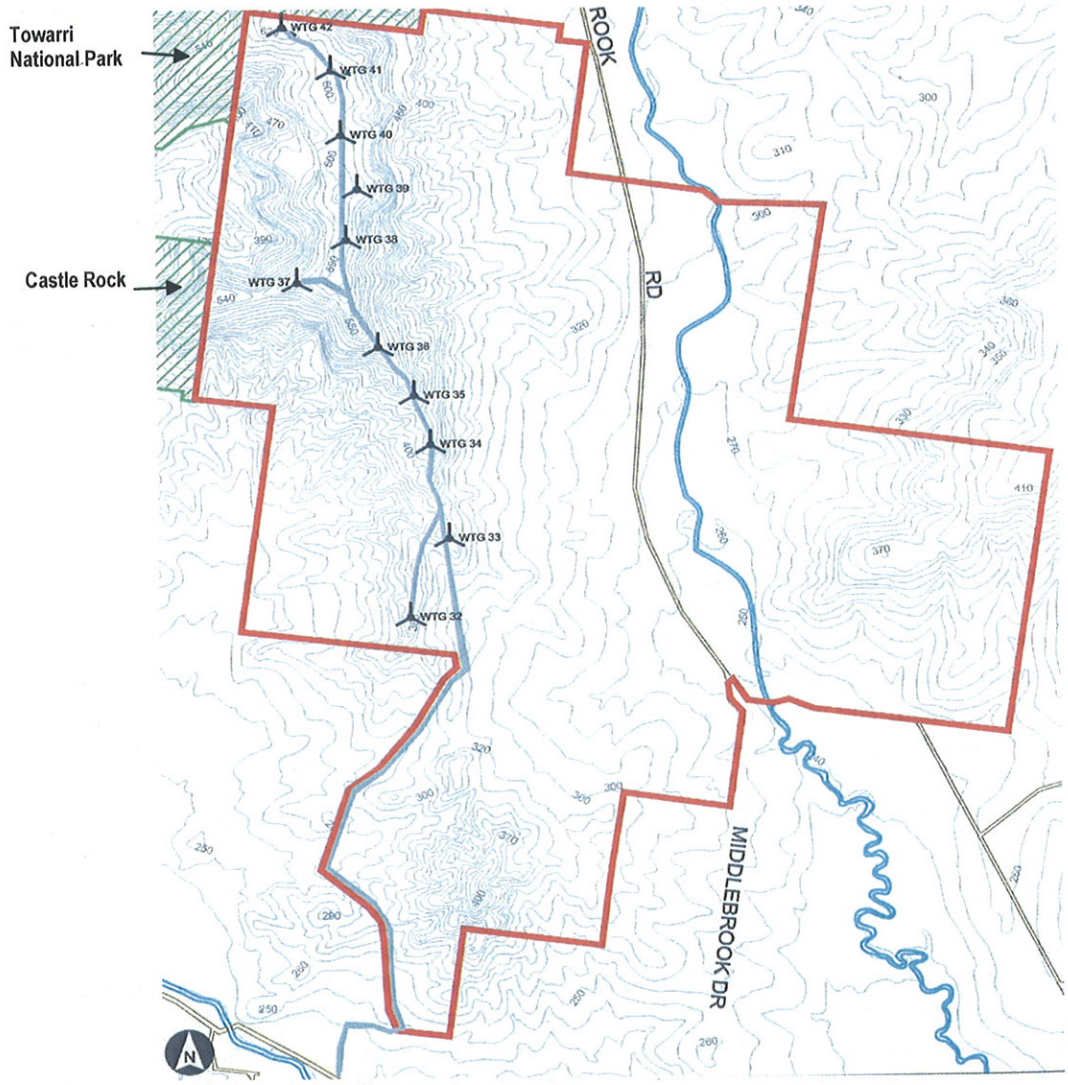
2.2 Changes to Project Since Exhibition

The Environmental Assessment exhibited for the project identified a total of 42 wind turbines comprising 31 at Mountain Station and 11 turbines at Middlebrook Station. In response to concerns raised in submissions, the Proponent made changes to the project as part of its Response to Submissions and Preferred Project Report comprising the reduction of the total number of wind turbines from 42 to 34. All of the turbines removed were from Middlebrook Station with no changes proposed to the other generation elements or the configuration of project components at Mountain Station. The Proponent has stated in its Response to Submissions and Preferred Project Report that the remaining three turbines at Middlebrook Station (including associated transmission costs) remain a viable option for development. The original configuration of Middlebrook Station is identified in Figure 8 below.

