MAJOR PROJECT ASSESSMENT:
Black Springs Wind Farm

Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

June 2008

Published June 2008
NSW Department of Planning
www.planning.nsw.gov.au

EXECUTIVE SUMMARY

Wind Corporation Australia (the Proponent) is seeking the Minister for Planning's approval for the construction and operation of a nine-turbine wind farm at Black Springs in the Central West of New South Wales. The turbines will be located on two privately owned landholdings located approximately three kilometres to the south west of Black Springs Village some 25km south west of the town of Oberon within the Oberon local government area (see regional context in Figure 1). The turbines will be capable of generating up to 18.9 megawatts (MW) of electricity.

The project involves:

- construction of nine turbines, with blades up to 44m long mounted on tubular steel towers up to 80m high at the hub (total turbine height of up to 124m);
- electrical connections between the wind turbines via underground cables;
- construction of a substation (to be fully enclosed) and associated equipment permitting connection to the existing Country Energy 66kV Oberon-Burraga Line that runs along Campbells River Road between the turbines;
- onsite control room and facilities building;
- access roads around the site for installation and maintenance of the wind turbines; and
- temporary construction infrastructure including a site office and facilities.

The Black Springs wind farm will generate up to 46,420 MWh of renewable energy per annum, equivalent to the annual average energy consumption of around six thousand homes. At this output, an annual greenhouse gas saving of up to 43,660 tonnes would be achieved when compared to traditional fossil fuel generation.

Current conservative estimates predict a shortfall of approximately 10,500 Gigawatt hours demanded by the State within ten years based on current trends. This requires the installation of approximately 250-300 megawatts of new generation facilities annually. The Department advocates the installation of various generation types within the state (such as wind farms) to maintain the diversity in generation opportunities which is essential to minimise delivery risk to the community. Climate change and availability of fuels in particular are likely to become significant issues over the course of the Black Springs wind farms' operational life.

The Project would also result in the reduced use of water supplies and other pollutants that would otherwise be emitted from a coal or other fossil fuel-fired power station. The wind farm has a capital investment value of $32.6 million. It will employ approximately 32 people during construction and will generate one full time position during the 25 year life of the project.

A total of 100 submissions were received as a result of the public exhibition of the Environmental Assessment which included multiple submissions from individuals, form letters and local community groups. The Commonwealth Department of Defence, Civil Aviation Safety Authority, the then Department of Natural Resources, Roads and Traffic Authority, Rural Fire Service, Department of Primary Industries (Forests and Minerals), Department of Lands and Oberon Council also provided submissions on the project.

The majority of submissions objected to the proposal and raised a number of issues concerning visual amenity impacts, operational noise from the turbines, flora and fauna impacts, project justification, depreciation in property values, shadow flicker, interaction with mineral deposits and various construction related impacts (including erosion and sediment control and traffic). In response to community concerns, the Minister for Planning directed that an independent review of predicted noise and visual impacts be undertaken utilising consultants experienced in wind farm proposals to consider whether impacts are within acceptable bounds. The reports concluded that the proposed visual and noise impacts are within acceptable bounds and can be mitigated where appropriate. This mitigation includes the provision of landscaping to properties that are within four kilometres of turbines and the restriction of turbine 1 in specific wind conditions. Both reports are found in Appendix B.

The Department has assessed the Environmental Assessment, submissions received during exhibition, the Submissions Report and independent reviews and is satisfied that the impacts of the project can be mitigated and/or managed to ensure an acceptable level of environmental performance through the Proponent's Statement

of Commitments and the Department's recommended conditions of approval (see Appendix A). The recommended conditions cover on-going compliance mechanisms, independent reviews, community consultation and complaints management, performance audits and specific conditions to address key issues identified during the assessment process such as visual amenity and noise.

The site is considered suitable for the proposed project and will provide a range of benefits to the region and State. Consequently, the Department recommends the project be approved subject to the recommended conditions of approval.

CONTENTS

1. BACKGROUND 1
1.1 Site Description 1
1.2 Surrounding Land Use 1
2. PROPOSED DEVELOPMENT 3
2.1 Project Description 3
2.2 Project Justification 4
3. STATUTORY CONTEXT 7
3.1 Major Project 7
3.2 Environmental Planning Instruments 7
3.3 Environmental Assessment 7
4. CONSULTATION AND ISSUES RAISED 9
4.1 Issues Raised in Submissions 9
4.2 Submissions Report 10
4.3 Site Inspection 10
4.4 Minister's Meeting and Expert Reviews 10
5. ASSESSMENT OF ENVIRONMENTAL IMPACTS 13
5.1 Visual Amenity Impacts 13
5.2 Noise Impacts 27
5.3 Ecological Impacts 31
5.4 Hazards and Risk 35
5.5 Traffic and Transport 38
5.6 Property Prices and Land Valuation 40
5.7 Other Issues 42
6. CONCLUSION AND RECOMMENDATIONS 45
APPENDIX A – RECOMMENDED CONDITIONS OF APPROVAL 47
APPENDIX B – INDEPENDENT REVIEWS 49
APPENDIX C – STATEMENT OF COMMITMENTS 51
APPENDIX D - RESPONSE TO SUBMISSIONS 53
APPENDIX E – ENVIRONMENTAL ASSESSMENT 55

1. BACKGROUND

1.1 Site Description

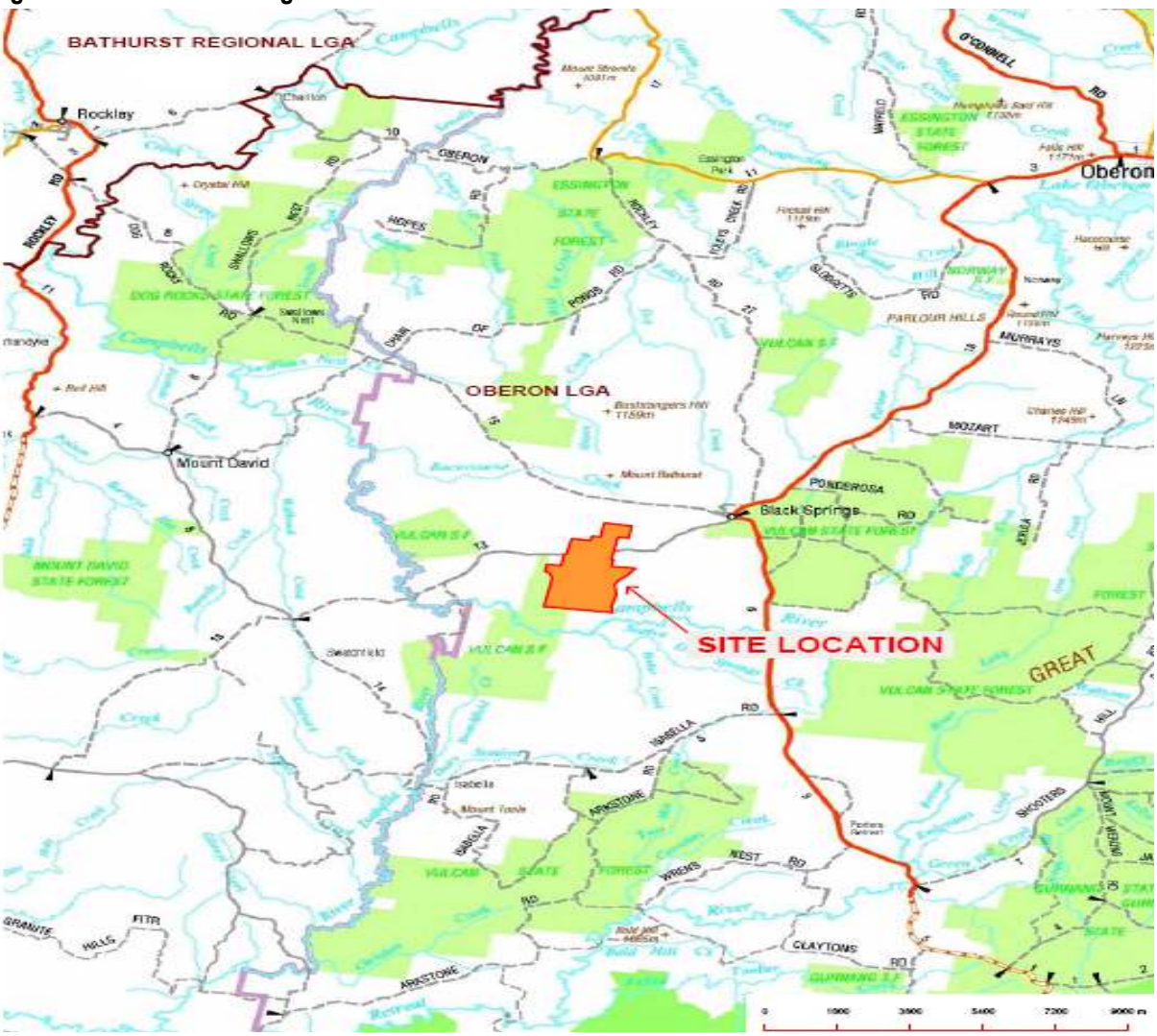
The wind farm is proposed to be located on two privately held landholdings, located approximately three kilometres to the south west of Black Springs Village. The land is generally 25 kilometres south-west of the town of Oberon, within the Oberon local government area. The topography of the area can be characterised as a series of rolling hills which form a gentle ridgeline in a north-west to south-east direction.

The site ranges in elevation between 1100 metres and 1250 metres above sea level, with a trig station located at the 'Daisybank' property at 1233 metres above mean sea level. Vulcan State Forest adjoins the western and south-western boundary of the Daisybank property. Several minor creeks characterise the site: within Daisybank these generally drain south towards Campbell's River; while within Acqualoria they generally drain to the north into Racecourse Creek, which also eventually joins Campbell's River. Private dams also exist on both properties.

1.2 Surrounding Land Use

The site location and regional context of the site are illustrated in Figure 1, with further detail of land uses immediately surrounding the site indicated in Figure 2 . The site is located in an area surrounded by a number of farming properties which consist of large cleared areas of grassland utilised for sheep and cattle grazing. Directly south and west of the site are pine plantations (Vulcan State Forest) which are managed by Forests NSW. These forest areas are harvested approximately once every twenty years. The nearest National Park and nature reserve to the proposed wind farm are located approximately 25 kilometres to the south and south-west respectively.

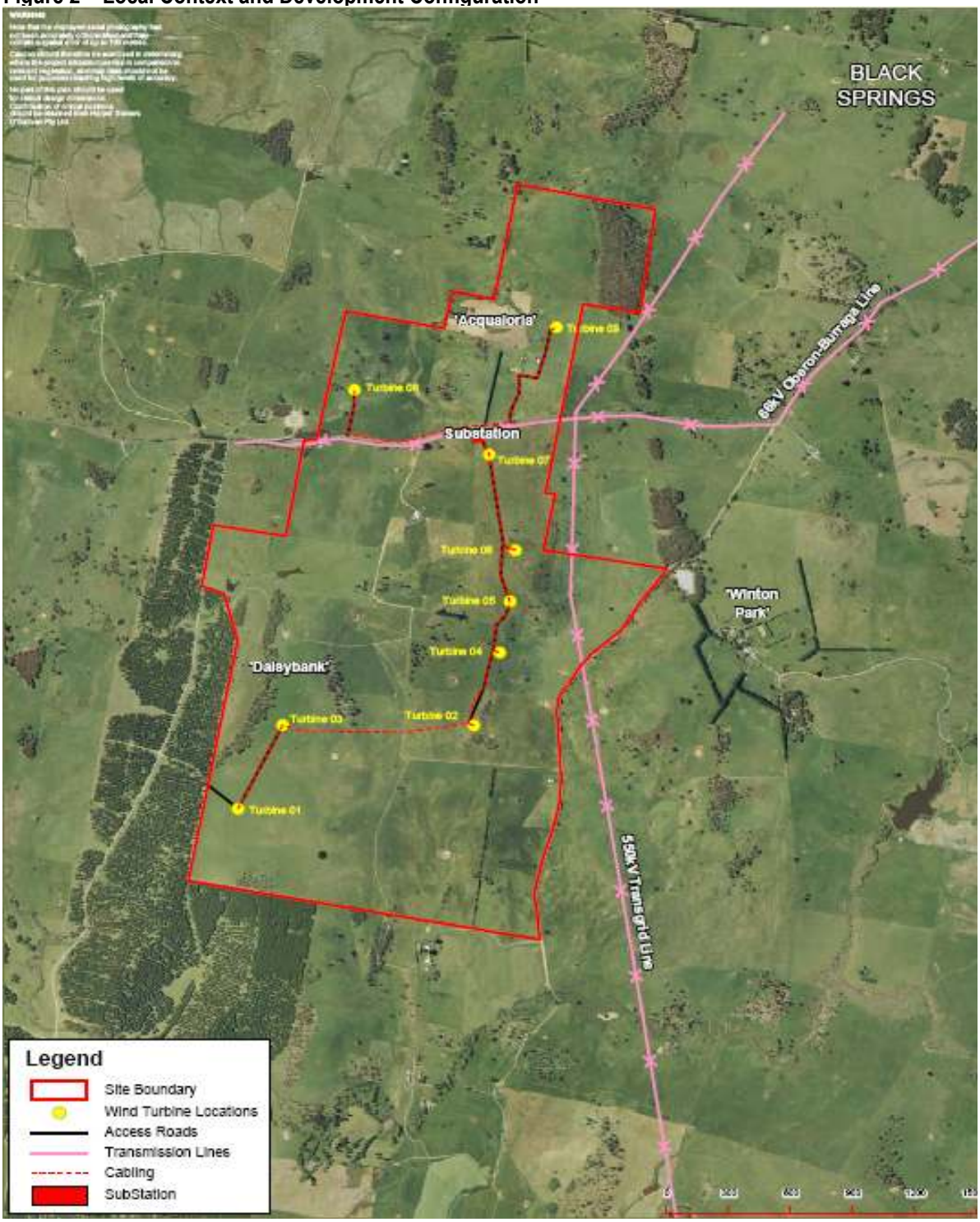
Figure 1 - Location and Regional Context of Site



Black Springs village is located three kilometres northeast of the site and has a population of approximately 500 residents (as per the 2001 census data). Oberon is located 25 kilometres away from the site. Black Springs village and its surrounds are currently experiencing a demand for rural residential allotments which has seen a number of the larger landholdings receive approval from Council for subdivisions. Winton Park and Swatchfield are two neighbouring properties where this is the case.

Adjoining the site within the Winton Park property is a small gravel quarry with vehicular access via Swatchfield Road. Abercrombie Road, which runs from Goulburn to Oberon is approximately three kilometres to the east through Black Springs and is used as an alternate access to the Central West by Southern Highlands traffic. The Great Western Highway (nearest major arterial road) is located approximately 70 kilometres to the east. Running north-south along the eastern boundary of the site is a TransGrid 500kV transmission line that originates from the Mt Piper power station near Lithgow and runs via Oberon to Marulan in the Southern Highlands.

