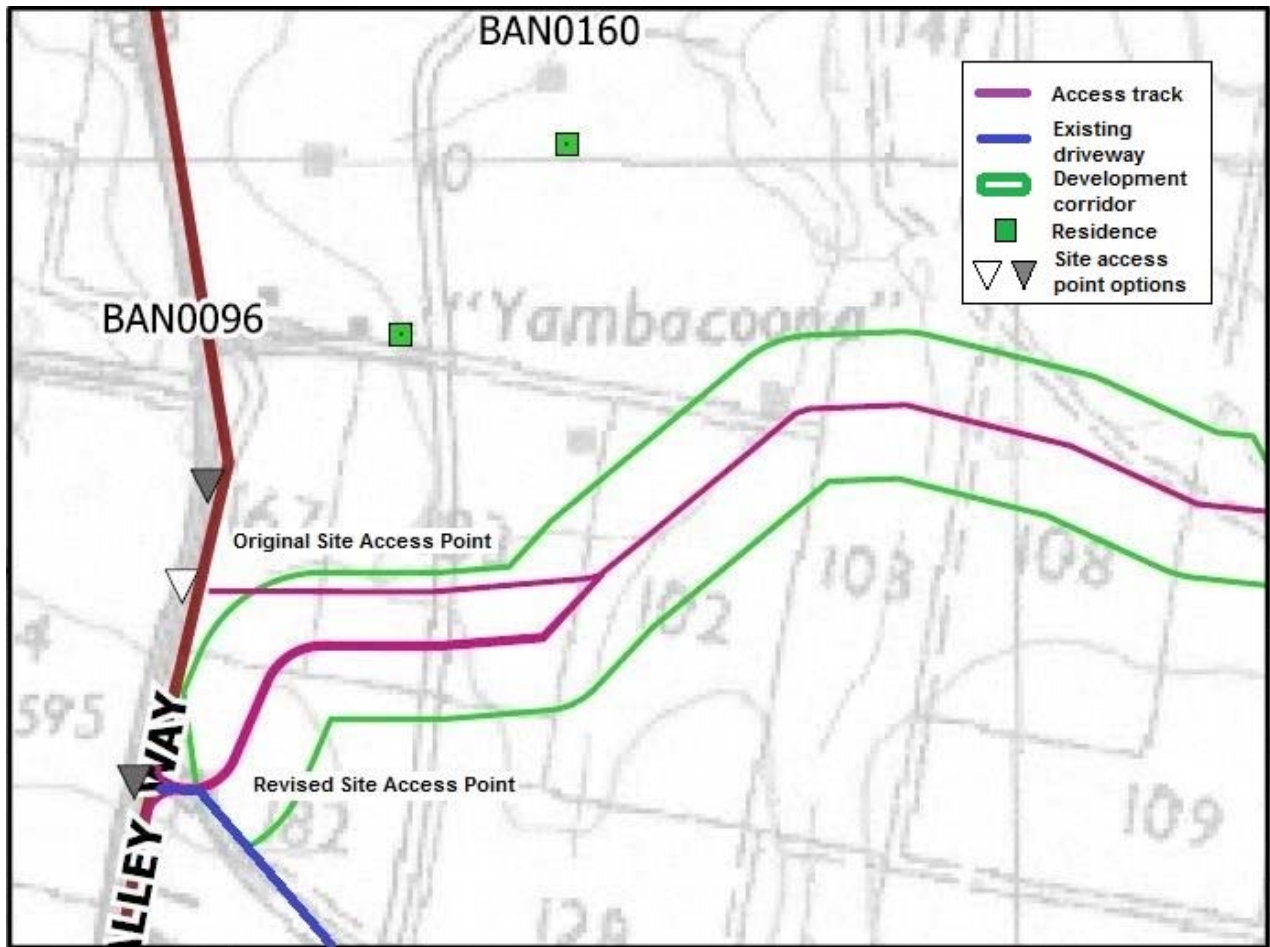


Figure 20: Site Access Point Options - Lachlan Valley Way

Light vehicle traffic associated with the construction of the project would likely travel to the project site from Yass via either Wargeila Road or Tangmangaroo Road (see Figure 21). The intersections of these roads and the site access points would need to be upgraded as required with a Rural Property Access type treatment in accordance with the *Austrroads Guide to Road Design* as amended by the supplements adopted by RMS.

Once on site, the access tracks would traverse associated residences properties and provide access to various parts of the wind farm site.

Road Upgrades

The road upgrades required along Lachlan Valley Way and the local road network to facilitate the construction of the project are summarised in Table 14.