Figure 8: Original Turbine Layout at Middlebrook Station (Proponent's Environment Assessment, Exhibited June-July 2009)



The Proponent has identified that the main reason for the removal of turbines from Middlebrook Station was to avoid impacts and intrusion into the landing and take off air space of Scone Aerodrome which was predicted to be impacted by these eight turbines. The Proponent has stated that these turbines were also of most contention with respect to potential visual impacts (including impacts to the Castle Rock scenic area), disturbance of vegetation including endangered ecological communities and residual risk to aerial fauna inhabiting areas of contiguous vegetation within Middlebrook Station and the adjacent Towarri National Park.

The Proponent has stated that the elimination of the eight turbines has reduced the anticipated vegetation disturbance from the project at Middlebrook Station by 93% and it would conserve the entire area of White Box – Yellow Box – Blakely's Red Gum Woodland endangered ecological community (3.6 hectares) originally proposed

to be disturbed at this site by the project. The Proponent has also stated that the removal of turbines is expected to considerably reduce the noise impacts of the wind turbine component of the project to "associated" (i.e. residents within Middlebrook Station) and "non-associated" residents. In summary, the Proponent has concluded that the proposed changes would significantly reduce the overall residual environmental risk associated with the wind turbine component of the project.

2.3 Project Need

Electricity demand in NSW is predicted to rise and exceed existing reserves unless new generation capacity is installed. Both the NSW Government enquiry into electricity supply (Owen Report, 2007) and the National Electricity Market Management Company (NEMMCO) Statement of Opportunities (2007) predicted that additional generating capacity would be required by 2013/2014 to ensure on-going security and reliability of supply. Whilst the 2008 and 2009 Statement of Opportunities revised and pushed back this date by two years taking into account new generation capacity constructed and expected to come on line in the interim (Tallawarra, Uranquinty, Colongra and the upgrade of the existing Eraring Power Station) and reduced overall demand resulting from the Global Financial Crisis, low reserve conditions are notwithstanding expected to be reached mid decade with a deficit of 182 megawatts predicted by 2015/2016. Based on forward predictions, the shortfall could be as much as 1450 megawatts by 2018/19. Additional capacity limitation may also result from drought conditions and associated water restrictions on existing hydro and coal-fired generators.

While demand management and efficiency measures have an important role to play, it is recognised that these approaches alone would not be sufficient to address the predicted deficit in generation reserve by 2015/2016 without the addition of new generating capacity to the network. The Proponent has proposed the Kyoto Energy Park in part to respond to the growing demand and predicted shortfalls in electricity supply in New South Wales. In particular, the Proponent has noted that the proposal would be well placed to address forecast shortfalls in summer peak reserve capacity in the local region, as identified by EnergyAustralia (the network operator in the region) in its load forecasts for the Muswellbrook and Scone substations. The Proponent has suggested that connection of the project to either of these substations would help meet local demand with greater efficiency by avoiding the need for the electricity to be diverted from generators further afield and associated transmission losses.

Based on wind monitoring at the site, the Proponent has determined that there is adequate wind resource at the site to develop a medium sized wind farm with a capacity of up to 113 megawatts. The Proponent has proposed a mix of generation methods including solar and min-hydro to supplement the wind turbines (the main form of generation proposed on site) to enhance the reliability and robustness of generation output from the site. This includes the use of the closed loop mini-hydro plant for reliable peak electricity generation (targeting the short periods of very high demand) and for load balancing of intermittent power generated by the wind and solar components to minimise the variability (and thereby maximise the quality) of power output to the grid for intermediate-load generation. Furthermore, the solar components would be well placed to meet peak summer load with periods of maximum solar generating capacity being closely correlated with periods of high summer peak demand.

The proposal is also a response to State and Federal Government policy on greenhouse gas reduction and the increased use of renewable energy sources of electricity generation, in particular the recent Commonwealth commitment to expand the existing Mandatory Renewable Energy Target (MRET) of 9,500 gigawatt-hours of energy generated by renewable sources by 2010 to 45,000 gigawatt-hours by 2020. The new target aims for 20% of the electricity generated in Australia to be obtained from renewable sources by 2020 and is proposed to be achieved through a new, single, consolidated national scheme (the Renewable Energy Target - RET) which would absorb existing and proposed State and Territory targets. The proposal is expected to commence from January 2010 and would complement (and eventually be overtaken by) the Federal Government's proposed Carbon Pollution Reduction Scheme, a National greenhouse gas emissions target and trading scheme, also proposed to be legislated in the near future. The Proponent has identified that the project would help meet the RET targets for renewable energy as well as provide significant greenhouse gas benefits as Australia moves towards a more carbon constrained market.