Figure 2 – Local Context and Development Configuration



2. PROPOSED DEVELOPMENT

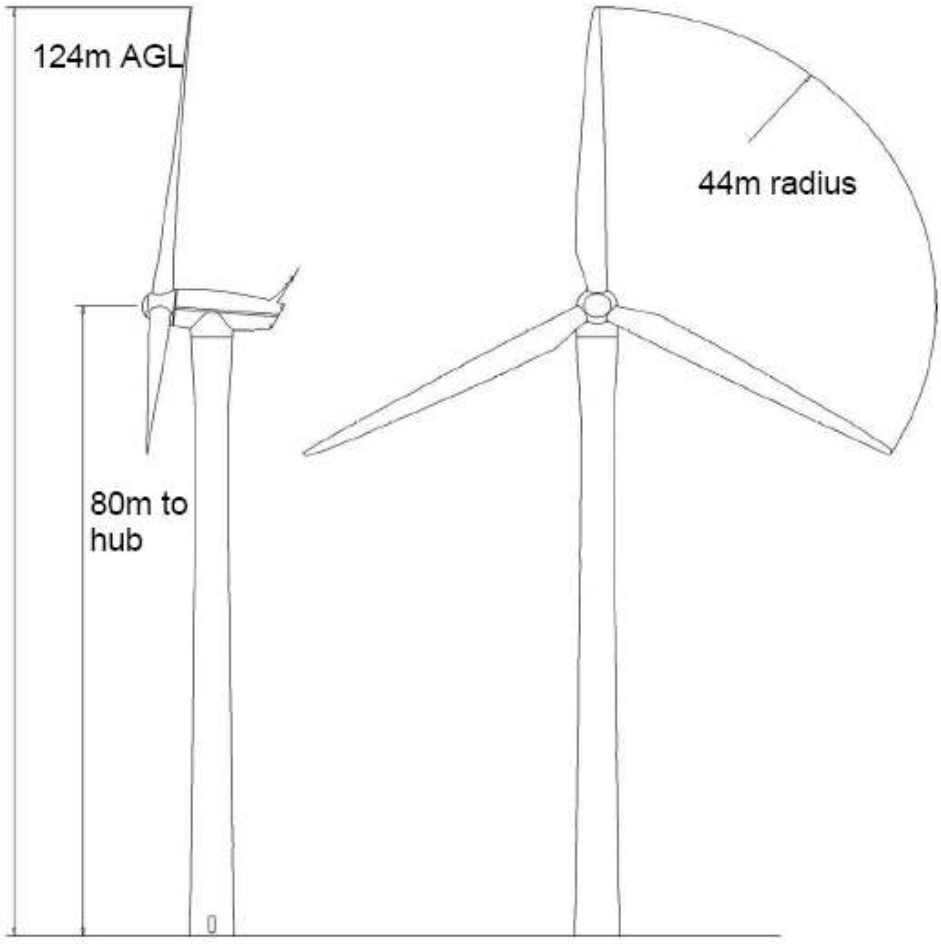
2.1 Project Description

Wind Corporation Australia Pty Limited (the Proponent) seeks the Minister for Planning's approval for the construction and operation of up to nine wind turbines near Black Springs. The general configuration of the proposed wind farm development is indicated in Figure 2. The turbines will be capable of producing up to 18.9 megawatts of electricity. The turbines have an expected economic life of 25 years, after which time they would be replaced or removed from the site. It should be noted, however, that this project does not include the replacement and recommissioning of wind turbines after this initial 25-year period. Any proposal for replacement and recommissioning of the wind farm after this period would be subject to further assessment under the *Environmental Planning and Assessment Act 1979*.

The main components of the wind farm project include:

- construction of up to nine wind turbines capable of producing 2.1MW each, with three fibreglass blades on each turbine of up to 44m in length connected to the nacelle and mounted on a tubular steel tower up to 80 metres high at the hub (total turbine height of up to 124m). Each turbine will have a hard surface area measuring 17 metres by 17 metres wide and three metres deep with a swept area of 6082 m^2. Figure 3 indicates the scale and dimensions of each wind turbine;
- a substation (approximately 70 metres by 70 metres) to convert power from an on-site reticulation voltage of 33 kV to a transmission voltage of 66kV, with subsequent connection to Country Energy's existing Oberon to Burraga transmission line;
- underground electrical connections between the wind turbines and the substation;
- ancillary facilities, including an onsite control room and equipment storage facilities, access roads around the site (unsealed and up to 5.5 metres in width), and temporary construction infrastructure including a site office and facilities.

Figure 3 - Indicative Wind Turbine Dimensions



The turbine which has been considered for this assessment is based on a SUZLON S88/2.1MW turbine, however the Proponent has indicated that this is an indicative turbine and may elect to use another turbine type that will be similar in height, output and impacts. The turbine layout will not significantly change should an alternate turbine be selected.

Construction is expected to take approximately four to eight months with the turbines erected using a combination of two cranes. This results in a two to three day construction period for each turbine once footings and crane erection at the turbine location is complete.

The project involves a capital investment value of $32.6 million and would employ approximately 32 people during the construction period. One employment position would be required during the operation phase of the project, compared with 10-20 during the four month commissioning period.

2.2 Project Justification

The Proponent has argued that the justification of the project is based on the following:

- production of up to 46,420 MWh of renewable electricity per year, sufficient for the average consumption of up to 6000 homes;
- over the projected life of the project (to 2030), the renewable energy generated will total 120,929 gigawatt hours (GWh) which will supply approximately 33 times the energy used throughout its own life and will result in greenhouse gas emission savings of approximately 115 million tonnes;
- the proposal is consistent with the objectives of Ecologically Sustainable Development (ESD);
- the proposal will avoid the following emissions if the same quantity of power were to be generated by existing coal-fired power stations (in New South Wales):
  - → water consumption associated with coal-fired power stations;
  - → 400 tonnes of solid waste associated with coal-fired power stations
  - → 329,000 kg per annum of sulfur dioxide, nitrogen oxides and particulates as well as a 4700kg annual reduction in emissions of trace metals such as lead, mercury, manganese and nickel as well as hydrochloric acid and volatile organic compounds;
- provision for an additional source of income to the participating landholders and add to the viability and sustainability of these properties;
- provision of a community fund of $15,000 per year for local community and environmental projects;
- potential regional tourism opportunities and promotion of the local region as a user of renewable energy;
- local resource utilisation and opportunities during construction which will benefit local employment; and
- improved security of electricity supply through generation close to point of consumption.

The Department considers that the proposed wind farm would make a contribution towards offsetting the emissions of CO_2 and other gases, particulate emissions and other pollutants that would otherwise be produced if the equivalent power supply was provided by fossil-fuel combustion. The project would also result in the avoidance of consumption of water that would otherwise have been used in coal or other fossil fuel fired power stations.

The Department supports the development of wind farms as a form of renewable energy, subject to suitability of the location of these wind farms. This is consistent with Commonwealth and State policies promoting the production and uptake of renewable energies as a means of addressing climate change. The proposed adoption of the New South Wales Renewable Energy Target (NRET) will further cement the NSW Government's commitment to the environment.

In NSW, currently around 90% of our electricity needs are provided by non-renewable coal-fired power stations and as such, contribute the greatest share of base load production. There is acknowledgement within both the political arena and in the community that energy generation must decrease its reliance on fossil fuels.

The Owen enquiry into NSW energy supply in 2007 identified that an additional 9000 gigawatt hours are required to satisfy predicted energy demand in the State. This translates into approximately 1030 Megawatts off generation capacity.

Based on the rules which govern the National Electricity Market (NEM), of which NSW is one of five participating states, electricity that is provided to the NEM by wind farms will displace an equivalent amount of electricity provided by base load generators, thus reducing the fuel required to be burned for these generators. Accordingly, greenhouse gas savings associated with wind farms are usually presented as a proportion of CO_2 that is saved from being generated by the base load generators of electricity.

In general terms, for every kilowatt-hour of electricity produced by non-renewable generators, approximately one kilogram of CO_2 will be emitted to the atmosphere. For NSW, this ratio is at 0.954 tonnes CO_2-e/MWh in 2007 (the NSW Pool Coefficient) due to the mix of energy sources used in the State (that is, it includes both renewable and non-renewable energy produced in the State). With respect to the Black Springs wind farm, the Proponent states that the proposed project has the potential to offset the equivalent of 43,660 tonnes of CO_2 emissions per year (as it will produce 46,462 MWh of electricity). The Department has assessed these figures against the co-efficient and estimated greenhouse savings and found them generally consistent. The co-efficient is set annually (November) via the NSW Greenhouse Gas Office and administered by the Independent Pricing and Regulatory Tribunal (NSW).

The Proponent has calculated this figure using two assumptions: firstly, that the wind farm's capacity factor is between 28% (capacity factor is the ratio of average actual annual energy output to the theoretical maximum output); and secondly, that for every megawatt of electricity produced, one kilogram of CO_2 would be offset. Submissions received from the Black Springs Guardians and other parties questioned why the Proponent's maximum proposed annual capacity factor will be 28% based on a 18.9MW proposal. Data obtained for the Crookwell I and Blayney wind farms have averaged 21% combined over their six year operation which feed 14.7MW into the grid.

The Department considers it difficult and inappropriate to compare the Black Springs capacity factor against other sites as each will have a different wind resource, different topographic features, different wind turbines (Blayney and Crookwell 45m hub) and technology, improvements to micro siting of turbines following the Blayney and Crookwell approvals, different transmission constraints, different operating conditions and different market conditions. What is certain is regardless of the actual amount, there will still be savings.

With respect to concerns raised in submissions over the intermittent nature of wind farms, it would appear that these concerns have been derived from the belief that the component of ancillary services, known as the 'spinning reserve', used to cope with load variations would need to be increased in order to smooth the "noise" from intermittent wind generated electricity that is supplied to the NEM. According to objectors, it follows that greenhouse gas producing fuels will be required to supply this extra spinning reserve, thereby cancelling out the greenhouse gas savings attributed to the electricity generated by the wind farm.

Contrary to opinions expressed by those objecting to the Black Springs wind farm, it is highly unlikely that there will be a need to increase the reserve/ ancillary system stand-by capacity, (that is, to burn more fuel to accommodate frequency and power fluctuations of the wind farm), because the highest load on the reserve system is when the wind turbines are not generating. Increases in wind farm output cause the ancillary service to reduce their output, thereby decreasing greenhouse gas emissions. In situations under which the wind farm has decreased its output to zero, the ancillary service would increase to meet the prevailing load on the system (as if there was no wind farm).

The Australian Greenhouse Office examined the capability of the National Electricity Market to accept wind generation and concluded that approximately 8,000MW of wind energy generation capacity could be readily accepted in the NEM and avoid the problems associated with intermittent generation if it was distributed among the existing NEM regions. Should the contribution of intermittent generation to the NEM rise significantly in the future (beyond around 10% of generation), it is expected that there may be a need for further ancillary services to be employed. This would particularly be the case where a wind turbine is generating at capacity and then has to switch off when the wind speeds exceed the safe operating limit. The Department has been advised by the then Department of Energy, Utilities and Sustainability, however, that the variability of wind farm output can be dampened by relatively simple measures such as capping output, controlling the rate of change in output during critical periods and increasing interconnector capacity. Furthermore, given that the wind farms are geographically dispersed this situation may not be as severe as might be supposed.

3. STATUTORY CONTEXT

3.1 Major Project

On 15 March 2006, the Director-General of the Department of Planning, as delegate of the Minister for Planning, formed the opinion that the proposed development is a project to which Part 3A of the *Environmental Planning and Assessment Act 1979* applies due to it being a development of a kind that is described in Schedule 1 of *State Environmental Planning Policy (Major Projects) 2005*. Specifically, the project is development for the purpose of electricity generation that has a capital investment value of more than $30 million (Schedule 1, clause 24).

3.2 Environmental Planning Instruments

The proposed development site is zoned 1(a) – Rural 'A' under the *Oberon Local Environmental Plan 1998*. Development for the purpose of a wind farm is an innominate permissible use in that zone. There are no other environmental planning instruments that substantially govern the carry-out of the project.

To the extent that the *Oberon Council Wind Power Development Control Plan 2005* provides a focus for the assessment of the subject project, the Department considers that the project is generally consistent with the provisions of the Plan. The Department's assessment of the project has taken into consideration relevant aspects of the Plan.

3.3 Environmental Assessment

On 4 May 2006, Director-General's requirements for preparation of an Environmental Assessment for the proposed project were issued. On 28 December 2006, the Environmental Assessment was considered to be compliant with the environmental assessment requirements.

In accordance with section 75H(3) of the Act, the Environmental Assessment was placed on public exhibition from 25 January 2007 until 9 March 2007. Advertisements notifying of the exhibition of the Environmental Assessment were placed in the *Oberon Revie*w and all residents in a 10-kilometre radius of the proposal were notified in writing by the Department. The six week exhibition period exceeded the statutory minimum period of 30 days to reflect the level of community interest and concern with the project. The Environmental Assessment was made publicly available on the Department's website, the Department's head office and at Oberon Council. Additional copies of the Environmental Assessment were also made available at Oberon Council Library, Oberon Visitor Information Centre, Burraga and Black Springs General store.

The Department considers that applicable environmental assessment requirements have been met with respect to the project, for the purpose of section 75I(2)(g) of the *Environmental Planning and Assessment Act 1979*.

4. CONSULTATION AND ISSUES RAISED

4.1 Issues Raised in Submissions

A total of 100 submissions were received in response to the public exhibition of the Environmental Assessment, including:

- 92 submissions from members of the public and special interest groups;
- six submissions from State and local government agencies (the Department of Lands, Department of Primary Industries, Rural Fire Service, Department of Natural Resources, the Roads and Traffic Authority and Oberon Council); and
- two submissions from Commonwealth Government agencies (the Department of Defence and the Civil Aviation Safety Authority).

The Department of Lands supported the project, while four other State Government agencies (Department of Primary Industries (NSW Forests), Rural Fire Service, Department of Natural Resources and the Roads and Traffic Authority) raised issues requiring further comment/ information or suggested conditions of approval. These issues have now been addressed and resolved through the Proponent's Submissions Report and/ or the recommended conditions of approval.

The Department of Primary Industries (Mineral Resources) objected to the project based on the fact that it is located on land the subject of an existing exploration licence (EL 5574), which is being actively explored for gold-copper mineralisation. The Proponent has since engaged with the licence holder and developed a cooperative agreement to resolve potential conflicts between the project and possible future mineral extraction. The recommended conditions of approval require on-going consultation between the parties.

Oberon Council objected to the project, based on issues including visual amenity, noise impacts, impacts on property values and possible conflicts with the future expansion of Black Springs village. Council suggested that alternative locations for the development would be preferable, or at least alternative technologies (including nuclear power and clean coal).

Submissions from the Commonwealth (Department of Defence and Civil Aviation Safety Authority) related to potential impacts on aircraft movements and aviation hazards. Both parties indicated that they would not object to the project, subject to the imposition of conditions relating to lighting the wind turbines, and provision of detailed designs (including locations and construction timeframes) for the project. These conditions have been incorporated into the recommended instrument of approval.

Of the public submissions received, five supported the project (5%) and 87 (95%) objected to the project. Key issues raised in public submissions can be summarised as follows:

- visual amenity impacts, including:
  - → wind turbines will dominate and scar the landscape;
  - → the project will degrade the surrounding scenic qualities and values of the area including rural residential allotments and the village of Black Springs;
  - → wind turbines should be located in areas away from people such as around Paling Yards and within the Forests NSW estate;
- noise impacts, including:
  - → the wind turbines will disturb the peace;
  - → modulating sounds generated by the wind turbines will be annoying
  - → temperature inversions will exacerbate noise impacts;
- impacts on flora and fauna, particularly the potential for bird and bat deaths from blade strikes;
- property impacts, particularly the potential for the project to lead to a devaluation of surrounding property values and to prevent future expansion of Black Springs village;
- resource sterilisation, particularly as a result of conflicts between the wind farm and mineral resource extraction;
- justification for the project, including:
  - → wind farms only provide negligible useful electricity and are inefficient;

  - → wind farms will not result in the closing down of any power stations and a reserve of power will still be required to operate in the background;
  - → better technology exists for electricity generation, such as solar;
  - → the Black Springs wind resource is marginal and cannot operate without government subsidies;
- hazards, risks and interference effects, including:
  - → bushfire risks associated with the location of the turbines on bushfire-prone ridge tops and the impact of lightning strikes;
  - → impacts on TV and radio reception, particularly in the context of the (radio) fire communication link between Black Springs and Burraga;
  - → the effects of shadow flicker.

4.2 Submissions Report

On review of the issues identified in submissions, the Department required the Proponent to prepare a Submissions Report to address each of the issues raised in those submissions. As part of this process, the Proponent reviewed each submission and made specific comment in relation to each issue identified.

The Proponent provided responses to the submissions via two separate Submissions Reports (one titled *Response to Public Submissions* and the other titled *Response to Department of Planning Comments*) which were both submitted in July 2007. The Submissions Report includes minor changes to the Proponent's Statement of Commitments in response to a number of issues. The revised Statement of Commitments is attached to this report (refer to Appendix C).