Table 14: Proposed road upgrades

Road/ Intersection	Start – End	Length (km)	Upgrade
Lachlan Valley Way	Hume Highway to Site Access Point	30	Adjust overhead powerlines at rail bridge overpass as necessary to allow access for over-dimensional vehicles.
Lachlan Valley Way / Site Access Point Intersection	-	-	Upgrade with a Basic Right Turn (BAR) and Basic Left Turn (BAL) intersection treatment in accordance with the <i>Austrroads Guide to Road Design</i> as amended by the supplements adopted by RMS.
Tangmangaroo Road / Site Access Points Intersection	-	-	Upgrade as necessary with a Rural Property Access type treatment in accordance with the <i>Austrroads Guide to Road Design</i> as amended by the supplements adopted by RMS
Wargeila Road / Site Access Point Intersection	-	-	Upgrade as necessary with a Rural Property Access type treatment in accordance with the <i>Austrroads Guide to Road Design</i> as amended by the supplements adopted by RMS

Both the Department and BWF have undertaken extensive consultation with the local Councils and RMS on the proposed transport route and road upgrades throughout the assessment of the project.

RMS have indicated that as Lachlan Valley Way is a classified road with a 100 km/h posted speed limit, it cannot support the creation of a new intersection for the main site access point for road safety reasons. As such, BWF has redesigned the main site access point so that it is co-located with an existing intersection (see Figure 20).

The Department is satisfied that subject to further detailed assessment and design in consultation with RMS, the main site access point on Lachlan Valley Way is feasible and any residual impacts would be able to be managed. As such, the Department has recommended conditions requiring BWF to undertake the intersection upgrade to the satisfaction of RMS, and in accordance with a detailed Traffic Management Plan.

With these measures in place, and the restriction for over-dimensional and heavy vehicles to access the site via Lachlan Valley Way, both the Councils and RMS have confirmed that they are satisfied with the proposed design standards and road upgrades.

Traffic Impacts

Construction related traffic impacts would be limited to the construction period of 18 months, including a shorter period of up to 4 months using over-dimensional vehicles.

The transport assessment identified the light, heavy and over-dimensional vehicle transport requirements, including the vehicle type and the number that would be required to transport all wind turbine and infrastructure components to the project site. Based on the revised project layout, the estimated vehicle movements (i.e. two-way trips) during construction are shown in Table 15.

Table 15: Traffic generation summary

Vehicle type	Average vehicle movements		Peak vehicle movements	
	Per hour	Per day	Per hour	Per day
Light	65	130	108	215
Heavy	35	100	39	132
Over-dimensional	0	0	4	10
Total	100	230	150	357

The volume of construction traffic would be spread over the construction period, but on a daily basis the frequency of vehicle movements would vary depending on the construction activities occurring at the time. Deliveries of long loads, such as the wind turbines blades, may involve up to 10 over-dimensional vehicle movements, 132 heavy vehicle movements and 215 light vehicle movements per working day. However, for the majority of the construction period, maximum daily traffic generation would be:

- 100 heavy vehicle movements per working day; and
- 130 light vehicle movements per working day.

Based on this traffic generation, the transport assessment concluded that the level of service on the local and classified road network would only change marginally with the contribution of the project-generated construction traffic.