Based on life cycle analyses of the proposed generating components (i.e. greenhouse gas emitted during the production, transportation, construction and decommissioning of the components), the Proponent has estimated

that the greenhouse gas payback period for the proposal would be in the order of two years, after which the proposal would provide a net neutral greenhouse gas outcome. The Proponent has suggested that the proposal would in fact have the potential to displace other greenhouse gas intensive generators in the National Electricity Market resulting in net annual savings of greenhouse gas of up to 260,000 tonnes of CO_2 equivalent per annum (calculated on the basis of the forecast NSW Greenhouse Gas Reduction Scheme pool coefficient for 2011/12 as an indicator of the average emissions intensity of major generators in NSW, including existing coal-fired generators).

The Proponent has also identified that the project would have direct local benefits through capital investment and job creation in the locality (particular in the construction phase through multiplier effects) and by increasing visitors/ tourism to the area by creating an added feature of interest in the local (which would benefit existing local economies and potentially complement existing nature-based tourism). The proposal would also provide an added means for the landowner of Middlebrook and Mountain Stations to supplement existing rural income. Furthermore to offset residual local amenity impacts of the proposal, the Proponent has committed to providing yearly community contributions in the order of 0.25% of annual revenue (equating on average to approximately $60-65,000 per year) to fund local community enhancement initiatives, as determined by a specific foundation (the Moobi Foundation Charter) which would include representatives from the Proponent, community and Council.

Department's Consideration

The Department accepts that new generating sources are required to meet the growing electricity needs and forecast future capacity deficits of the State and considers that a diverse mix of local embedded generating solutions would provide the most risk averse method of achieving this outcome, in conjunction with relevant demand management and efficiency measures. A diverse suite of generating solutions would enable the State to achieve a secure and reliable supply base which is resilient to changing market factors including a more constrained carbon market and water restrictions associated with drought which may affect the performance of existing hydro and coal-fired generators. Local embedded generation in regional areas would promote greater transmission efficiencies (and associated greenhouse gas benefits from reduced transmission losses) by reducing the need for electricity to be diverted from further afield and thereby enabling more efficient transmission to the areas of greatest demand, being the load centres of Newcastle-Sydney-Wollongong.

On this basis, the Department accepts the need for the project with respect to helping to secure the State's electricity supply. The Department acknowledges questions raised by some community members in relation to the reliability of wind-generation technology in particular, given the inherent variability of wind resources. In relation to the current project, the Department is satisfied that the Proponent has demonstrated (based on wind monitoring to date) that a viable wind resource exists on site. Furthermore, the Department notes that the Proponent has specifically designed its generation mix to supplement the majority wind-based generation on site, to maximise the reliability and quality of generation output from the project as a whole. On the above basis, the Department considers the proposed Kyoto Energy Park would have a role in helping to meet the energy requirements of the State as well as in addressing local demand.

The Department also accepts that the project would provide important greenhouse gas benefits by resulting in no net greenhouse gas emissions during operation. The Department further notes that the project has the potential to displace other more greenhouse gas intensive generators in the National Electricity Market, although acknowledging that the extent of this displacement may vary from that estimated by the Proponent (noting that the project may not always be in direct competition with non-renewable generators in the National Electricity Market but with other renewable generators, which would result in nil displacement of emissions). Notwithstanding this variation, Department accepts that the project constitutes an important step in the State's transition toward a low carbon economy and would help meet State and Commonwealth targets in relation to greenhouse gas reduction. In this regard, the Department considers the project to be entirely consistent with priorities E2 *(a reliable electricity supply with increased use of renewable energy)* and E3 *(cleaner air with progress on greenhouse gas reductions)* of the NSW State Plan and is justified on the grounds of greenhouse gas reduction.

The Department also accepts that the proposal would involve a number of direct local benefits including employment generation, potential tourist opportunities, opportunities for the local landowner to supplement rural

income and ongoing community contributions to fund local community enhancement initiatives. The issue of community contributions is further discussed in Section 4 of this report.

3. STATUTORY CONTEXT

3.1 Major Project

The project is declared to be a Major Project under *State Environmental Planning Policy (Major Development) 2005* because it is development for the purpose of an electricity generation facility for wind, solar and hydro generation that has a capital investment value of more than $30 million (clause 24(a)). The project is therefore subject to Part 3A of the *Environmental Planning and Assessment Act 1979* (the Act) and the Minister for Planning is the approval authority.

3.2 Permissibility

The permissibility of the project is summarised in Table 1 below.