4.3 Site Inspection

As part of the assessment process, the Department inspected the wind farm site with the Proponent on 20 April 2007 and viewed the proposal from the participatory landholders' properties. A second site inspection was undertaken on 15 May 2007 which involved a meeting with Oberon Council and the Black Springs Community Landscape Guardians. This was followed by an inspection of a representative number of properties in and around Black Springs selected by the Black Springs Guardians and included properties and views from:

- Swatchfield Road;
- Campbells River Road;
- Tillsbury Lane;
- Dog Rocks Road; and
- Abercrombie Road.

4.4 Minister's Meeting and Expert Reviews

On 17 October 2007, the Minister for Planning met with the Gerald Martin MP (Member for Bathurst) and residents from Black Springs to discuss stakeholder concerns over the project. . In recognition of the strong community concern over the key impacts associated with the project, particularly visual amenity and noise impacts, the Minister for Planning directed that independent experts be engaged to provide advice on those aspects of the project. In particular, the Minister specified the following terms of reference for the independent reviews:

1. consideration of operational noise including validity of predictions; the adequacy of background monitoring with regard to seasonal effects; and the acceptability of potential impacts. This should be undertaken having regard to current industry practice including the *Environmental Noise Guidelines: Wind Farms* (Environmental Protection Authority, South Australia);
2. consideration of visual impacts including consideration of the validity of photomontages used, the area's ability to accept/absorb the turbines from both a regional and local perspective, and potential mitigation measures; and
3. consultation with neighbouring residents, Oberon Council and the Proponent regarding 1 and 2 above.

Mr Peter Haack of EDAW AECOM was engaged to review visual amenity impacts, and Mr John Wasserman of Wilkinson Murray Pty Limited was engaged to consider noise impacts. Reports from these independent experts were provided in December 2007 and January 2008, and are provided in Appendix B of this report.

Both independent experts conclude that the impacts of the project are generally acceptable, subject to the imposition of conditions, and implementation of the mitigation measures proposed by the Proponent.

With respect to visual amenity, the independent expert concluded that:

1. overall, the findings of the Proponent's visual amenity impact assessment are generally sound. The number of sensitive receptors is relatively low and the landscape is able to accommodate change effectively due to the topographic form and scattered vegetation;
2. there has been a change in landuse with the increase in lifestyle focussed land owners which has changed the visual sensitivity of the area due to a change in resident perceptions and expectations of the landscape experience;
3. the landscape of the region is subject to change through forestry operations, with viewlines progressively blocked by maturing plantations and then opened up, with scarred expanses of ground plane exposed following harvesting;
4. the impact of shadow flicker on the approved building envelopes, particularly the closest three to the east of turbines 6, 7 and 9, also requires additional assessment; and
5. the current plantation forests have a significant bearing on views of the proposed development, particularly from residences to the west. Future harvesting of the entire block will open up views of the proposed development and it is recommended that a possible condition be imposed that requires the proponent to liaise with forest management to coordinate logging so that visual buffering is retained until replanted forest reaches a height to provide visual amelioration

With respect to noise impacts, the independent expert concluded that:

1. the locations of the background noise monitoring undertaken by the Proponent do not appear to have been ideal. Additional noise monitoring at the Kringis residence (32) as it is the most affected residence with regard to noise and at measurement at location 29 (south west) would have supported the noise assessment well;
2. the contractually involved residences have signed noise acceptance agreements with the Proponent accepting a maximum noise level generated by the wind farm of 50dB(A). This level is 5dB(A) higher than would ordinarily be applied. However, the risk associated with relying on such negotiated agreements rests with the Proponent;
3. the wind turbine manufacturer, Suzlon, has recently conducted noise tests that suggested turbines could achieve lower noise emissions than assumed as part of the Proponent's noise assessment. A comparison between the new and the old data indicates a reduction in noise impacts of 3 to 4dB(A) relative to the noise levels predicted in the Proponent's assessment;
4. the potential for the "Van den Berg effect" is not an issue at this site;
5. additional modelling undertaken for the purpose of the independent review suggests that noise impacts may be 4 to 6dB(A) lower than predicted by the Proponent. This is as a result of using updated wind turbine noise emissions (refer above) and a slightly different modelling approach;
6. given the difference in existing day time and night time noise levels, it is recommended that a conservative approach be taken by adopting noise criteria based on the lowest measured night time noise. Taking into account updated modelling undertaken for the independent review, the revised (conservative) noise criteria, a noise exceedance of 1.4 dB(A) is predicted at resident 32. At the DA175/5 subdivision (not currently populated), exceedances up to 7 dB(A) are predicted. Noise exceedances are generally the result of operation of turbine 1 under certain meteorological conditions;
7. the issue of noise execeedances could be addressed in the following ways:
   - → removing turbine 1 from the scope of the project; or
   - → moving turbine 1 from its current proposed position to somewhere near Daisybank Shed; or
   - → using sector management and switching off wind turbine 1 at wind speeds of less than 6ms^{-1} during night time periods;
8. it is also recommended that, if approved, the Proponent be required to implement all 'reasonable and feasible' noise mitigation measures at any new dwelling (one per property) built on a currently-vacant lot and at which noise criteria from the SA guideline are exceeded.

The Department generally concurs with the findings and recommendations of the two independent expert reviews, and has recommended conditions of approval to give effect to these outcomes. Relevant aspects of the independent expert reviews are considered further as part of the Department's assessment of the project in section 5 of this report.

5. ASSESSMENT OF ENVIRONMENTAL IMPACTS

Key issues raised in the submissions in response to the public exhibition of the project and/or identified during the Department's assessment included:

- visual amenity impacts;
- noise impacts;
- ecological impacts;
- hazards and risk impacts;
- traffic and transport impacts;
- property prices and land valuation; and
- other issues which include transmission interference, resource sterilisation, water quality and erosion and sediment control.

All other issues are considered to be minor and have been addressed as part of the Proponent's Statement of Commitments.

5.1 Visual Amenity Impacts

Issues

The visual amenity impacts of the proposed wind farm on the Black Springs district was the key issue raised in public submissions. The majority of submissions received from the local considered that the location of the proposed wind farm within an area characterised by rural and rural residential development was inappropriate due to its negative visual impact on both homes and the surrounding natural landscape. The five submissions received in support of the project argued that location of a wind farm in the area would in fact be a visual asset.

The Environmental Assessment highlights that the Black Springs area can be characterised as an area consisting of undulating, moderately sloped rolling hills with shallow valleys in between covered with grasses, typical of the wider Oberon local government area. No significant ridgelines dominate the landscape. The hills and the valley floors have been predominately cleared of its native flora (woodland communities) to facilitate agricultural purposes. Pine plantations, windbreaks and shade trees also exist in the area which contributes to a highly modified, working landscape.

The visual catchment has a number of distinctive existing anthropogenic structures located within the landscape. These include 500kV and 66kV transmission line towers approximately 60 metres in height, a wind monitoring tower also 60 metres tall and the existing road network. The 500kV towers running adjacent to the site are prominent visual structures that exist within and beyond the visual catchment of the wind farm. The visual catchment beyond the site consists of undulating hills and valleys. Farm residences plus associated sheds and structures are scattered through the landscape. Radiata pine plantations are also noticeable elements on the landscape with numerous plantations in the area. These have the capacity to mask the turbines at various locations immediately surrounding the Daisybank property in particular. However these plantations are likely to be felled approximately once every twenty years thus increasing the turbines dominance on the landscape during those periods.

Within this landscape, the Proponent proposes to construct up to nine wind turbine generators. The Proponent states that each turbine will be up to 124 metres in height, comprising three blades 44 metres in length mounted on a tubular steel tower 80 metres high. To assess the effect of the proposed wind farm from various viewpoints within the surrounding landscape, a visual impact assessment was included in the Environmental Assessment. This included photomontages from specific locations.

The assessment methodology employed by the Proponent included an assessment of the quality of the landscape, that is, its visual appeal, identification of important views to the wind farm and distance to the site, identification of the type of user in the surrounding area including the duration of exposure and dominance of exposure to determine their visual sensitivity, assessment of the degree of change brought by the introduction of the wind farm into the landscape and whether the landscape is able to absorb that change.

In response to community concerns and Departmental assessment, additional photomontages from nominated receivers were undertaken along with an analysis of key properties in close proximity to the wind farm. These were included within the Submissions Report (Response to Department of Planning).

The Black Springs Guardians engaged their own consultant to produce photomontages and these appear consistent with those produced by the Proponent. Additionally, in response to the Minister's direction, the Department engaged EDAW/AECOM to undertake an independent visual impact assessment of the proposal on surrounding properties in response to community concerns. The independent expert's consideration of the proposal included consideration and comparison of all visual amenity assessments and photomontages.

Broad Landscape Impacts

The Proponent's visual assessment considered the impact turbines would have on surrounding residences, roads, recreational areas and Black Springs village for ten kilometres. A zone of visual influence map was prepared to identify areas where the proposed wind farm could be viewed, and is reproduced as Figure 4. This model identified that the wind farm will be visible in all directions, however, the number of individual turbines that will be seen from any one point varies from none to nine. The Proponent highlights that the assessment did not take into consideration intervening vegetation and as such, is somewhat conservative in nature. Some submissions suggested that the Proponent had underestimated the extent to which parts of the project may be visible, and argued that visual impacts would continue for up to 25 kilometres from the project.

The assessment also notes the increasing number of rural residential subdivisions occurring within the Oberon area as the demand for land for 'tree change' lifestyles continues. A number of properties within the area have Council-approved subdivisions (some of which surround the wind farm). However, few have been developed at this time. The most notable exception is to the immediate West (adjacent to Vulcan State Forest). In terms of overall scenic quality, the visual impact assessment concludes that the area surrounding the proposed wind farm could be described as either low or moderate scenic quality. That is, the area is fairly common and typical of the surrounding region, however, the existence of established domestic farming structures and the established landscapes (pine plantations which have yet to be logged) was considered to be a highly desirable landscape characteristic. In contrast to other recent wind farm proposals, the turbines have not been sited on the highest point of the Daisybank property but rather at lower points of ridgelines due to the absence of vegetation which maximises exposure to the wind resource. Nevertheless the height of these turbines and absence of vegetation generally ensures that these turbines are highly visible structures in the landscape.

Selected Viewpoints

In addition to consideration of the broader visual amenity implications of the project at a regional scale, the Proponent undertook more detailed considerations to identify near-field receptors and potential impacts at a local level. To identify relevant local vantage points, the Proponent initially mapped the visual zone of influence of the project at a four-kilometre scale (refer to Figure 6). From this, potentially-affected near-field receptors were identified for more detailed analysis, through a local landscape assessment and subsequently, through photomontages.

The Proponent's landscape assessment is reproduced as Figure 5. From this assessment, it is apparent that key local receptors likely to be visually impacted include a number of proximate residences to the west (Daisybank) and to the south (Swatchfield and Kringis Kalgoorlie Hall), as well as more distant receptors to the north. Areas to the west also include potential future residential dwellings associated with recent subdivions. Visual amenity impacts can therefore be grouped for further consideration as follows:

1. Black Springs Village, particularly receptors along Dog Rocks Road and Campbells River Road;
2. West of the project, particularly recently subdivided land and a number of potential future dwellings (subject to Council approvals at various stages);
3. East of the project, particularly the Gribble and Winton Park properties;
4. North of the project, particularly along Dogs Rock Road; and
5. South of the project, particularly the Swatchfield and Kringis Kalgoorlie Hall properties.

Figure 4 - Visual Zone of Influence (Ten-Kilometre Radius)