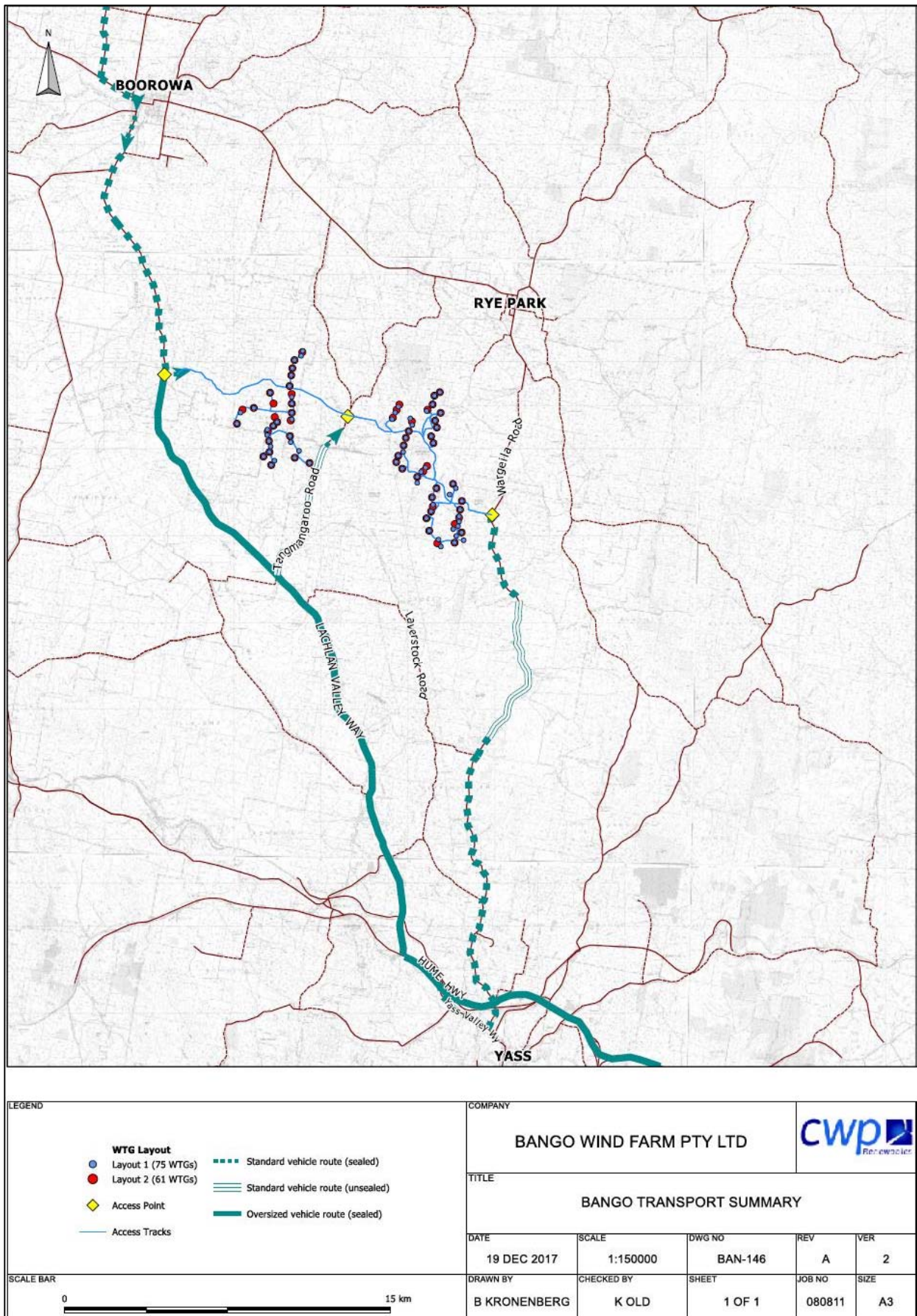


Figure 21: Over-dimensional and Heavy Vehicle Transport Route

Over-dimensional and Heavy Vehicles

Submissions raised a number of concerns relating to road safety and construction traffic impacts on local residents, particularly associated with over-dimensional and heavy vehicles.

However, both of the Councils, RMS and the Department consider that the proposed transport route as outlined above is suitable for the typical transport loads associated with the construction of a wind farm with minimal impacts to the existing public roads, subject to the identified road upgrades.

Additionally, the Department is satisfied that the proposed transport route could be upgraded to facilitate the transport of turbine components to the site, noting that the final road upgrade works would be subject to further detailed assessment and design prior to the implementation of these works. BWF has committed to road dilapidation surveys and repairing any damage resulting from the project's construction traffic.

Cumulative Impacts

The Rye Park Wind Farm is approved to use Lachlan Valley Way as part of its over-dimensional and heavy vehicle transport route. If construction of the Rye Park Wind Farm were to occur either concurrently or consecutively with the project, there would be cumulative traffic impacts. Similar to the project, the Rye Park Wind Farm would have a construction period of 18 months, including a shorter period of up to 9 months using over-dimensional vehicles.

Predicted daily traffic volumes for the Rye Park Wind Farm based on an 18 month construction period include:

- 76 heavy vehicle movements per working day; and
- 200 light vehicle movements per working day.

Deliveries of the long loads during the 9 month peak construction period would involve up to 6 over-dimensional vehicle movements per day.