Table 1: Zoning and Permissibility

Project Component	Zoning	Permissibility
Wind, solar and hydro generating facilities and associated infrastructure including access roads and maintenance shed	1c) Rural Small Holdings - *Scone Local Environmental Plan 1986* (Scone LEP)	Prohibited under the Scone LEP but **permissible** under Division 4 Clause 34 of *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) as the works meet the definition of "development for the purpose of electricity generating works" and would be located on land subject to an equivalent zoning to the "prescribed zones" specified in Clause 33 of the Infrastructure SEPP (in this case "RU4 Rural Small Holdings").
	1d) Rural Holding, 1s) Small Farm and 7a) Environmental Protection "A" Scenic - Scone LEP	Meets the definition of 'Eco-Generating Works' under the Scone LEP and is therefore **permissible** with consent under the Scone LEP.
Substation	1d) Rural Holding	'Meets the definition of 'Eco-Generating Works' under the Scone LEP and is therefore **permissible** with consent under the Scone LEP. Also permissible under Division 5, Clause 41[#] of the Infrastructure SEPP as the Proponent meets the definition of an "electricity supply authority" and the works meet the definition of "development for the purpose of an electricity transmission or distribution network".
Transmission Network (within and outside of the site)	Multiple zonings under the Scone LEP and the *Muswellbrook Local Environmental Plan 1985*	**Permissible** without consent under Division 5, Clause 41 of the Infrastructure SEPP as the Proponent meets the definition of an "electricity supply authority" and the works meet the definition of "development for the purpose of an electricity transmission or distribution network". Division 5, Clause 41 imposes some restrictions on development which affects land zoned for to National Parks (or equivalent). No such land is affected by the current development.
Visitor and Education Centre	1s) Small Farm - Scone LEP	Innominate **permissible** use with consent, under the Scone LEP.
Manager's Residence	1d) Rural Holding - Scone LEP	Innominate **permissible** use with consent, under the Scone LEP.

3.3 Environmental Planning Instruments

There are no environmental planning instruments that substantially govern the carrying out of the proposal.

3.4 Exhibition and Notification

The Proponent submitted an Environmental Assessment with the Director-General in May 2009. Pursuant to Section 75H and 75I(2)(g) of the Act, the Director-General was satisfied that the Environmental Assessment had addressed the environmental assessment requirements specified in Director-General's requirements issued for the project on 1 May 2007. A copy of the Environmental Assessment is attached (see Appendix E).

The Environmental Assessment was placed on public exhibition from 18 June 2009 until 20 July 2009 and submissions invited in accordance with Section 75H of the Act. The Environmental Assessment was also made publicly available on the Department's website.

Following the exhibition period, the Director-General directed the Proponent to respond to the issues raised in submissions. The Response to Submissions (see Appendix D) including final Statement of Commitments (see Appendix C) prepared by the Proponent was subsequently made publicly available on the Department's website.

3.5 Objects of the *Environmental Planning and Assessment Act 1979*

Section 5 of the *Environmental Planning and Assessment Act 1979* details the objects of the legislation. The objects of the Act are:

(a) to encourage:
- *(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment;*
- *(ii) the promotion and co-ordination of the orderly and economic use and development of land;*
- *(iii) the protection, provision and co-ordination of communication and utility services;*
- *(iv) the provision of land for public purposes;*
- *(v) the provision and co-ordination of community services and facilities;*
- *(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats;*
- *(vii) ecologically sustainable development;*
- *(viii) the provision and maintenance of affordable housing; and*

(b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State; and

(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

Of particular relevance to the environmental impact assessment and eventual determination of the subject project application by the Minister, are those objects stipulated under section 5(a). Relevantly, the objects stipulated under (i), (ii), (iii), (vi) and (vii) are significant factors informing determination of the application (noting that the proposal does not raise significant issues relating to land for public purposes, community services and facilities or affordable housing). With respect to ecologically sustainable development, the EP&A Act adopts the definition in the *Protection of the Environment Administration Act 1991*, including the precautionary principle, the principle of inter-generational equity, the principle of conservation of biological diversity and ecological integrity, and the principle of improved valuation, pricing and incentive mechanisms.

It is important to recognise, that while the EP&A Act requires that the principles of ecologically sustainable development be encouraged, it provides other objects that must equally be included in the decision-making process for the subject proposal. The Department has considered the need to encourage the principles of ecologically sustainable development, in addition to the need for the proper management and conservation of natural resources such as natural areas; the orderly development of land considering landuse; and the protection of the environment including threatened species in Section 5 of this report. The agency and community consultation undertaken as part of the assessment process (see Sections 3 and 4 of this report), address objects 5(b) and (c) of the Act.