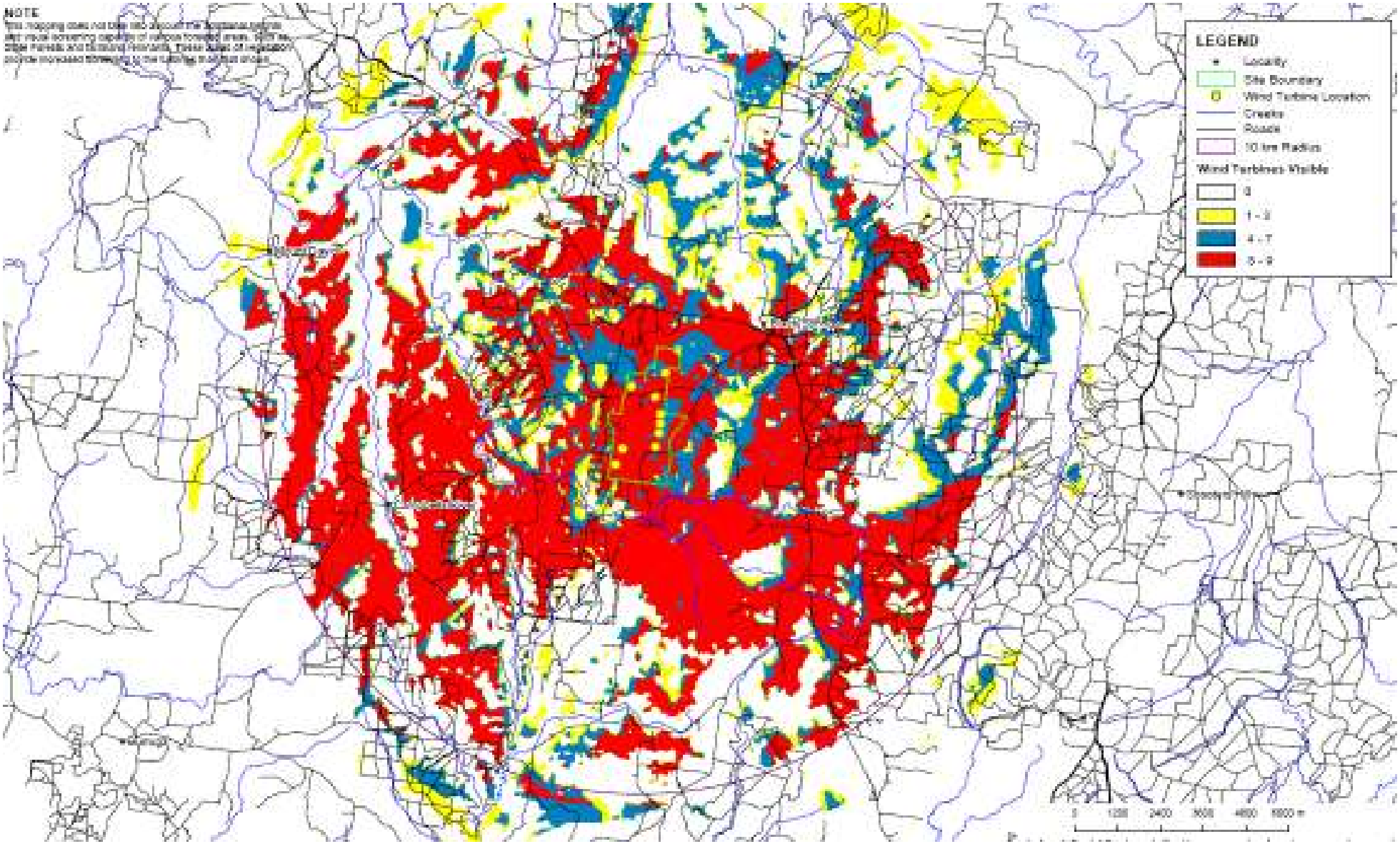


Figure 5 – Local Area Landscape Assessment

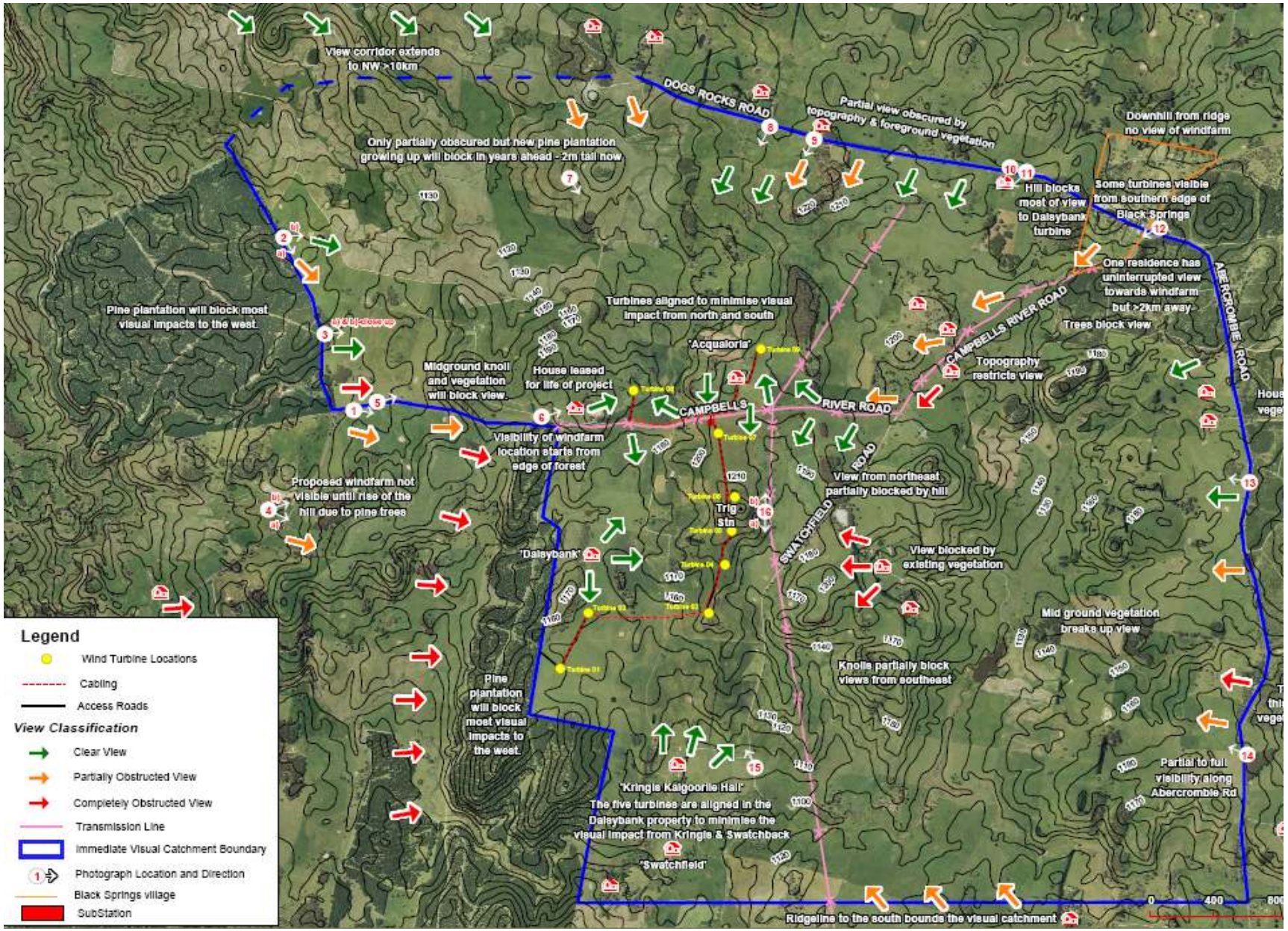
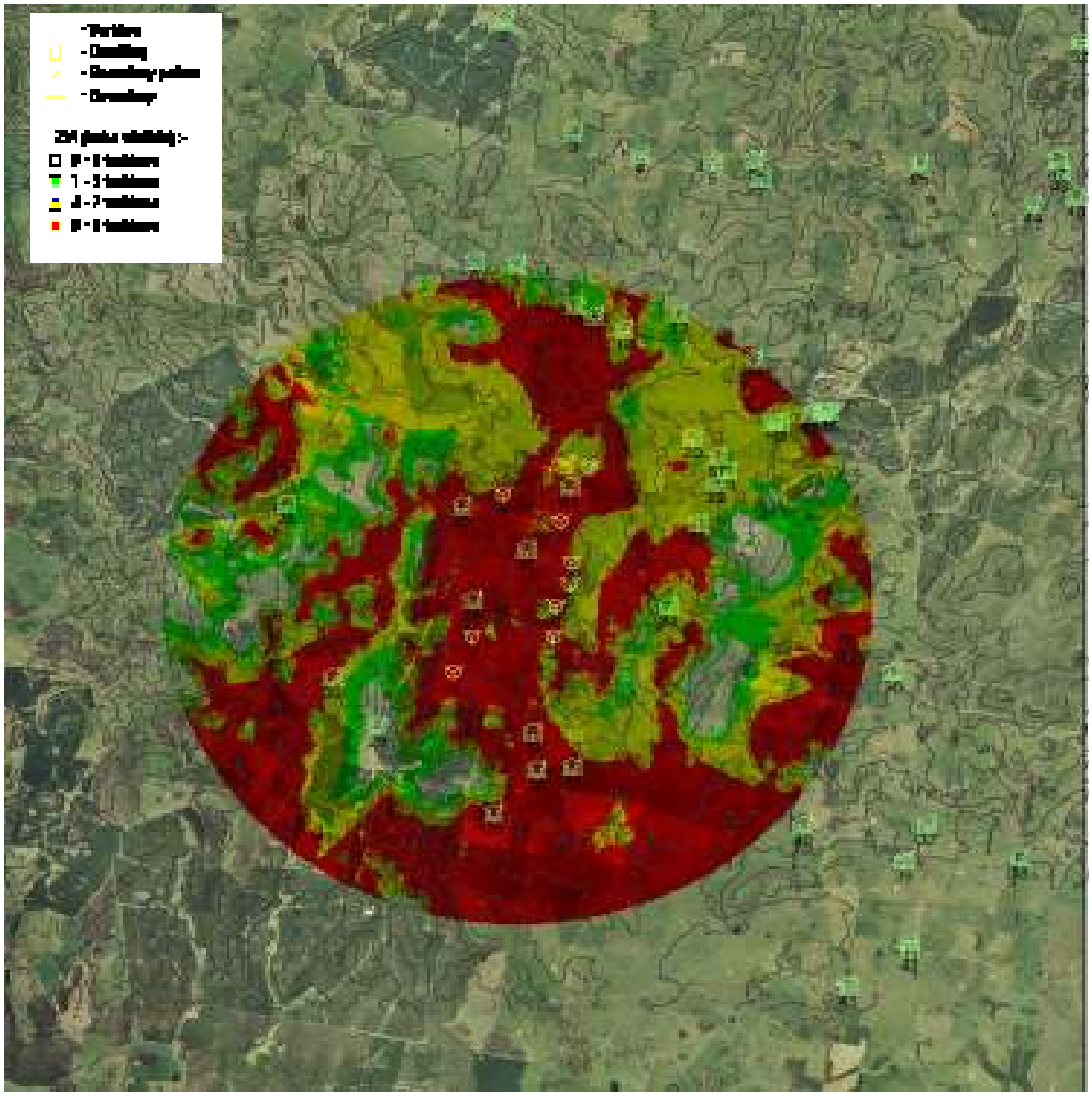


Figure 6 - Visual Zone of Influence (Four-Kilometre Radius)



Black Springs Village

The 2001 census indicates that approximately 500 people reside in the Black Springs area. The wind farm is located approximately three kilometres south west of the village. The Proponent suggests that at this distances, parts of the wind farm may be visible, but the project is unlikely to dominate view sheds. Further, in addition to distance, dwellings within the village have been constructed to take advantage of district views towards Oberon as a pronounced ridge in the village blocks views to the south west, the direction of the wind farm.

The exception to this rule is four properties along Dog Rocks Road and another three properties along Campbells River Road in the village, each of which is located on a pronounced ridge. As evident in Figure 7 approximately three to four turbines will be visible from each property but, due to the distance (2.8 kilometres) from the site, these do not dominate the landscape and appear consistent in height to the existing tree line. Foreground landscaping will remove these elements from the receiver's viewpoint.

Figure 7 – View from Black Springs Village (Campbells River Road) towards the Project (2.8 kilometres)

West of the Project

Properties which have been subdivided and are at various stages of approval for the establishment of rural residential dwellings are located to the west of the project site, between the pine plantation and the number '4' in Figure 5. The majority of these properties are the result of more recent subdivisions and are likely to have been purchased for their aesthetic quality. Visual impacts on the viewshed in this direction are presented in Figure 8. The Proponent argues that properties to the west will be minimally affected due to the pine plantation blocking views.

Figure 8 – View from Western Properties towards the Project (2.6 kilometres)

East of the Project

Due to the surrounding topography and existing property screening, the Proponent contends that the majority of dwellings to the immediate east of the site will be screened from some or all of the turbines. The view from the Gribble property as depicted in Figure 9 is the nearest eastern property where all turbines will be dominant structures located in the view shed. This property is between one and two kilometres from the turbines and located at the junction of Swatchfield Road and Campbells River Road. Winton Park is located approximately one kilometre to the east from the nearest turbine but will not view turbines due to existing screening around the dwelling.

Figure 9 – View from Eastern Properties towards the Project (1.5 kilometres)

North of the Project

Impacts on the northern view shed are minimal and limited to properties on Dog Rocks Road, which is between one and two kilometres from the nearest turbine. The topography and intervening vegetation along this area minimises full turbine views from residents. New pine plantations depicted in Figure 10 will screen turbines once the trees grow but in any event they are clear felled, the turbines are not dominant structures due to the linear configuration, topography and distance from the receiver. Properties further along Dogs Rock Road (as depicted in Figure 11) will have more direct views towards the project, but with a reduced impact as a result of increased viewing distances.

Figure 10 – View from Northern Properties (Dogs Rock Road) towards the Project (1.5 kilometres)

Figure 11 – View from Northern Properties (Dogs Rock Road) towards the Project (5 kilometres)

South of the Project

Properties to the south along Swatchfield Road are the closest non-participatory receivers, and include Swatchfield and Kringis Kalgoorlie Hall (1.8 kilometres and 1.1 kilometres from the project, respectively). Expected views of the project are reproduced in photomontages from Figure 12 to Figure 15. It is noted that they will not see all the turbines although the ones that can be seen will dominate. The Proponent considers that those residents located along Swatchfield Road to the south of the site are possibly the most sensitive to the wind farm due to the lack of vegetation and intervening topography.

To minimise impacts, the Proponent has suggested that the turbines have been arranged in a linear fashion to minimise visual intrusion on these receivers by concentrating impacts in a smaller view shed. Figure 16 demonstrates the percentage of total view shed affected with the shaded black along the right of the figure depicting the orientation of the dwelling and the coloured lines indicating the direction of view from a lounge/living area. The Proponent considers that with the turbine layout as proposed, views to the wind farm from the south will be minimised and the presence of landscaping which will be offered to these properties will screen turbines.

Kringis Kalgoorlie Hall is the closest residence to the project, and will be the most significantly impacted property in terms of visual amenity. It is, however, almost immediately to the south of the project, and as such, the breadth of visual impacts is limited (due to the relative linearity of the project configuration) despite the dominance of the wind turbines above the horizon.

The Swatchfield property contains two residences: the main homestead; and the caretaker's residence. The caretaker's residence is likely to be the most affected residence on this property. This is due to the dwelling location (on a cleared ridge) which is likely to see the majority of turbines unimpeded. There is currently no foreground landscaping to visually filter turbines.

The Proponent intends to provide vegetative screening at these residences to reduce the potential visual impacts of the project. In addition, muted colours are proposed for project components, particularly the elevated turbines, to assist with visual integration of the project into the surrounding landscape.

Figure 12 – View from Kringis Kalgoorlie Hall towards the Project (1.1 kilometres)

Figure 13 – View from Kringis Kalgoorlie Hall towards the Project (1.1 kilometres)

Figure 14 – View from Swatchfield towards the Project (1.8 kilometres)

Figure 15 – View from Swatchfield towards the Project (1.6 kilometres)

Figure 16 - Cone of Visual Influence - Swatchfield and Kringis Kalgoorlie Hall Properties

Consideration

There are two key issues that must be considered when assessing the visual impact of a wind farm: the effect on the quality of the broad landscape that is going to be intruded upon; and the effect on individual locations, including those identified by the community as a result of exhibition of the Environmental Assessment. These issues are considered separately below.

In general terms, the Department considers that the Proponent has undertaken an appropriate level of assessment of the potential visual amenity implications of the project, and has applied an appropriate assessment methodology. It is important to note that while the Proponent's assessment and the assessments presented in various submissions (particularly in relation to photomontages) differ to a minimal degree, the magnitude of these differences are not sufficient to alter the outcomes of the visual impact assessment. Further, the independent visual impact review has confirmed that the assessment methodology applied by the Proponent, and the outcomes of that assessment are generally robust and sufficient for the purpose of informing consideration of the project.

Broad Landscape Impacts

Although the Proponent has predicted that parts of the project will be visible some ten kilometres away, and submissions have suggested that visual impacts may extend to up to 25 kilometres, the Department suggests that both of these positions are highly conservative. Neither takes into account intervening vegetation or structures, and assumes perfect visibility over the entire viewing distance. In reality, the extent to which parts of the project are visible at a distance from the development site will be affected by meteorology, air quality on any particular day, and factors such as lighting direction. Further, while parts of the project may be visible at a distance, the colour of the project relative to the surrounding landscape is likely to result in the human eye being unable to distinguish between natural and anthropogenic elements at the distances suggested by both the Proponent and submitters. In the context of the topography of the area and the configuration of the project, the Department considers that potential visual impacts would be minimal beyond approximately four kilometres from any single turbine. This in itself is considered by the Department to be a conservative approach, noting the abovementioned factors that may act to reduce visibility at any particular time.

The landscape and visual quality within this area of potential affectation can be characterised as a 'working landscape' with active pine plantations and existing electricity transmission infrastructure characterising the locality. The landscape is highly modified from its original quality, having been subject to long-term agricultural practices. While the Department appreciates the concerns of local residents over the current landscape qualities of the local setting, there is no particular attribute of the landscape surrounding the project site that would elevate it above other rural settings in terms of natural or scenic visual qualities. At a regional- and State-scale, the area in which the project is proposed to be located is generally typical of a rural setting. It is also noted that with recent subdivisions and residential development proposals in the area, the visual quality of the locality is likely to become more 'developed' or 'urbanised' in quality, as distinct from the 'unoccupied' rural setting highlighted in submissions.

The independent visual amenity expert appointed to undertake a review of the project noted that number of sensitive visual receptors on the area is relatively low and that the landscape able to accommodate change effectively due to the topographic form and scattered vegetation. Notwithstanding, the review also recognised that there has been a change in land use in the area, with an increase in lifestyle-focused landowners contributing to perceptions and expectations of certain landscape experiences. The review suggested that the landscape may be considered as significant by local receptors, but at a broader regional or State level, the locality would rate as being of moderate scenic quality. Local scenic quality is in a continually state of flux given active forestry operations that result in view lines being progressively blocked by maturing plantations and then opened up, with scarred expanses of ground plane exposed following harvesting.

Within the context of these observations on the quality of the broader landscape, the Department does not consider that the visual impacts of the project would be unacceptable. It is important, however, to ensure that impacts, although minimal, are reduced as far as reasonably possible. The Proponent's commitment to apply colours and external finishes to the project to minimise potential impacts is therefore supported. The Department has reinforced this committed through recommended conditions of approval that require the project to be off-white/ grey in colour, non-reflective and devoid of advertising or other logos.

In recognition of the fact that some people may in fact be attracted to the visual appearance of the project, as highlighted in some submissions, the Department also recommends that the Proponent be required to investigate a viewing platform for the project, in consultation with Council. Such a viewing platform has the potential to develop into a local attraction, and may in the longer-term become a positive aspect for the local area. The recommended conditions of approval require investigation of such a platform, including associated signage and facilities. The Department notes that the Proponent may require separate planning approval for such a structure.

Although principally related to mitigation of visual impacts at particular receptors (and discussed further below), the Department notes that vegetative screening to be applied by the Proponent at sites around the project would assist in reducing potential lines-of-sight towards the project. Relevantly, the Department has recommended that the Proponent be required to provide landscaping along key public places, including Campbells River Road, Abercrombie Road and Dog Rocks Road. There is also potential for screening to be provided by existing State Forest areas, and for at least some areas of forest to be retained (without future clearing) for the purpose of screening. To facilitate this approach, the recommended conditions approval require further consultation between the Proponent and Forests NSW with the aim of retaining some forests areas without clearing in future.