As such, in the worst-case scenario where the peak construction periods for both projects occur concurrently, the maximum daily traffic generation would be:

- 16 over-dimensional vehicle movements along Lachlan Valley Way per working day;
- 208 heavy vehicle movements along Lachlan Valley Way per working day; and
- 415 light vehicle movements per working day.

The existing traffic volume on Lachlan Valley Way is approximately 1,800 vehicle movements per day. With the combined traffic impacts of both projects, during peak construction periods the volume of traffic on Lachlan Valley Way would increase to 2,439 vehicle movements per day. The assessment demonstrates that this traffic volume would only marginally affect the level of service, and would still allow for stable flow with reasonable freedom for drivers to select desired speed and manoeuvre within the traffic stream. The temporary increase in traffic volumes would be able to be readily absorbed by the road network subject to the road upgrade works and traffic management during the construction period.

Nevertheless, BWF has committed to liaising with the applicant of Rye Park Wind Farm to minimise the construction traffic impacts of the projects. It has proposed implementing mitigation measures that include scheduling of construction activities and deliveries to minimise road transport movements, region wide traffic management and/or shared road upgrades. The Department has formalised this commitment as part of the Traffic Management Plan required to be prepared in consultation with relevant road authorities and the proponent for the Rye Park Wind Farm.

Conclusion

With suitable road upgrades, regular road maintenance, and the implementation of a detailed Traffic Management Plan, the Department is satisfied that the project would not result in unacceptable impacts on the capacity, efficiency or safety of the road network.

To ensure this occurs, the Department has recommended conditions requiring BWF to:

- undertake all necessary road upgrades for the project to the satisfaction of the relevant roads authority prior to the commencement of construction;
- undertake dilapidation surveys of the relevant transport routes prior to construction and decommissioning, and repairing any damage resulting from construction traffic;
- prepare a detailed Traffic Management Plan in consultation with the relevant roads authorities, that includes provisions for:
 - consideration of potential interaction with Rye Park Wind Farm in consultation with the applicant of that project;
 - temporary traffic controls, including detours and signage;
 - notifying the local community about project-related traffic impacts;
 - minimising potential for conflict with rail services, stock movements and school buses in consultation with local schools;
 - implementing measures to minimise development-related traffic on the public road network outside of standard construction hours;
 - responding to any emergency repair or maintenance requirements during construction and/or decommissioning;
 - a traffic management system for managing over-dimensional vehicles; and
 - a driver's code of conduct that addresses travelling speeds and procedures to ensure that drivers implement safe driving practices.

5.5 Other Issues

The Department's consideration of other issues is summarised in Table 16.

Table 16: Other Issues

Issue	Consideration	Recommendation
Heritage	<ul style="list-style-type: none"> The EIS includes an Archaeological and Cultural Heritage Assessment in accordance with the applicable guidelines, including consultation with the local Aboriginal community. The assessment identified: <ul style="list-style-type: none"> 4 Aboriginal heritage items outside of the development corridor, which would not be impacted by the project; 10 Aboriginal heritage items within the development corridor that would potentially be directly impacted by the project; and 3 historic heritage items within the site which would not be impacted by the project, including 1 farmhouse complex and 2 prospecting pits, all of which do not satisfy heritage listing criteria. All of the identified Aboriginal heritage items are stone artefacts and were assessed as having negligible to low archaeological significance. The assessment concluded that due to the low significance of the artefacts, a program of subsurface excavation and salvage would not be required. However, the assessment recommended ground disturbance impacts be kept to a minimum to ensure as little impact as possible to the artefacts. As such, the Department is satisfied that the project is unlikely to result in a significant impact on the heritage values of the locality. 	<ul style="list-style-type: none"> The Department has recommended conditions requiring BWF to: <ul style="list-style-type: none"> avoid impacts to the 4 Aboriginal heritage items located outside of the development corridor; and minimise impacts to the 10 Aboriginal heritage items located within the development corridor. To ensure that heritage impacts are still minimised as far as practicable, the Department has recommended conditions requiring BWF to prepare and implement a Heritage Management Plan. This plan would: <ul style="list-style-type: none"> be prepared by a suitably qualified and experienced person whose appointment has been endorsed by the Secretary; be prepared in consultation with OEH and Aboriginal stakeholders; include updated baseline mapping of the heritage items within and adjoining the project disturbance area; include a description of the measures that would be implemented for: <ul style="list-style-type: none"> protecting Aboriginal heritage items outside the project disturbance area; minimising and managing the impacts of the project on heritage items within the disturbance area; a contingency plan and reporting procedure if: <ul style="list-style-type: none"> Aboriginal heritage items outside the approved disturbance area are damaged; previously unidentified Aboriginal heritage items are found; or Aboriginal skeletal material is discovered; ensuring workers on site receive suitable heritage inductions prior to carrying out any development on site, and that records are kept of these inductions; and ongoing consultation with Aboriginal stakeholders during the implementation of the plan; and a program to monitor and report on the effectiveness of these measures and any heritage impacts of the project.
Aviation safety	<ul style="list-style-type: none"> The project is located 50 km southeast of Young airport and 32 km northeast of Harden Aeroplane Landing Area (ALA). Eight (8) private airstrips are located within the vicinity of the project, which have historically been used for aerial agriculture. The closest non-associated private airstrip is approximately 3.2 km from the nearest wind turbine. BWF commissioned Rehbein Airport Consulting to undertake an Aviation Impact Statement in May 2013. The assessment concluded that the project would not: <ul style="list-style-type: none"> impact any registered, certified or unregistered aerodromes Obstacle Limitation Surfaces (OLS); impact on any Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) protection surfaces at Young airport; impact on any published Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) air routes; impact on any minimum safe or lower safe altitude; impact on the performance of any radio navigation aid, radar facility or airborne radio; and have an unacceptable impact on aerial agricultural, recreation, air ambulance or military low jet operations. The assessment recommended that as the turbines are greater than 152 m in height, it would be prudent to install medium intensity obstacle lighting in accordance with CASA's requirements. Airservices Australia agrees with the conclusions of the assessments and confirmed that there would be no adverse impact on aviation communications, navigation and surveillance equipment from the project. CASA agreed with the conclusions of the assessments and requested that the turbines be lit at night consistent with the provisions of the <i>National Airports Safeguarding Framework Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation</i>. The Department of Defence did not raise any concerns about the project, and requested that the details of turbines and monitoring masts be included in the RAAF's national database for tall structures. Despite the conclusions of the assessment that the project would not have any unacceptable impacts on aerial agricultural, recreation, air ambulance or military low jet operations, a number of submissions expressed concerns about the potential impacts of the project on aerial fertiliser application on land in the immediate area surrounding the wind turbines. In response, BWF amended the locations of turbines to be set back a minimum of 100 m from the project site boundary, consistent with the recommendations for turbine setbacks of the Aerial Agricultural Association of Australia's (AAAA) National Wind Farm Operating Protocols (May, 2014). The Department notes that any impacts are expected to be minimal noting that alternative techniques (such as use of helicopters) could continue to be used for this type of application. Furthermore, any impacts are likely to be primarily limited to the properties associated with the project. As such, the Department is satisfied that the project is unlikely to result in any significant aviation hazards or impacts to aerial agricultural activities. 	<ul style="list-style-type: none"> The Department has restricted any turbines from being located within 100 m of the site boundary, unless otherwise agreed by the adjoining landowner. To ensure that hazards are appropriately managed, the Department has recommended conditions requiring BWF to provide the relevant authorities (including CASA, Airservices Australia and RAAF) with the final details of the wind turbines and associated infrastructure. Additionally, the Department has recommended that wind turbines have aviation hazard lighting installed in accordance with CASA's requirements and in a manner that minimises any adverse visual impacts in accordance with <i>Australian Standard AS 4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting</i>. As outlined in Section 5.1, any such lighting would also need to use best management practice for bat deterrence.