The Department also notes that it is likely that some or all of the turbines will be required to accommodate flashing, medium-intensity red obstacle to meet the requirements of the Civil Aviation Safety Authority. This lighting may produce a visual amenity impact during the evening and night time periods. It is important to note that this impact is likely to be minimal during daylight hours, and at night is more likely to represent a nuisance effect rather than to detract from the scenic value of the landscape (which would itself be minimal given the absence of ambient lighting). Further, the Department highlights that potential visual receptors during the evening and night time periods would be minimise by lines of sight as well as sleeping patterns. Intervening vegetation would also mitigated lighting impacts. As a consequence, the Department is satisfied that aviation hazard lighting would pose a minimal potential impact on surrounding receptors, and at its most extreme would be no greater than lighting installed on communications towers and similar structures in the locality and region.

Selected Viewpoints

As distinct from broader regional landscape impacts, the Department recognises the project has the potential to have acute visual amenity impacts on residential receivers in closer proximity to the site. These receivers can be considered in two broad categories: near field receivers generally under two kilometres from any single turbine; and those further-field receivers up to approximately four to five kilometres from any turbine. Beyond this, the Department considers that topography, vegetation, meteorology and natural limitations on sight will result in a negligible visual amenity impact for any particular receiver.

Further-field receivers considered by the Proponent in the Environmental Assessment include the village of Black Springs (Figure 7), properties the west of the site (Figure 8) and some northern properties along Dogs Rock Road (Figure 11). In the case of the latter, it is apparent from photomontages presented by the Proponent, and further consideration provided by the independent expert and in various public submissions, that visual impacts from Dogs Rock Road at a distance of five kilometres would be minimal. While turbines would be visible, mitigation provided by physical distance and spread of turbines results in a residual amenity effect of limited magnitude.

In the case of Black Springs village (Campbells River Road), physical separation (of approximately 2.8 kilometres) and existing, intervening vegetation all but screens the project from view. The Department considers that provided existing circumstances prevail, particularly with respect to retention of vegetation, the residual amenity impacts are likely to be minimal from this view point.

Properties to the west of the site are similarly screened from visual impacts by existing vegetation. This vegetation is, however, a pine plantation, and there is an expectation that clearing will occur at some point in future. The independent expert has drawn particular attention to this potential outcome, noting that the loss of intervening vegetation would introduce a new set of visual amenity impacts on western receptors. The independent expert therefore recommended that the potential to protect the vegetation as a visual screen be pursued by the Proponent as a mitigation approach. As previously noted, the Department supports this recommendation made by the independent expert, and has included conditions of approval that require the Proponent to pursue this issue with State Forests NSW. In the event that an agreement cannot be reached between the Proponent and State Forests NSW to retain the pine plantation as a vegetative screen, the Department considers that the resultant potential visual impact could be reasonably mitigated with provision of an alternative screen between the project and affected receivers.

Nearer-field receivers include properties to the east of the project (Figure 9), closer points along Dogs Rock Road (Figure 10) and the Kringis Kalgoorlie Hall (Figure 12 and Figure 13) and Swatchfield (Figure 14 and Figure 15) properties. The Kringis Kalgoorlie Hall and Swatchfield properties would experience the greatest impact through the dominance of the project given their relative proximity to the nearest turbines (generally around 1 to 1.5 kilometres). However, the relative orientation of residential structures on these properties places key lines of sight only marginally shifted from the principal axis of the project. The result is a visually dominant series of structures in the view field, but over a limited cone of visual influence. Consideration of the photomontages prepared with respect to these properties suggests that there is reasonable potential to screen project components given the visual scale of the project relative to existing vegetation and the concentration of impacts within a generally narrow visual range.

A similar outcome is likely to be achievable for Dogs Rock Road, where in lies within about 1.5 kilometres of the project. At this point, photomontages suggest that topography plays a significant role in reducing potential visual amenity impacts. The dominance of near-field existing vegetation supports the conclusion that vegetation screening could also be employed at this location to reduce impacts even further.

Potentially one of the more challenging vantage points with respect to mitigating and managing visual impacts will be to the east of the project. While the Department accepts the Proponent's suggestion that may of the properties in this direction will be screened from the project with existing vegetation, there are at least some, including for example the Gribble property (Figure 9) that do not have the advantage of intervening vegetation or topography. At this location, the project turbines assume a moderate dominance in the landscape over a reasonable visual cone. While the Department considers that screening would be a reasonable and appropriate option in this circumstance, it is recognised that the extent of screening may need to be greater that at other locations.

One tool that has been used by the Department when looking at ways to lessen the impact of a wind farm on an individual or group of residences is to either require that certain turbines be removed or otherwise relocated. In the case of this proposal the turbines have been arranged in a linear fashion to minimise impacts onto the catchment of the nearest affected residences and concentrates view loss, it is the Department's view that any individual residence is unlikely to be assisted by such an approach. The removal of one or more turbines from the total of nine is unlikely to make a significant difference to the overall appearance of the wind farm.

Another measure is to provide landscape treatment to nearby affected residents. Due to the level of elevation of the site with respect to the surrounding landscape, landscape screening on neighbouring properties would only provide a limited form of amelioration and could also result in the loss of views. The size of the turbines means that they are unlikely to be able to be fully screened. Nevertheless, the Department does consider that provision of landscaping on neighbouring properties may reduce the potential visual dominance of the turbine(s). Should the Minister determine to approve the proposal, the Department recommends that the Proponent be required to offer landscaping to all owners of residential dwellings with views of turbines located within four kilometres of their dwelling, not just those that are likely to be most affected. The Department further recognises that a number of undeveloped lots exist in the area which are likely to be developed in the near future for the purposes of rural-residential development. The Department considers that these should also be eligible for landscaping and this is reflected in the Department's recommended conditions.

Ancillary and Associated Works

The Department has considered the appearance of the substation and control and facilities room in respect to its location beside Campbells River Road and the likelihood to detract from the surrounding environment. The Department considers it appropriate to locate the facilities to minimise the visual impact from roads and surrounding properties, which includes full enclosure and screening around the perimeter using species representative of the surrounding vegetation and treatments to blend in with the surrounding landscape. These measures are reflected in the Department's recommended conditions of approval.

Conclusion

The Department recognises the very strong and genuine concerns of the potentially affected residents. It is understood that many within the local community have strong negative feelings about the proposed wind farm. In some cases, this is independent of the actual proximity to the turbines. Whilst there may be some people who are less concerned about the landscape in which they reside, there are clearly many people that choose to live in rural areas because of the landscape. The Department received numerous submissions from members of the public objecting to the proposed wind farm during exhibition on the basis that the proposed wind farm would spoil the view from their home. The Department's experience in the assessment of other wind farms throughout the State is that this is a common reason for objecting to a proposal. In particular, submitters identify that home is not just occupied in the morning or evening and weekends, but is occupied day and night, all year and is often their place of work. It is clear from these submissions, that many rural residents have a strong association with their land.

Whilst the Department recognises the genuine concerns of those residents living in a rural zone, the Department considers that these concerns must be tempered with consideration of the objectives and permissibility of development in the rural zone. The Department is satisfied that the proposed wind farm is permissible and is consistent with the objectives of the rural zone. Further he Department is not satisfied that the residual amenity impacts of the project in the context of the Black Springs region are sufficient to negate the significant environmental and economic benefits presented by the proposal.

As highlighted by the independent visual expert, the assessment approach applied by the Proponent is sound and the impacts of the project can be mitigated to fall within acceptable limits. Limitation of visual impacts is assisted by the relatively low number of sensitive receptors in the area, and the ability of the landscape to accommodate change effectively through topographic form and scattered vegetation.

Nevertheless, the Department recognises that the proposed project will alter the landscape and views of the site. The acceptability of changes to the visual outlook will always be subject to debate because of the subjectivity of individual likes and dislikes. However, the Department considers that the site is a suitable setting for a wind farm in a landscape rated at best of moderate significance and which is affected by strong built elements nearby.

These elements include high voltage power lines and the working nature of the landscape – namely clear felling of large radiata pine plantations regularly. Thus, the Department is satisfied that the impacts of the wind farm are within reasonable bounds. This is further reinforced by the independent expert engaged by the Department to undertake a peer review in consultation with the community. The Department's recommended conditions of approval, including those suggested by the independent expert, will serve to reduce the visual amenity impact of the proposal to an acceptable level.

5.2 Noise Impacts

Issue

The Environmental Assessment presents a noise impact assessment for the project to determine compliance with noise criteria established in accordance with *Wind Farms – Environmental Noise Guidelines 2003* (SA Environment Protection Authority). As no equivalent noise guideline currently exists in this jurisdiction, the SA guidelines have been adopted and applied for the purpose of assessment of wind farm proposals in New South Wales.

The noise impact assessment considers fourteen residential receptors around the project site and within the noise catchment, generally grouped as receivers to the east (receiver references 20, 21, 22, 23 and 31), north (receiver references 24, 25, 27 and 28) and south (receiver references 29, 32, 33, 34 and 35). The relative location of these receivers is indicated in Figure 17. Of these properties, all four of the northern receivers have entered into contractual arrangements with the Proponent, including agreement to accept up to 50 dB(A) at the exterior of a dwelling on those properties. Because such agreements are in place, the noise criteria ordinarily applied to those properties in accordance with the SA Guidelines do not apply.

The Proponent applied the ISO 9613 Part 2 noise model to predict the noise levels from the project at surrounding receivers over a range of wind speeds (4 ms^{-1} to 14 ms^{-1}). The Proponent contends that validation studies have demonstrated that the ISO model tends to slightly overestimate noise levels at nearby dwellings as it does not consider vegetation or structures which have the potential to reduce noise levels between source and receiver. A further level of conservatism was applied to the noise assessment, with the assumed operation of Suzlon S88 turbines. These turbines are expected to represent worst-case noise generation of all the potential turbines to be used in the project. The Proponent also highlights that these turbines were assumed to generate a sound power level of 106.2 dB(A) at 10ms^{-1} for the purpose of the modelling exercise. However, interim noise testing in 2005 by the German Wind Energy Institute has suggested that sound power levels of this turbine are actually slightly lower (104.9 dB(A) at 8ms^{-1} as opposed to 105.9dB(A) assumed in the current noise impact assessment).

The results of the noise modelling are summarised in Table 1 below. Receivers have been grouped according to general direction relative to the project, with worst predicted noise impacts for each receiver grouping presented. Predicted exceedances of noise criteria are highlighted in red. It is noted that the northern receiver grouping is the subject of separate negotiated agreements with the Proponent to accept up to 50 dB(A), rather than the usual noise criteria. Noise impacts are also illustrated in Figure 17.

Table 1 - Maximum Predicted Impact at Representative Receivers

Wind Speed (ms^{-1})	Eastern Receivers		Northern Receivers		Southern Receivers	
	Criteria (dB(A))	Impact (dB(A))	Criteria (dB(A))	Impact (dB(A))	Criteria (dB(A))	Impact (dB(A))
4	37.4	39.0	36.1	47.7	35.8	38.1
5	38.0	39.6	37.8	48.3	37.6	38.7
6	39.2	40.2	39.7	48.9	39.3	39.3
7	40.8	40.6	41.9	49.3	41.2	39.7
8	42.9	40.9	44.3	49.6	43.1	40.0
9	45.5	41.1	47.0	49.8	45.1	40.2
10	48.5	41.2	49.9	49.9	47.1	40.3
11	52.1	41.2	53.0	49.9	49.2	40.3
12	56.1	41.2	56.3	49.9	51.4	40.3
13	60.6	41.2	59.9	49.9	53.7	40.3
14	65.6	41.2	63.7	49.9	56.0	40.3

Figure 17 - Predicted Noise Impacts around the Project

As can be seen from the information presented in the Table, of the properties not the subject of negotiated agreements, the most impacted receivers in the eastern and southern groupings are predicted to experience noise levels about established criteria. This translates to two properties: 31 ("Winton Park") to the east of the project with exceedances of up to 1.6 dB(A) at wind speeds between 4 ms^{-1} and 6 ms^{-1}; and 32 ("Kringis Kalgoorlie Hall") to the south of the project with exceedances up to 2.3 dB(A) at wind speeds between 4 ms^{-1} and 5 ms^{-1}.

The Proponent has argued that these predicted exceedances are minimal, and within the confidence limits for the noise model and assumes applied to the modelling process. In particular, the Proponent has highlighted additional conservatism built into sound power assumes for turbines, and inherent conservatism of the noise model (particularly exclusion of attenuation due to topography and vegetation). As a consequence, the

Proponent argues that it can in fact meet specified noise criteria, and will do so through appropriate selection of technology. In the event that exceedances do in fact occur, the Proponent has committed to applying additional mitigation, including the use of double-glazing and wind sector management strategies for properties that may experience annoyance as a result of operation of the wind farm.

The Van den Berg effect refers to an incidence where stable atmospheric conditions occur producing low background levels at receivers with noise levels at the turbines themselves operating close to or at maximum noise levels. This is due to the turbine hub being located at the wind mixing layer height. The Environmental Assessment suggests that an analysis of the wind speed correlation between 10 metres and 50 metres indicates that the Van den Berg effect would not be a characteristic of the site.

Consideration

The Department is generally satisfied that the Proponent has undertaken an appropriate and adequate level of assessment of the potential noise impacts associated with the project, using relevant methodologies and applying reasonably conservative assumptions. This is a view shared in broad terms by the independent expert.

The independent expert has, however, raised two important issues as part of the consideration of the noise impacts of the project. These issues relate to derivation of noise criteria, and the level of conservatism associated with assumed turbine sound power levels.

In relation to the derivation of noise criteria, the independent expert has highlighted that criteria are established based on monitored background noise levels. As such, it is important to accurately establish representative background noise levels for a particular locality, have appropriate regard to variations in background noise during different time periods. In the case of the subject project, the independent expert noted variability in background noise data for the day and night time periods and recommended that a conservative approach to deriving noise criteria be adopted based on the lower recorded night time noise data. While the Department notes that this level of conservatism may extend beyond the intent of the SA Guideline in some cases, it considers it prudent to consider the scenario suggested by the independent expert in this case, given the significant level of concern expressed in submissions on this issue. The net effect of this additional conservatism is a reduction in noise criteria of approximately 1-2 dB(A) at wind speeds up to 10 ms^{-1}, and a reduction of 2-15 dB(A) above 10 ms^{-1}.

The independent expert undertook additional noise modelling of the project, using updated sound power levels for assumed turbines, and applying a different noise model. The updated modelling suggests a noise impact generally 4 to 6 dB(A) lower than predicted by the Proponent. Taking into account the more stringent noise criteria derived by the independent expert, this results in noise exceedances at a single existing residential premises: up to 1.4 dB(A) at receiver 32 ("Kringis Kalgoorlie Hall"). The independent expert identified that these exceedances are the result of the operation of turbine 1 under certain meteorological conditions, and suggested that exceedances could be resolved by:

- removing turbine 1 from the project; or
- relocating turbine 1 within the project; or
- applying a sector management approach to ensure that turbine manner is not operated in a manner and under meteorological conditions conducive to noise exceedances.

The Department has discussed these options with the Proponent, and in the context of the marginal predicted exceedances (1.4 dB(A)) and the more conservative noise criteria recommended by the independent expert. Despite the independent experts predictions, the Proponent remains confident that it can design and operate the project to meet acceptable noise outcomes. It therefore favours a sector management approach.

On balance, the Department concurs that a sector management approach would be appropriate for application to the project. This is based on recognition that predicted noise exceedances are relatively minor: they occur at one location, under limited meterological conditions, and are relatively small in the context of the conservatism of the modelling approach and stringent noise limits. Further, there is potential for the Proponent to apply technology to the project at the time of implementation with sound power levels below those assumed in the noise modelling, thereby potentially resolving predicted noise exceedance issues. The Department has therefore recommended a precautionary tiered approach to the operation of turbine 1, including:

- application of a sector management strategy at the commencement of operation of the project, including restrictions on operation under winds between 270° and 330°, with monitoring of noise generated by the project, particularly turbine 1;
- independent review of the noise performance of the project, particularly turbine 1 in the context of the sector management approach, at six months after commencement of operation and periodically thereafter. Based on the outcomes of these independent reviews, the Director-General may require more stringent sector management (and potentially cessation operation) or may agree to a more flexible set of restrictions if acceptable noise performance is achieved.