Issue	Consideration	Recommendation
<i>Bushfire safety</i>	<ul style="list-style-type: none"> A number of submissions were received from the public regarding the impact of the project on aerial bushfire fighting. However, the NSW Rural Fire Service (RFS) did not raise any concerns about the project's impacts on aerial bushfire fighting. The Department also notes that in its Wind Farm and Aerial Firefighting Information Sheet, the RFS states that the presence of a wind farm would not stop it from fighting a fire and it would deal with wind farms in the same way it deals with other potential hazards, such as powerlines, radiocommunication towers, mountains or valleys. BWF has committed to a number of mitigation measures, including the preparation of a Bushfire Management Plan in consultation with the NSW RFS and NSW Fire Brigade. Given the above, the Department is satisfied that the bushfire risks associated with the project are not significant and can be effectively managed subject to implementation of the proposed mitigation measures. 	<ul style="list-style-type: none"> The Department has recommended conditions requiring BWF to: <ul style="list-style-type: none"> ensure that the project provides for asset protection in accordance with the NSW RFS's <i>Planning for Bushfire Protection 2006</i> (or equivalent) and is suitably equipped to respond to any fires on site; develop procedures to manage potential fires on site in consultation with the RFS; and assist the NSW RFS and emergency services if there is a fire in the vicinity of the project site.
<i>Electric and magnetic fields</i>	<ul style="list-style-type: none"> Like other electricity generating infrastructure, Electric and Magnetic Fields (EMF) would be generated by the electrical components of the project, including wind turbines, transmission lines and substations. It is noted that EMF also results from natural sources such as the Earth's magnetic field and lightning. A number of submissions regarding the health impacts of the project from EMF were received from the public. The main sources from the project would be the electrical equipment within the turbine structures, the substation, interconnecting underground cables and overhead transmission lines. BWF has implemented the principles of prudent avoidance by locating the transmission power lines as far as practical from residences. The EIS includes an assessment of EMF, which indicates that the levels of EMF would be significantly lower than the current internationally acceptable level for human health. The Department is satisfied the project is unlikely to have any significant EMF related impacts. 	<ul style="list-style-type: none"> No specific conditions required.
<i>Radiocommunications</i>	<ul style="list-style-type: none"> Electromagnetic signals transmitted for telecommunication systems (such as radio, televisions, mobile phones and mobile/fixed radio transmitters) function most efficiently where a clear line of sight exists between the transmitting and receiving locations. Wind farms and other infrastructure have the potential to cause interference with this line of site. BWF undertook an Electromagnetic and Communication System Assessment in 2013 as part of its EIS. The assessment included consultation with telecommunications licence holders and service providers. The assessment concludes that the project would have minimal effect on telecommunications services in the area. However, two point-to-point radio links operated by OEH nominally cross the site. While the proposed turbine locations are outside of the required clearance distance, any micro-siting of turbines would need to take into consideration the location of these radio links. 	<ul style="list-style-type: none"> To ensure that telecommunications services are maintained, the Department has recommended conditions requiring BWF to 'make good' any disruption to radio or telecommunications services caused as a result of the project as soon as possible following the disruption, but no later than 1 month following the disruption of the service unless the relevant service provider or user or Secretary agrees otherwise. The Department notes that this approach has been effective in addressing interference with telecommunications services associated with other wind farms in NSW.
<i>Agriculture</i>	<ul style="list-style-type: none"> The project site is dominated by agricultural land uses, in particular, sheep and cattle grazing. Given the relatively small disturbance footprint of the project components, the Department is satisfied that farming and wind farm activities are compatible land uses and can co-exist in the locality. This has been demonstrated at several operating wind farms in NSW. The Department notes that the project would provide an additional source of income for the landowners of the associated properties, whose land would be directly affected by the project. 	<ul style="list-style-type: none"> The Department has recommended conditions requiring the project site be rehabilitated to a standard that makes it available for agricultural production following decommissioning.
<i>Mineral resources</i>	<ul style="list-style-type: none"> There are currently two mineral exploration licenses (i.e. EL 8400 and EL 8573) within the project site, held by the same licence holder. The wind farm would not preclude exploration from occurring within the entire project site, only in proximity to wind turbines and electrical infrastructure, which is only a small percentage of the exploration site area. As the wind farm would be decommissioned after completion of its working life, the land in the project site would not be sterilised in the long term. BWF has consulted with the exploration licence holder and has committed to continue to liaise with them prior to and during the life of the project. The Department is satisfied the project is unlikely to have significant impacts on mining exploration as it considers that while operating the project would only preclude exploration in proximity to turbines and ancillary infrastructure, and as such, the mineral resource would not be inaccessible. 	<ul style="list-style-type: none"> In order to ensure that the whole of the project site is available for future mineral exploration following decommissioning, the Department has recommended conditions requiring all above ground infrastructure be decommissioned and removed to a standard that makes the project site available for future mineral exploration within 18 months of the cessation of operations.
<i>Property values</i>	<ul style="list-style-type: none"> A number of submissions from the public and from the Councils raised concerns about potential adverse impacts on property values in the area. The Department notes that property values are influenced by a number of factors. In 2009, the NSW Valuer-General released a report on the impacts of wind farms on land values in Australia. The report was based on primary investigations and analysis of previous studies, and concluded that the majority of wind farms in Australia appear to have no quantifiable effect on land values. In 2016, OEH commissioned Urbis to undertake an investigation into the potential impact of wind farm developments in NSW. The study was based on sales data and traditional valuation sales analysis techniques, and similar to the NSW Valuer-General's report, concluded that wind farms are unlikely to have a measurable negative impact on surrounding land values in rural areas. The Department acknowledges that these reports were based on limited data and should be considered in that context. Nonetheless, the Department notes that the project is permissible with consent under applicable planning instruments, and the assessment demonstrates that with the substantial reduction in the scale of the project through the assessment process and the changes recommended by the Department, the project would not result in any significant impacts and would be able to comply with applicable amenity criteria established by the NSW Government for wind farm developments. Accordingly, the Department considers the project would not result in any significant or widespread reduction in land values in the areas surrounding the wind farm. 	<ul style="list-style-type: none"> No specific conditions required.