The Department considers that this precautionary tiered approach strikes an appropriate balance between the Proponent's commitments to achieve acceptable noise outcomes through design and operational considerations, and the need to protect local acoustic amenity.

Whilst the Department supports the Proponent's commitment to meet the limits set under the SA Guidelines for all non-associated residences, where noise modelling undertaken by the Proponent predicts that the noise level at a residence would be lower than that otherwise recommended by the Guideline (but still above a base level of 35dB(A)), the Department considers that 'best practice' prevails. In this instance the Department considers it appropriate to set the noise limit at that lower level irrespective if beneath the Guidelines minimum threshold. In some circumstances, predicted noise levels are up to 5 dB(A) lower than the limit that would otherwise be set under the SA Guidelines. This ensures best practice measures are adopted in the operation of the wind farm and is consistent with both DECC and Departmental policy for all new development. This position is reflected in the Department's recommended conditions.

Furthermore, as a safeguard for the community, once the Proponent has selected the final turbine model and layout, the Department recommends the Proponent be required to submit a detailed noise compliance assessment plan prior to the commencement of operation of the wind farm demonstrating how compliance with the noise criteria will be achieved. As part of this plan, the Proponent should be required to undertake noise monitoring following the commencement of operation in order to demonstrate compliance with the noise criteria at all residential receivers. Should monitoring demonstrate the wind farm is exceeding the noise limits set under the approval, ameliorative measures would need to be undertaken to rectify this situation. Such measures should be outlined in a noise management plan. The Department considers that noise monitoring should also be required where credible noise complaints are received.

For project-involved residences and any other landowners to which a voluntary noise agreement is in place, the noise limits discussed above would not apply. This is consistent with the SA Guidelines and acknowledges that any agreement between the Proponent and a landholder will in part compensate to the extent agreed between the parties for any loss of amenity due to noise. However, it is important that such landholders be fully informed of noise impacts at their residences. To this end, the Department recommends that the Proponent disclose the noise impact at a residence when entering into any financial agreement with a landholder. As noted above, there is still an obligation on the Proponent to minimise impacts on the amenity of residences to which an agreement is in place and this is reflected in the Department's recommended conditions.

A potential future set of noise receptors not directly considered in the Environmental Assessment, but addressed by the independent expert, are those that may be associated with the Council-approved subdivision (DA 175/5) to the north-west of the project. Modelling undertaken by the independent expert suggests that noise criteria may be exceeded by up to 7 dB(A) if residential dwellings are approved and established at this location in future.

The SA Guidelines acknowledge this issue and note that where a wind farm is proposed to be located near an area zoned primarily for residential development that is yet to be fully developed, noise compliance should be assessed at the zone boundary, rather than within 20 metres from the dwelling as is otherwise recommended. For the purposes of this proposed wind farm, the Department notes that the area including and surrounding the site is zoned 1(a) General rural zone. The 1(a) zone's focus is not for residential development. As such, the Department is satisfied that the Proponent's noise assessment is consistent with the requirements of the SA Guidelines.

Nevertheless, in developing recommended conditions for the proposed wind farm, the Department recognises that it is important to protect not only existing residences but that consideration should also be given to future dwellings in certain circumstances. To this end, the Department recommends that for all vacant parcels of land within five kilometres of the site, noise mitigation measures should be provided for no more than one new dwelling constructed on that parcel (where erection of a dwelling was permissible at the time of any approval by the Minister, for which a valid construction certificate exists within three years after the date of the approval) and where noise monitoring at that location shows that the noise levels would exceed the criteria outlined in the SA Guidelines.

Conclusion

Overall, the Department is satisfied that the noise impact assessment is appropriate and a conservative prediction of potential noise impacts at residences adjacent to the proposed wind farm. The Proponent has demonstrated that the proposed wind farm could operate within the noise criteria determined under most operating conditions. Sector management strategies and negotiated agreements have also been implemented by the Proponent where noise levels are predicted to be exceeded to ensure that levels are within reasonable bounds.

A comprehensive independent review was undertaken and agreed with the Proponents previous studies. However, with the onset of further validation monitoring by the turbine manufacturer following lodgement of the Environmental Assessment, lower noise levels have been derived which, in turn, equate to less disturbance to non-participatory receivers. Sector management of turbine 1 will address this. Construction noise impacts, including vibration, are within acceptable limits. The Department is satisfied that any construction noise impacts would be short term and of a minor nature and could be adequately managed through the Proponent's statement of commitments and recommended conditions.

5.3 Ecological Impacts

Issue

The key impacts on flora and fauna during the construction phase are loss of habitat and habitat degradation from vegetation clearing/trampling and soil disturbance. Impacts from the project during the operational phase are primarily associated with the movement of the turbine blades that have the potential to cause bird and bat strikes.

The Proponent undertook detailed ecological surveys in December 2004, January and February 2005. Follow up surveys were conducted in February and June 2006. The assessment characterised the biodiversity attributes of the site with particular attention given to species and communities listed under the *Threatened Species Conservation Act 1995* (TSC Act), *Fisheries Management Act 1994* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). An assessment of the site against the provisions of State Environmental Planning Policy No. 44 (SEPP 44) – 'Koala Habitat Protection was also undertaken.

The report determined the likelihood and level of impact that may occur during the construction and operation of the project on flora and fauna species.

A referral (2007/3444) was also made by the Proponent to the Commonwealth Department of the Environment and Water Resources as there were several threatened flora or ecological communities listed under the Commonwealth EPBC Act potentially within the area. Migratory bird species listed under the Act were recorded by the consultant in the area and the referral contained an assessment of impacts in this regard. The Commonwealth concluded that the proposed wind farm would not have a significant impact on matters of National Environmental Significance and as such, did not constitute a 'Controlled Action' under the EPBC Act.

Flora

The Proponent has identified that the majority of the site is farmland that has been cleared and grazed for many decades. Significant clearing activities are also consistent with the wider Oberon bioregion with approximately 95% of native vegetation cleared for the purposes of grazing or for radiata pine plantations.

The biodiversity assessment also identifies the presence of remnant native vegetation generally less than one hectare which broadly fits into two vegetation types including Narrow-Leaved Peppermint-Mountain Gum Open

Forest, and 'Snow Gum Low Woodland and Box-Gum Woodland. No threatened flora species were recorded on the site during the surveys. These communities are depicted in Figure 18.

The assessment concluded that the remnant vegetation was considered to be significantly degraded as a result of clearing activities and grazing. Noticeably, understorey vegetation was absent from these areas which was consistent with stock trampling with primarily introduced grasses replacing natives. In addition to the remnant communities, there are scattered trees on both properties consisting of planted mature pines located primarily along fence lines and remnant trees primarily wattles.

The Proponent's assessment indicates that the proposal will require an aboveground footprint of twenty metres by twenty metres for construction activities for each turbine equating to approximately 3600 metres squared. This reduces to 2300 metres squared following completion of construction, as footings will be covered by topsoil and revegetated with grasses to permit grazing to the base of the turbines. The substation and access tracks will require 1.2 hectares.

The Proponent's assessment indicates that very little, if any of the existing remnant vegetation (trees) would be cleared, rather only the grasses within grazing areas as the wind turbines will be located on existing cleared knolls, ridgelines and elevated flats.

A primary driver for this site selection was the absence of significant tree vegetation communities on the property and the turbines themselves were positioned to be away from such. This is due to vegetation near turbines affecting wind speed as they slow winds and therefore electricity generation.

The Proponent has identified a range of measures to minimise the impact of the wind farm on flora at the site, including only removal of vegetation within the actual development footprint, micro-siting of roads utilising existing tracks wherever possible and underground cabling, appropriate stabilisation of exposed areas, weed management and measures to reinstate topsoil, subsoil. The Department supports these measures and their inclusion in the Proponent's Statement of Commitments.

Fauna

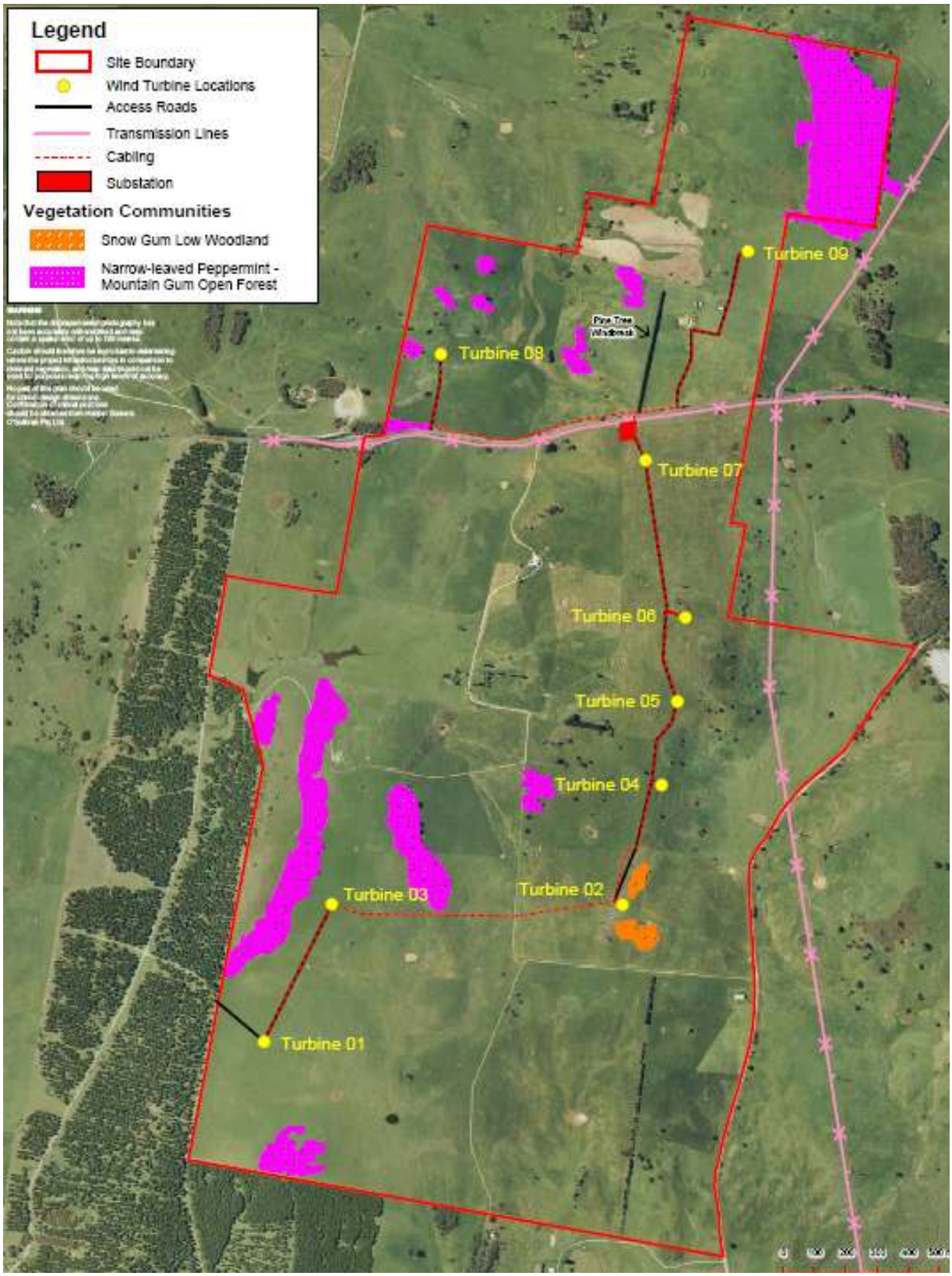
The Proponent undertook a fauna survey which sampled the range of habitats likely to be directly affected by the proposed project including attributes of habitats, significant habitats within the locality and an assessment of likely key corridors at Black Springs. 110 vertebrate fauna species were recorded during surveys, including 103 native and seven introduced species. The species recorded, and those that have the potential to occur are considered typical of the habitats present on the site and in the wider locality.

The impact on birds and bats from blade strike is a key area of concern for wind farms and thus is the primary focus for the Department's fauna assessment. The Department received a number of submissions from members of the public in relation to this issue.

To assess the impact of the proposal on avifauna species located either on or with the potential to occur on the site, a risk assessment was undertaken. The risk assessment identifies and evaluates risks posed by the proposal with respect to collisions with wind turbines causing death (often referred to as blade strike) and habitat loss or avoidance caused by the presence of the turbine and infrastructure and takes into consideration mitigation measures proposed by the Proponent. The assessment drew on past experience at other sites and from what is known of the ecology and behaviour of different species at risk of collision with wind farm infrastructure, such as what height species fly at or where they forage.

Five threatened fauna species were recorded during the current and / or previous surveys, including *Oxyura australis* (Blue-billed Duck), *Miniopterus schreibersii* (Eastern Bent-wing Bat), *Falsistrellus tasmaniensis* (Eastern Falsistrelle), *Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat) and *Myotis adversus* (Large footed Myotis).

Figure 18 - Vegetation Communities on the Project Site



Recordings of the Blue-billed duck were confined to a large dam located in the neighbouring Winton Park property whereas all threatened bat species were recorded at Mount Bathurst. The Eastern Bentwing Bat was also recorded at Daisybank, while the Eastern Falsistrelle was also recorded at both Winton Park and Daisybank. The Brown Treecreeper and Diamond Firetail have been recorded irregularly at the Daisybank property on the western edge of the property in open forest and associated disturbed riparian habitat respectively. These two species are listed as 'Vulnerable' under the TSC Act.

The Proponent's assessment of significance on bat species concluded that the proposal is not likely to significantly affect the life cycle or habitat for these flora species. Some minor impacts to birds and bats may be expected due to turbine collisions. These are likely to be in line with stated Australian Wind Energy Association (2004) collision rates of approximately several individuals per turbine per year. This is likely to cause minor changes to local distribution and abundance of locally occurring common species as a consequence of the ongoing operation of the turbines. However, these impacts are not expected to be significant with few or no impacts on population(s) sizes or surrounding habitats. The Department supports these conclusions.

The Proponent would also adopt an adaptive management approach and where impacts exceed a certain threshold, detailed in a management plan, mitigation measures would be implemented. Such measures identified by the Proponent include adjustments or enhancements to turbines and associated infrastructure, installation of flight diversion and deterrent structures, removal of local food sources, compensatory off-site habitat protection or enhancement, nest site protection, sponsoring the care of injured birds and the periodic shutdown of one or more turbines as required.

Consideration

The Department recognises the proposed wind farms potential to impact upon the local bird and bat population and considers it essential that should the Minister approve the project, the Proponent be required to undertake ongoing monitoring of bird as well as bat species at the site. An adaptive management approach should also be adopted to address any emerging issues arising from the results of monitoring. Should the Minister determine to approve the proposed wind farm, the Department recommends the Proponent be required to prepare and implement a Bird and Bat Management Program. This program must incorporate ongoing monitoring and a decision matrix that clearly sets out how the Proponent would respond to the outcomes of the monitoring work.

In addition, the commercial pine plantations surrounding the site and Black Springs generally were considered and concluded to be likely to provide shelter and general connectivity for some native fauna species within the locality, although they are of poor value in terms of providing foraging habitats or nesting hollows / microhabitat components. Outside of the Forest NSW estate the landscape is primarily pasture with scattered trees. Creek lines contain little native vegetation in many areas, limiting their value in terms of providing habitat or connectivity. Some boundaries have been planted with exotic pines, while others support stands of native trees. These contribute to the limited connectivity within the locality. Some remnant patches have been retained and these range in size from a few trees to approximately ten hectares. The larger of these remnants provide important habitat by themselves, while all of these remnants are likely to function as important 'stepping stones' for mobile fauna such as birds and bats. By not removing any vegetation it is considered that the existing habitats for species will be minimally affected.

The Department is generally satisfied that the survey provides a useful basis upon which to undertake an assessment of the proposed development's impact on flora and fauna. The Department considers that the proposed wind farm will not have a significant impact upon flora and non-avian fauna provided measures are taken to carefully position infrastructure to avoid the removal of remnant vegetation.