Issue	Consideration	Recommendation
Community enhancement	<ul style="list-style-type: none"> In their submissions, both Hilltops Council and Yass Valley Council requested BWF enter into a planning agreement to provide for community enhancement funding. The project is unlikely to result in significant additional demand on community services and infrastructure (excluding roads) given the relatively low level of local employment generated once it is operational. BWF has committed to contributing towards a community benefit fund to support community groups, programmes and activities in the locality. This funding would comprise \$2,825 per wind turbine built per annum, indexed to CPI. This equates to about \$211,875 per annum for the 75 proposed wind turbines in the Amended DA and RTS. The funding would be administered via a voluntary planning agreement (VPA) established under Section 93F of the EP&A Act, and would be split between the two Councils proportionate to the number of turbines in each LGA. Road upgrades and related infrastructure to support the project are addressed in Section 5.4 of this report. 	<ul style="list-style-type: none"> The Department has recommended that BWF be required to enter into a VPA with the two Councils prior to construction, in accordance with: <ul style="list-style-type: none"> Division 6 of Part 4 of the EP&A Act; and the terms of the offer from BWF.
Blasting and vibration	<ul style="list-style-type: none"> The blast assessment concluded that if blasts were required during construction, the project would comply with the applicable annoyance criteria at all surrounding private residential receivers. Furthermore, the assessment concluded that the project would not pose a perceptible source of vibration impacts during construction. 	<ul style="list-style-type: none"> To appropriately manage any blasting activities and vibration from the project, the Department has recommended conditions requiring BWF to: <ul style="list-style-type: none"> manage blasting operations to comply with relevant criteria at any residence on privately-owned land; and limit blast hours to be consistent with the <i>Australian and New Zealand Environment Council Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration</i>.
Water use	<ul style="list-style-type: none"> The project could affect the availability of local water resources for agricultural and potable water supplies, such as Lake Burrinjuck. A number of submissions raised concerns regarding the uncertainty of the water sources for the project. The total amount of water required for the construction of the wind farm is estimated to be around 60 ML. This includes water for the construction of concrete foundations for the wind turbines, control buildings and substations as well as for dust suppression and in case of fire. BWF is proposing to source the water required for construction either by purchasing groundwater from associated residences who hold groundwater licences and have unused allocations, buying water from external suppliers or sourcing water from Lake Burrinjuck. Department of Industry – Crown Lands and Water (CL&W) has not raised any concerns with obtaining water from these sources. The amount of water required during the operation of the wind farm is estimated to be approximately 1 ML per annum and BWF is proposing to source the water required for operation from on-site tanks collecting rainwater runoff from any permanent structures. While the project would involve some rock anchoring at depth (up to 20 m below ground surface level) and potentially some blasting, the activities are unlikely to result in any significant impacts to groundwater resources. BWF has committed to consulting further with CL&W if any significant volumes of groundwater are intercepted during construction. The Department and CL&W are satisfied that the project's water use is unlikely to have any significant impact on water supply and demand in the region. However, CL&W noted that any water sourced for the project is required to be appropriately licensed under the <i>Water Act 1912</i> or the <i>Water Management Act 2000</i>, like any other water user. 	<ul style="list-style-type: none"> The Department has recommended conditions requiring BWF to ensure it has adequate water supplies for the project and that it obtains any necessary licences under the <i>Water Act 1912</i> or <i>Water Management Act 2000</i> required for the project.
Riparian areas and erosion risk	<ul style="list-style-type: none"> The project involves a number of water crossings for internal access roads and cabling. The landscape within the project site is dominated by rolling hills, with steep slopes limited to the Mt Buffalo cluster, and the soils have a high erosion potential. While the Department acknowledges that the site has high erosion potential, there is no evidence that the site is materially different to other sites in the Southern Tablelands and South West Slopes where these issues have been effectively managed during the construction of major infrastructure projects and other wind farms using standard best practice soil and erosion management techniques described in a range of NSW Government guidelines. Neither the EPA nor CL&W have raised any concerns about this issue, and the Department considers that with the implementation of best practice control measures, any risks can be adequately managed. The Department also notes that it is a strict liability offence to pollute any waters under the <i>Protection of the Environment Operations Act 1997</i>. 	<ul style="list-style-type: none"> The Department has recommended conditions requiring BWF to: <ul style="list-style-type: none"> comply with Section 120 of the <i>Protection of the Environment Operations Act 1997</i>; and undertake activities in accordance with applicable guidelines including OEH's <i>Managing Urban Stormwater: Soils and Construction</i> and DPI's <i>Guidelines for Controlled Activities on Waterfront Land, Policy and Guidelines for Fish Friendly Waterway Crossings</i> and <i>Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings</i>.
Decommissioning and rehabilitation	<ul style="list-style-type: none"> Some submissions raised concerns about decommissioning of wind turbines and associated infrastructure after the operational life of the project. However, the Department has developed standard conditions for wind farms to cover this stage of the project life cycle, including clear decommissioning triggers and rehabilitation objectives (see opposite). Additionally, the Department has provided guidance on how host landowner agreements should consider refurbishment, decommissioning and rehabilitation in the <i>NSW Wind Energy Framework's Negotiated Agreement Advice Sheet</i>. With the implementation of these measures, the Department considers that turbines would be suitably decommissioned, either at the end of the project life or if they are not operating for more than a year, and the site appropriately rehabilitated to a standard that would allow the ongoing productive use of the land. 	<ul style="list-style-type: none"> To ensure that redundant infrastructure is removed and the areas rehabilitated appropriately, the Department has recommended conditions requiring BWF to: <ul style="list-style-type: none"> decommission wind turbines (and associated infrastructure) within 18 months of the cessation of operations; progressively rehabilitate the site, and minimise the total disturbance area exposed at any time; and comply with a number of rehabilitation objectives, including removing redundant above-ground infrastructure, restoring rural land capability and vegetation, ensuring public safety and ensuring the site is maintained in a safe, stable and non-polluting condition.