Similarly, the Department considers that the potential risk of bird and bat deaths from the operation of the wind farm would be low and that impacts could be adequately managed provided the Proponent implements the measures it has committed to undertake and operates the project in accordance with the Department's recommended conditions of approval.

5.4 Hazards and Risk

Bushfire Risk

The potential for wind turbines to start bush fires has been raised in a number of submissions. Submissions also expressed concern regarding lightning strikes and the potential to start fires and raised issues concerning the turbine placement with regard to the Burraga Fire tower radio link to the Black Springs field office which plays a significant role in the detection of fire activity in the area. An assessment of potential impacts to the line and mitigation measures as specified in the Departments recommended condition of approval can be found in section 5.8. The Proponent notes that summer conditions in the Oberon district can be hot and dry with high wind speeds, producing a local grass fire hazard. Both properties adjoin Vulcan State Forest which consist entirely of pine plantations and is considered to be a high-risk fire source.

In the event of a fire, the cleared grassland found on the participatory landholdings tends to burn for shorter periods at a lower heat when compared to the pine plantations located on neighbouring landholdings. Construction and maintenance of Asset Protection Zones (specifically beyond one hundred and forty metres for vegetation such as pine classed as category 3 as per the NSW Rural Fire Service Building in Bushfire prone areas 2001) reduces this risk. The Proponent identifies both construction and operational factors associated with the wind farm have the potential to influence bushfires. With respect to construction, the key issue relates to flammable material such as fuel being brought on to site. The Proponent states that this would be managed through appropriate storage and handling as per manufacturer's instructions and keeping appropriate fire fighting equipment on site during high fire danger periods. The Rural Fire Service (RFS) would also be consulted during the construction phase. The Department is satisfied that any fire risk during construction could be adequately managed and supports the measures proposed by the Proponent.

The Department notes the importance of keeping the RFS informed of construction works at the site and recommends as part of any conditions of approval a bushfire management plan be prepared and implemented in consultation with the RFS. The recommended conditions also require the Proponent to comply with any reasonable request of the local RFS to reduce the risk of bushfire and to enable fast access in emergencies throughout the life of the project.

During operation, the key issues include turbine ignition, lightning strikes, the location of the substation, control room and aerial cables and interference with fire-fighting operations including the Burraga-Black Springs fire link. One submission also noted the fire that occurred at the wind farm at Lake Bonney, South Australia in January 2006 and raised concern that the same could happen at Black Springs.

The Proponent states that fires due to equipment failure in modern turbines are very rare. One of the safety features of turbines is that they will automatically shut down if ambient temperatures exceed the safe operating range, or components overheat. Nevertheless, in the event a turbine catches fire, the generally low fuel levels in surrounding pasture, ready visibility of most of the turbines and local presence of rural fire service equipment and personnel would assist in the detection, response and control of the fire. There are existing dams and new water tanks will be installed on both properties to ensure adequate supplies exist in the case of an incident on the property. For the substation, the Proponent states that it will be bunded such that the capacity exceeds the level of transformer fuel. Regular inspections and maintenance will also be undertaken. With respect to concerns regarding lightning, the Proponent states that all turbines will have lightning rods installed to ground strikes and minimise damage and fire risk. The Proponent considers that the presence of the wind farm would not be a hazard to fire fighting helicopters and planes as there are no large water bodies in the immediate vicinity and hence, such aircraft are unlikely to fly close to the turbines.

The Department is satisfied that the potential for wind farms to cause a fire or to fuel them once started is low provided appropriate precautionary measures are implemented to minimise risk. As noted above, the Department recommends a bushfire management plan be implemented during construction and operation, following consultation with the RFS. Appropriate fire fighting equipment should be kept on-site at all times with personnel trained in its use. The local RFS be consulted regularly to ensure it is familiar with the project.

Aviation Hazards

Three airstrips were identified in the immediate area (within 10km), two are now pine plantations with the remaining site subject to two to three rotary wing (helicopter) movements a week. The distance from the nearest turbine to the landing ground is approximately 1500m. Helicopters rely on visual approach for all landings. This generally restricts movements to and from the property. The turbines have been designed to allow sufficent distance for a helicopter circuit and landing at the Swatchfield property without any impacts.

Irrespective, under the Civil Aviation Regulations, the Civil Aviation Safety Authority (CASA) may determine that an object or a proposed object that intrudes into navigable airspace may be required to provide obstacle lighting. In the case of obstacles located outside an aerodrome, lighting may be required if the structure is greater than 110 metres above the ground level.

The proposed wind turbines are greater than 110 metres in height. The Proponent consulted with CASA to determine the need for obstacle lighting for the Black Springs wind farm. CASA advised that in July 2007 Advisory Circular AC 139-18(0) Obstacle Marking and Lighting of Wind Farms was published with a purpose to provide information and advice to proponents of wind farms and planning authorities on how to mitigate possible hazards for low flying aircraft.

In order to comply with this circular, specifically clause 5.7, CASA has endorsed a lighting plan for the wind farm. Turbines 01, 02, 03,06,07,08 and 09 will be equipped with an obstacle lighting system that will be mounted on the turbine generator housing. Each housing will contain two flashing red medium intensity obstacle lights positioned in a manner so that they aren't obscured by the rotor hub.

In addition, CASA has been provided with the relevant coordinates and heights of the "as constructed" wind farm. CASA has advised that should the Minister determine to approve the project and the turbine locations vary, re-notification will be required. The Department of Defence also provided comment on the proposal during the exhibition period and raised no objections. Additional comment was sought following the designation by the 171 Aviation Squadron in December 2007 to conduct low flying activities within the Black Springs area. The Squadron advised that the wind farm site was at the Northern extremity of the low flying area and is located well away from its activities and raised no objections provided recommended conditions stated in its previous correspondence were incorporated into any approval. These requirements are reflected in the Department's recommended conditions of approval and will minimise impacts to aircraft movements in the area.

Shadow Flicker

Shadow flicker is produced by the shadow cast by rotating turbine blades. It results in a pulsating shadow (often referred to as 'chopping the light') which can be annoying. The effect of shadow flicker attenuates with distance and is generally not noticed beyond around 500-1000 metres from a turbine (or approximately 10 rotor heights)[1]. It has been suggested that no dwelling should experience more than 30 hours of shadow flicker per annum[2]. Concern was raised in a number of submissions regarding the effects of shadow flicker. In response to Department and community concerns, the shadow flicker study was refined and incorporated within the Submissions Report. The independent visual assessment also identified the potential for significant shadow flicker at an adjoining approved three lot subdivision within the Winton Park property.

With respect to the Winton Park property, it is identified the subdivision in question was approved following the exhibition of this proposal. Advice from Council suggests that this subdivision is unlikely to proceed however the Department must assume that as it is approved, there is likelihood it will at some point involve dwelling construction and hence shadow flicker must remain within acceptable bounds.

To assess the impact of shadow flicker for this wind farm on motorists and residences, a general overview shadow flicker diagram was prepared identifying the number of surrounding dwellings and likely hours a year for which shadow will impact the property. A detailed site analysis was undertaken for the four properties expected to experience flicker. Of these four properties, three are participatory landowners, two of which are dwellings and

[1] UK Department of Trade and Industry http://www.dti.gov.uk/energy/sources/renewables/planning/onshore-wind/shadow-flicker/page18736.html retrieved 3 October 2007

[2] Danish Wind Industry Association http://www.windpower.org/en/tour/env/shadow/index.htm retrieved 3 October 2007

the remainder a shed. The fourth is a project-involved receiver which the Department understands is subject to an ongoing agreement to accept the conditions specified within the Environmental Assessment (maximum 50 hours). Shadow flicker may also increase risk of an accident for passing motorists travelling along Campbells River and Swatchfield Roads at certain times of the day due to the angle of the sun distracting the driver.

To prevent excessive shadow flicker from disrupting residences, the Proponent has given an assurance to comply with a maximum of 30 hours of shadow flicker requirements for non-participating landholders who are not subject to an agreement as adopted by the Danish Wind Energy Association and found within the Victorian Policy Guidelines for the development of wind energy facilities in Victoria (2003). NSW does not have its own standard but the 30hrs is considered appropriate. This is due to this figure being generally accepted by industry with it originating from a judgement in a German Court where the Judge found that a period up to and including 30 hours where the residents were awake is an acceptable impact to non project involved receivers.

The Department acknowledges that shadow flicker diagrams present a worst-case scenario as the assessment is based on it always being a clear day, the sun being a point source of light with the rotors always facing directly towards or away from the sun.

However, the worst-case scenario is unlikely to occur as a number of other factors will act to reduce the actual length of time for shadow flicker to occur such as the presence of cloud cover, smoke or dust, or intervening vegetation or buildings, the incidence of the rotors facing directly towards or away from the sun and the period during which the turbines are rotating. It is noted that the project involved receiver has entered into an agreement to accept up to 50 hours of shadow flicker per annum.
This figure is likely to be under 30 hours due to surrounding topography, vegetation (pine plantations) bordering the property which will provide intervening screening.

To reiterate compliance with this criterion, a condition, which reflects the Proponent's commitment, has been incorporated within the recommended conditions of approval.

With respect to impacts on passing motorists, the Proponent states it will monitor the condition once the turbines are in place and implement mitigation measures such as roadway landscaping to ameliorate any safety impacts arising from shadow flicker however, is unlikely to be a significant issue. This approach is supported by the RTA and Department, and is reflected in the recommended conditions of approval.

Driver Distraction

The proximity and visibility of wind turbines to the road and their potential to contribute to driver distraction and other associated safety concerns must be considered. The Department notes that driver distraction can occur because of a number of factors including a turbine's proximity to the road, its location on a prominent landmark or bend in the road. Campbells River and Swatchfield Roads are adjacent to, or bisect the wind farm. Abercrombie Road (the nearest regional road) is located approximately three kilometres east.

During the initial period following the commissioning of the wind farm, it is likely that the wind turbines may provide a new visual focal point for light and heavy vehicle drivers who primarily will be local residential and business traffic. For motorists using Abercrombie Road (combination of local and regional traffic), the turbines will be clearly visible over approximately ten minutes when travelling the first six kilometres of the road south of Black Springs village however, as the turbines are in view for some distance, they will not be a surprise to motorists and are therefore unlikely to compromise road safety

For motorists using Swatchfield and Campbells River Road, the Department notes that the wind turbines will be in much closer proximity and as such, there is greater potential for driver distraction. Motorists travelling along Campbells River Road to and from Burraga will pass the wind farm along a 2.5km stretch equating to a brief exposure between two and three minutes as the vehicle travels through an area. Swatchfield Road will also experience a similar exposure duration. The risk of this occurring, however, is minimised as the turbines will not appear suddenly and are likely to at least be partially screened from view along parts of the road due to intervening topography characteristic of the area, pine plantations at varying degrees of maturity and the trees which line the road in parts. Furthermore, drivers travelling along Campbells River Road are unlikely to be travelling at speed due to the road's pavement and design thereby further reducing the risk of an accident

occurring. A similar outcome can be expected of Swatchfield Road which is a gravel road used primarily for access to private farming properties.

To determine if driver distraction is an issue with turbine(s), the Proponent provided information on daily traffic movements and accident rates within a two-kilometre section along Cormorant Road, Kooragang Island near Newcastle by the RTA from 2001-2006 where an EnergyAustralia wind turbine is located. Annual Average Daily Traffic in 2005 was 19581 vehicles with 33 reported accidents. Of these two fatalities were recorded. Statistics analysed did not identify driver distraction of shadow flicker to be a cause of accidents for which the RTA advised they would not be making any further enquiries at this point in time.

Although it is highly unlikely Black Springs will experience a similar daily traffic flow to that of Newcastle, it is fair to assume that the wind farm will not influence driver distraction greatly within the surrounding road network.

5.5 Traffic and Transport

Issue

Traffic and transport related impacts will be at their greatest during the construction period, most notably during concrete pours due to the number of trucks required and transportation of the wind turbines due to the length of the vehicles. The Department received a number of submissions raising concern about traffic and transport issues associated with construction such as vehicle collisions and inability to utilise public roads when components are transported due to the existing network being too narrow to facilitate passing. Concern was also expressed that the turbines themselves would be a distraction to drivers, particularly for those travelling along Campbells River Road. This issue has previously been addressed in section 5.5 of this report.

Council and the RTA made submissions during exhibition with the RTA requesting a number of conditions relating to traffic and road safety be imposed. Council has requested $310,000 payment to undertake roadwork in the vicinity of Campbells River Road if the Minister determines to approve the project.

Access to the site is somewhat different to previous proposals assessed for wind farms by the Department, as previously approved wind farm locations generally have been located in close proximity to major arteries comprised of dual carriageways (i.e Hume Highway) whereas the Black Springs proposal is located approximately 70km from the nearest artery and is predominately single carriageway. The transport of turbines has the potential to impact on vehicular movements between Black Springs and Oberon in addition to between Oberon and the Great Western Highway at Bathurst.

The existing network already carries a noticeable number of heavy vehicles because of business operations surrounding Oberon namely logging and processed timber articulated vehicles with quarry vehicles also represented.

Consideration

The Proponent undertook an assessment of the impact the proposed wind farm would have on traffic and transport of equipment within the construction, operation and decommissioning periods. The assessment provides a preliminary technical appraisal of the traffic and safety implications arising from the use of selected traffic route(s) and recommends measures for minimising traffic impacts.

Traffic volumes associated with the project will be at its greatest during the construction phase. A mix of light vehicle traffic for workers, concrete trucks and oversized vehicles will be required. This would increase markedly during concrete pours where up to 26 concrete trucks may be required each day to establish each of the turbine footings. In general, the Proponent indicates within the Environmental Assessment that most of the heavy and oversized deliveries will take place over a one to three week period which will result in concentrated disturbances. This equates to approximately 12 oversized vehicle movements assuming deliveries occur only within five-day periods and thus worst case scenario. It is highly likely that these deliveries will be required outside normal construction hours at the RTA's request.

Light vehicle movements based on a construction workforce of 32 persons is expected to generate approximately 2500-3200 movements, with the local road network containing sufficient capacity to cope with this demand.

The Proponent notes that during the commissioning period of between two-four months, 10-20 staff will be on-site whereas during operation two-three staff will attend the site approximately every six months. Access to the site will be undertaken using a light vehicle and via access tracks constructed on the property and not expected to generate any traffic or safety implications.

Equipment will be sourced from either Port Botany, Port Kembla or Melbourne and transported along arterial roads managed by the RTA where it ultimately diverges from the Great Western Highway at O'Connell Road, east of Bathurst and transported to Black Springs via Oberon. O'Connell Road has been identified as the preferred route for oversize and over dimensional loads. The road is sealed with few sharp bends and there are no significant grades that that are likely to cause difficulties for the haulage equipment and transport vehicles. There are no significant settlements along the route between the Great Western Highway and Oberon that minimises any potential noise impacts on residences that may be associated with night movements of oversize and over dimensional loads.

Oberon itself contains a heavy vehicle bypass which, after consultation with Council carries approximately 2000 vehicles a day largely trucks. The proposed heavy vehicle movements associated with the construction period are not likely to adversely impact on the existing road conditions. The Goulburn Road that runs from Oberon to Black Springs is also sealed and contains few bends along with no significant grades and is considered to have minimal difficulties for oversized vehicles.

Vehicles would need to travel through Black Springs village itself to reach the construction site. However, vehicles will not have to make any turns in this village and the majority of residences are contained to the northern side of the road which reduces risk of injury or accident.

It is worth noting that Black Springs already experiences a moderate amount of heavy vehicle movements through the town as a result of logging operations from local pine plantations which transfer timber to the Oberon timber complex. In addition, part of the Goulburn Road is an overland stock route and there is potential for stock strikes whilst travelling to the site.