6. RECOMMENDED CONDITIONS

The Department has prepared recommended conditions of consent for the project (see Appendix G). These conditions are required to:

- prevent, minimise, and/or offset adverse impacts of the project;
- ensure standards and performance measures for acceptable environmental performance;
- ensure regular monitoring and reporting; and
- provide for the ongoing environmental management of the project.

In particular, the Department has recommended that 4 turbines in Layout Option 1 in the southern Kangiara cluster (and the corresponding 3 turbines in Layout Option 2) not be allowed to proceed due to significant visual impacts on a relatively large number of non-associated residences in the vicinity of these turbines.

The Department has also recommended a further two turbines in Layout Option 1 (and corresponding turbine in Layout Option 2) in the northern Kangiara cluster not be allowed to proceed unless agreement can be reached with the affected landowner.

The recommended conditions use a risk-based approach that focuses on performance-based outcomes. This reflects current government policy and the fact that wind farms require relatively limited ongoing environmental management once the turbines have been commissioned.

In line with this approach, the Department has:

- set strict criteria for noise and shadow flicker;
- recommended operating conditions to minimise noise, biodiversity, air quality, and water impacts; and
- consolidated the number of management plans to the following:
 - Traffic Management Plan;
 - Heritage Management Plan;
 - Biodiversity Management Plan; and
 - Bird and Bat Adaptive Management Plan.

Additionally, given concerns raised about micro-siting on other wind farm projects in NSW, the Department has recommended conditions setting clear limits on the scope of micro-siting.

These conditions allow BWF to micro-site wind turbines and ancillary infrastructure without further approval provided:

- they remain within the development corridor;
- no wind turbine is moved more than 100 m from its approved location;
- the revised location of Turbine Nos. 14, 25, 27, 76 and 98 in Layout Option 1 and Turbine Nos. 22, 45 and 103 in Layout Option 2 are not moved any closer to a Wedge-tailed eagle nest; and
- the revised location of the wind turbine and/or ancillary infrastructure would not result in any non-compliance with the conditions of the consent.

The recommended conditions also require BWF to provide detailed final layout plans to the Department prior to construction.

With these measures in place, the Department considers the conditions provide sufficient flexibility for BWF to further improve the efficiency of the wind farm and/or reduce its environmental impacts without adversely affecting nearby residents or surrounding land.

Other key recommended conditions include:

- *visual mitigation* - additional visual impact mitigation for non-associated residences within 4 km;
- *biodiversity offsets* – retire biodiversity offset credits in accordance with the *NSW Biodiversity Offsets Policy for Major projects*;
- *roads* – requiring the intersections of Lachlan Valley Way, Tangmangaroo Road and Wargeila Road and the site access points be upgraded prior to construction;
- *community contributions* – formalising community contributions of up to \$200,575 a year (plus CPI) for the construction of 71 turbines through a VPA with each of the two Councils; and
- *decommissioning and rehabilitation* – requiring the wind turbines to be removed and the site rehabilitated to a good condition.

7. CONCLUSION

The Department has assessed the development application, EIS, submissions, Amended DA and RTS and additional information provided by BWF in accordance with the requirements of the EP&A Act. The Department has also considered the independent peer review of the project's visual assessment.

The Department notes that during the development of the project, BWF significantly reduced the maximum number of turbines proposed to be constructed from up to 122 to 75, primarily to avoid and/or minimise biodiversity and visual impacts.

The Department has carefully considered the residual potential impacts of the project on the site and surrounds in its assessment, and has concluded that the impacts of the project on the environment and the community could be adequately minimised, managed, or at least compensated for, to an acceptable standard, and the project can be carried out in a manner that is consistent with the principles of ecologically sustainable development (ESD).

The operation of the project would also not compromise the long-term use of the land for agricultural purposes and it encourages the proper development of natural resources. The project is able to be undertaken in a manner that would improve or at least maintain the biodiversity values of the locality over the medium to long term, and would not significantly impact threatened species and ecological communities of the locality. The Department is also satisfied that any residual biodiversity impacts can be managed and/or mitigated by imposing appropriate conditions and retiring the required biodiversity offset credits.

Overall, the Department considers the site to be suitable for the project, as it is in a region with significant wind resources, has good access to the state's electricity transmission infrastructure, is a permissible use on the land, and has relatively few environmental constraints.

To address the residual impacts of the project, the Department has recommended detailed conditions to ensure these impacts are effectively minimised and/or offset. These conditions use a risk-based approach that focuses on performance-based outcomes. This reflects current government policy, and the fact that wind farms require relatively limited ongoing environmental management once the turbines have been commissioned.

Notwithstanding some community opposition from local landowners and special interest groups, the project offers several benefits for the wider community, and would facilitate the development of the state's renewable energy resources, and is consistent with the NSW Government's vision for a secure, reliable, affordable and clean energy future for the state.

Importantly, while the removal of the turbines would reduce the number of turbines to 71, the project would still provide an installed capacity of approximately 240 MW, which would assist in meeting Australia's renewable energy targets as well as future electricity demands without the production of additional greenhouse gases.

In addition, the project would have flow-on benefits to the local community through job creation, capital investment, and BWF's proposed community funding contributions.


Given these benefits can be achieved without causing any significant adverse impacts, the Department believes the project is in the public interest and should be approved, subject to the removal of 4 turbines from Layout Option 1 (and the corresponding 3 turbines from Layout Option 2).

As such, following on from its assessment of the project, the Department considers that the project is approvable, subject to conditions.


8. RECOMMENDATION

It is recommended that the Planning Assessment Commission, as delegate of the Minister:

- **considers** the findings and recommendations of this report, noting that the Department considers that the application is approvable;
- if the Commission determines to grant consent to the application, **signs** the attached Instrument of Consent (Appendix G).


Mike Young
Director
Resource and Energy Assessments

22/2/18.


David Kitto
Executive Director
Resource Assessments and Business Systems

22/2/18