The Proponent has identified a number of safety issues that could arise as a result of the project, including the risk of vehicle collisions (particularly during wet weather or fog), obstruction by long loads, road surface deterioration, driver distraction, traffic noise and shadow flicker from turbines. To address these issues the Proponent has committed to implementing the following safeguards:

- preparation of traffic control plans for all operations of oversize and overweight vehicles including disruption to logging operations and stock movements. An oversize vehicle permit would also be required to be obtained from the RTA;
- education of drivers regarding the preferred traffic route to the site;
- monitoring of shadow flicker effects on Campbells River Road and where necessary, implementation of mitigation measures to manage this;
- implementation of a monitoring program to assess traffic impacts during construction such as noise and dust and where necessary, implement measures to reduce these; and
- timing of traffic movements to the site outside of peak travelling periods and during times when heavy fogs are likely.

The Department notes there will be a significant increase in traffic volumes during the construction phase of the project. The Department considers that the use of only sealed roads for heavy vehicles during construction and decommissioning phases of the project appropriate, to minimise damage to surrounding gravel roads (Swatchfield Road) which are used primarily for farm access for non-project involved receivers. This is reflected in the Department's recommended conditions of approval.

The RTA made a submission on the EA, raising no objections to the project subject to the Department imposing a number of obligations on the Proponent which include a requirement to undertake a full risk assessment of the route, installation of appropriate regulatory signage advising of heavy vehicle movements, requirements to ensure all vehicles can safely manoeuvre within and to the site, and that safe intersection sight distances, in accordance

with RTA Guidelines, are maintained for all access locations to the site. The Department supports the recommendations of the RTA which are to be incorporated within a traffic management plan.

Council's submission requested that the Proponent contribute $320,000 to local road works surrounding the site rather than the undertaking of dilapidation reports, as it would be difficult to recover costs if the aforementioned report identified damage did occur.

Further discussions with Council identified that Forests NSW enter into an agreement annually with Council involving the funding of specified road works within the Oberon Local Government Area in lieu of dilapidation reports as recognition of impacts that heavy vehicles may have on the network.

The Department is of a different position to the Council and considers that the dilapidation report is a useful tool that reflects the road condition now and post construction. Further, heavy vehicle movements are likely to be concentrated within a short time frame and, due to the existing heavy vehicle traffic along the route selected, the Proponent may be contributing for damage already caused by other parties.

The Council has not identified that the nominated road(s) condition are not fit for its intended purpose. If heavy vehicle movements did not often occur along these areas, the Department would have further considered this request. Nevertheless, the point Council made concerning recovery of costs from damage to infrastructure is valid and the Department considers it appropriate for a bond or corporate guarantee to the amount specified by Council to be lodged as an insurance against damage. This has been incorporated within the Departments recommended conditions of approval. A traffic management plan and dust management plan will be prepared within the construction and environmental management plan to manage previously mentioned traffic and transport issues during the construction of the project. Matters relating to road safety are addressed in section 5.5.

Conclusion

Traffic and transport related impacts are likely to be short term in nature and restricted to the construction and decommissioning phase of the project. The Department is satisfied that the Proponent has adequately identified issues relating to traffic and transport with recommended safeguards for each key location. The Department considers that the implementation of the identified environmental safeguards within the Construction Environmental Management Plan and compliance with the recommended conditions should reduce the risk of traffic accidents and minimise structural and environmental damage.

The Department considers that a bond totalling $320,000 be lodged with Council to rectify damage if dilapidation reporting demonstrates that the heavy vehicle movements associated from the Project have damaged local roads.

5.6 Property Prices and Land Valuation

Issue

Given the variability and subjectiveness of public perception of wind farms, a perceived reduction in a particular amenity such as landscape quality or quietness could negatively affect a section of the property market. This is usually translated to lower saleability and market value of the property.

The Department received a number of submissions expressing concern that the value of their property would decrease should the wind farm be approved and subdivisions that had previously been approved by Council would be unmarketable. Some submissions contended that their property had already been affected by the proposal.

Consideration

As part of the Environmental Assessment, the Proponent included a report undertaken by Roger Lee Property Consultants that assessed the likely impact of the project on local land values by examining overseas wind farms and considering similar developments in Western Australia (Esperance) and Portland in Victoria commissioned by Pacific Hydro for consideration when planning for new wind farms. The Department acknowledges that any

negative effect wind farms may have on property values and future development potential is a major concern to local residents. However, there is limited quantifiable data which can be used to identify any valuation effects. The property value assessment highlighted that recently a sale of an adjoining landholding with full disclosure of the wind farm proposal occurred which resulted in a record price set for the area.

The Department considers the report undertaken by Henderson and Horning Property Consultants for the Conroy's Gap and Cullerin wind farms that assessed the likely impact of the project on local land values by examining overseas wind farms and using the Crookwell Wind Farm developed in 1998 as an appropriate case study in this instance. The Crookwell site has similar land uses (agricultural and rural residential), and several sales have taken place since the wind farm was built. The Crookwell case study examined the sale transactions in the Crookwell area over a 15-year period (1990 to 2006). The review of market sales in the Crookwell case study found no market evidence that having a view of the wind turbines had an effect on reducing land values.

The most extensive survey to examine the effect of wind farms on property values was undertaken in the United States and presented in an analytical report by the Renewable Energy Policy Project[3]. The study did not model the changes in property values, rather it was an empirical review where data from ten wind farm sites was collected and subjected to a statistical regression analysis to determine price changes in three ways:

- how property values (prices) changed over the entire period of the study for the view shed and comparable region;
- how prices changed in the view shed before and after the projects came on-line; and
- how property values changed for both the view shed and comparable community but only for the period after the project came on-line.

The results identified that in 30 separate analyses (that is, ten wind farm sites subjected to three assessments), 26 property values in the affected view shed performed better than the comparable properties. The study conclusion that "there is no support for the claim that wind development will harm property values" was qualified with a statement that more data will need to be analysed as it becomes available. This suggests that the conclusions drawn from the analysis are indicative and preliminary and should be used cautiously when translating to other sites that were not investigated.

The Bald Hills wind farm panel inquiry in Victoria examined the issues of property devaluation for neighbouring properties in a more qualitative manner. A number of property valuers and real estate agents provided submissions and appeared before the Panel Inquiry as expert witnesses. From a review of this evidence, the Panel Inquiry report concluded that:

> *All that appears to emerge from the range of submissions and evidence on valuation issues is the view that the effect of wind energy facilities on surrounding property values is inconclusive, beyond the position that the agricultural land component of value would remain unchanged. On this there appeared to be general agreement.*

The Department notes the concerns expressed in the submissions regarding the project's potential to adversely affect property values. It is arguable as to whether the wind farm may have a dampening effect on a sensitive section of the property buying market. In any case, the Department considers that there would be other influences such as demand for land and housing within a commutable distance from Sydney which affect property values to a more significant degree. The Department considers that the Crookwell case has close similarities with the proposed Black Springs wind farm, particularly as the assessment included sales transactions following the approval of the Crookwell II wind farm (which will have between 46 and 50 turbines), and its experience is therefore useful for drawing insights or for verification purposes.

The Department notes that there will be changes to the visual landscape along with other potential impacts of the wind farm (operational noise, shadow flicker, etc), as discussed elsewhere in this report. However, it is not possible to accurately factor in how this will affect property values. There is no conclusive evidence that significant value changes, transfers or inequities would result from the project proceeding as found in the stated

[3] Sterzinger, G *et al. The Effect of Wind Development on Local Property Values*, May 2003.

US survey and the Bald Hills wind farm panel inquiry. The Department's recommended conditions of approval aim to keep the identified impacts within acceptable limits, to ensure that any property value effects are minimal.

5.7 Other Issues

Erosion and Sediment Control and other Water Quality Issues

The Environmental Assessment identified that once disturbed the soils at the site are sensitive to structural degradation and therefore erosion. A small number of submissions stated that the proposed wind farm has the potential to impact on pastures and dam water quality on neighbouring properties due to increased erosion from construction activities.

The Proponent states that any impacts from erosion and sedimentation are most likely to occur during the construction and decommissioning phases of the proposal, particularly during excavation works and the transport of machinery. Care will need to be taken to minimise the area of compacted soil created by the proposal as this can reduce infiltration capability leaving surface layers of soil more susceptible to wind and water erosion.

Water quality impacts could also arise during the construction phase as a result of improperly stored or used chemicals at the site, including paints, cleaning solvents, concrete products, fuel and the like.

To minimise the potential for erosion and sedimentation and other water quality impacts, the Proponent identifies a number of commitments it will undertake, including:

- exposure of the smallest possible surface during construction;
- installing, where required, sediment fences and flow diversion and energy dissipation structures;
- ensuring vehicles and machinery use established tracks or routes;
- upgrading of tracks, where necessary, in accordance with best practice guidelines published by the former Department of Natural Resources (DNR);
- stabilising and rehabilitating disturbed surfaces as soon as possible;
- appropriately storing chemicals on site, including bunding; and
- reuse of all topsoil.

The Department supports the measures proposed by the Proponent to manage erosion and sedimentation and other water quality impacts and recommends the Proponent be required to prepare and implement an Erosion and Sediment Control Plan, in consultation with relevant authorities, to provide an overarching framework for management at the site.

The Department considers that through the measures proposed to be implemented by the Proponent and the conditions recommended by the Department, potential water quality impacts associated with the project can be adequately managed.

Resource Sterilisation

The proposed wind farm is affected by a current exploration licence (number 5574) issued in 1999 covering an area of 46km^2 for which the Daisybank property is the mid point of the investigation area. A submission from the Department of Primary Industries (Minerals) and the tenement holder objecting to the proposal was received during exhibition.

Both submissions identified that the wind farm had the potential to sterilise minerals on the site, which is only at the early stages of investigation by significantly reducing the potential to undertake aerial surveys and certain ground based activities. This in turn would add significant costs to the proposal and in turn provide a disincentive for mining investment in this area and therefore the State of NSW.

However, both submissions did identify that they were prepared to meet with the Proponent with view to resolving any issues mentioned above and consider mitigation opportunities (such as nominated buffer zones around the structures and cabling) in order to protect both mining and wind farm interests.

The Proponent met with the tenement holder whilst preparing the Submissions Report to resolve this matter and is understood to be entering into a Memorandum of Understanding (M.O.U) to facilitate both interests in the property. Currently this is in its final stages of resolution (October 2007).

The Department notes that both proposed industries are at different ends of the development spectrum with their own potential environmental issues. It is noted that the tenement is only at the early stages of investigation and further research of the resource is required to ascertain if it is viable let alone seeking formal approval (from either the Department or Council) for resource extraction which may take a significant time period.
Nevertheless, the Department considers that this issue should be considered the same to any other land use proposal and is not in the business of promoting wind farms over resource extraction or vice versa, rather assess the merits of an application against its wider regional and State benefits.

The proposal by the tenement holder to restrict investigation of land immediately around the turbines and the substation/ underground cable areas is considered to have merit, as there is potential for concurrent land use and investigations without completely sterilising whole properties. The preparation of an M.O.U is considered an appropriate and positive step in resolving this issue.

The Department's recommended condition of approval have been developed with the above in mind and requires that the proponent of the wind farm liaise with the exploration licence holder, and negotiate measures in both construction and operation to minimise sterilisation.

Transmission Interference

An assessment of electro-magnetic interference was undertaken as part of the environmental assessment which, considered communication links and broadcast networks in and surrounding the site. Electromagnetic interference (EMI) has the potential to cause degradation or total loss of signal strength. The Proponent notes it may cause poor TV reception and can result in a reduction in the coverage of mobile phone, radio and aircraft navigation communications under certain circumstances.

It is noted that it is difficult to assess the impact of the wind farm on television reception until such time as the farm is operational although it is accepted that that there is the potential for impacts to occur without mitigation. The international Telecommunication Union identifies that impacts on reception are unlikely to occur more than five kilometres from a wind turbine. The Proponent has identified that if impacts occur mitigation measures will be implemented such as installation of amplified antennas or satellite dishes. The Department has reinforced this commitment through the conditions of approval by requiring the Proponent to undertake a monitoring program of houses located within five kilometres of the wind farm to determine any loss in television signal strength and rectify any transmission problems, in consultation with the landowners, if they are found to occur.

The Proponent consulted with the relevant service providers of mobile phones and radio communication services and determined that there was generally a low risk of impact from the proposal. However, it was noted that a rural fire service VHF 450-460MHz that links Black Springs to the Burraga fire tower runs through the site. Forests NSW raised concerns that continuous operation of the link was integral for the early detection of fires and their control. The Proponent identified that the Blayney wind farm lies directly in a VHF link and to date not caused any discernable interference. Nevertheless, the Department has conditioned the approval specifying that at no time during construction, commissioning and operation shall the link be interrupted, mitigation at the Proponent's cost occurs if service deterioration is detected. Forests NSW are satisfied with this response.

The Proponent consulted with Civil Aviation Safety Authority in relation to the impact of the proposal on aircraft radar navigation systems who concluded that critical coverage areas are unlikely to be affected. Should any effects become apparent, the Proponent has committed to implementing mitigation measures to address these.

The Department supports the Proponent's commitments and is satisfied that issues relating to transmission interference from the wind farm are not significant and could be adequately managed through the Proponent's statement of commitments and Department's recommended conditions.

6. CONCLUSION AND RECOMMENDATIONS

Historically, the demand for electricity within NSW continues to increase. Predictions using TransGrid's 'medium growth scenario', indicate that annual growth in energy demand over the next decade is likely to be the equivalent of 250-300MW of new installed capacity per annum.

The Black Springs wind farm presents an opportunity to harness a commercial wind resource and contribute to satisfying this demand. The project will produce up to 46,420 MWh of renewable electricity per year. This would equate to a reduction in greenhouse gases of up to 43,660 tonnes of carbon dioxide per year and result in substantial savings in water consumption and pollution reduction that would otherwise result from fossil fuel-fired power stations. The project thus represents a good example of a renewable energy initiative with greenhouse gas saving benefits.

The two principal issues in relation to the project are the visual amenity and operational noise impacts which have been reviewed by independent experts who have had previous experience in dealing with the complexities of wind farm proposals.

The Department acknowledges that the project will alter the visual amenity of the area. The acceptability of these changes will always be a matter of debate because of the subjectivity of individual likes and dislikes. The Department recognises the genuine concerns of some potentially affected residents and sections of the community who have a special attachment to the regional landscape surrounding Black Springs. The Department is, however satisfied that the site is a suitable setting for the project and that the visual impact of the project is not unreasonable because of the varying levels of vegetation screening existing at affected properties, the overall moderate value and the working nature of the landscape associated with the clear felling and re-establishment of radiata pine plantations. This was reaffirmed through the independent review found in Appendix B.

The Department must consider the severity and ability to manage the visual impacts of the project within the context of the broader community and environmental benefits, and in particular, the potential contribution of wind farms to the much broader national, and ultimately global, objective of greenhouse gas reduction. For this project, the broader and overall strategic benefits of the proposal are considered to provide a stronger weighting than visual amenity concerns.

Should the Minister determine to approve the proposed wind farm, the Department recommends a range of measures to reduce the visual impact of the proposal. This includes controlling the colour of the turbines, limiting the amount of lighting at the site, requiring appropriate enclosure and landscaping around the substation and control buildings compatible with the surrounding area and requiring the Proponent to offer landscape treatments to all residences within four kilometres of the site to aid in screening views to the turbines.

The Proponent has demonstrated that the proposed wind farm would be able to operate under most operating conditions within the SA Guidelines noise criteria. Where this is not achieved, as is specifically the case with Turbine 1, the Proponent will need to implement a sector management strategy to ensure potential impacts are minimal on non-participatory residents.

Overall, the Department is satisfied that the impacts of the proposed project have been adequately addressed by the Proponent. The residual impacts can be suitably managed and mitigated through the Proponent's statement of commitments and the Department's recommended conditions in Appendix A.

The site is considered suitable for the proposed project and has the potential to contribute to a diverse energy generation sector by providing a range of benefits to the region and State. Consequently, the Department recommends the project be approved, subject to the recommended conditions of approval.

APPENDIX A – RECOMMENDED CONDITIONS OF APPROVAL

APPENDIX B – INDEPENDENT REVIEWS

APPENDIX C – STATEMENT OF COMMITMENTS

APPENDIX D - RESPONSE TO SUBMISSIONS

APPENDIX E – ENVIRONMENTAL ASSESSMENT