3.6 Minister's Approval Power

The Department has met all its legal obligations so that the Minister can make a determination regarding the project.

4. CONSULTATION AND ISSUES RAISED

4.1 Public Submissions

As well as receiving public submissions during the exhibition of the Environmental Assessment, the Department also accepted late submissions for a period of two weeks following the close of the exhibition period. A total of 123 public submissions were received on the project. Of these 20% supported the project, 59% objected to the project and 21% did not state a specific position, although identifying concerns or comments for consideration by the Department.

The main reasons identified in submissions of support for the project were that:

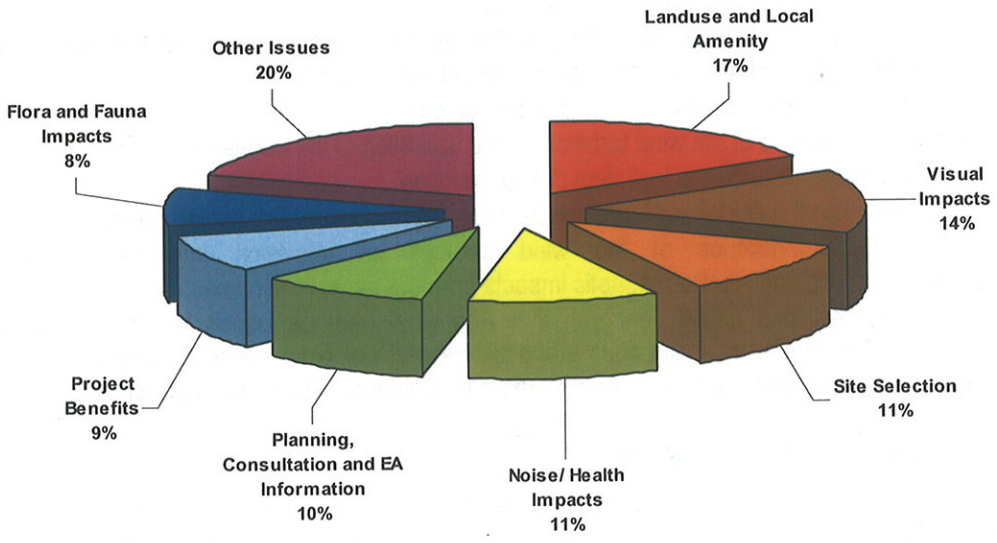
- the project represented a "clean/ green" alternative for electricity production compared to non-renewable generation technologies such as coal-fired power stations and is consistent with Australian government aims of reducing greenhouse gas emissions;
- the impacts of the project would be minimal compared to non-renewable generation technologies such as coal-fired power stations and associated mining activities;
- the project would be a positive outcome for the Upper Hunter region as it would promote the area on the basis of renewable energy rather than non-renewable (coal) resource extraction; and
- the project would provide economic opportunity in the renewable energy sector including direct and indirect job creation and encouraging tourism in the Upper Hunter region.

Of those submissions that objected to the project a large number of submitters did not necessarily object to the project specifically but to wind turbines in general. Many submissions of objection actually supported the solar and hydro components of the project but specifically objected to the proposed wind turbines or did not object to the project in principle but objected to the proposed location of the wind turbines, which were considered to be too close to surrounding residences. The main reasons for objection identified in submissions were that:

- the wind turbine component of the project was not appropriately located;
- the local amenity and environmental impacts of the wind turbine component of the project do not outweigh the strategic benefits of the project (including electricity generation and greenhouse gas benefits); and
- wind turbines were not considered to be an efficient form of electricity generation and the greenhouse emissions displaced by wind generation were considered to be over-estimated. Consequently, the submissions considered that there was no strategic justification for the development of wind farms.

The main issues raised in public submissions are presented in Figure 8. The graph indicates the relevant frequency of a particular issue against all issues raised, rather than as a percentage of submissions raising that issue.

Figure 9: Issues Raised in Submissions



The main issues raised in public submissions in order of magnitude were:

- **land use/local amenity impacts** – the issues identified included:
  - concerns that the "industrial" nature of the wind turbines would be inconsistent with and impact upon the rural amenity and lifestyle ("peace and quiet") of the area;
  - concerns that the wind turbines would negatively impact on property values and the future development potential of land with many submissions requiring that property impacts be compensated;
  - concerns that the wind turbines would negatively impact on the economic viability of local businesses (including the horse breeding industry and other livestock ventures as a result of adverse noise and flicker impacts to livestock and small business such as bed and breakfast accommodation from adverse noise and visual impacts);
  - social impacts including divisions caused within communities through some people opposing and others supporting the proposal; stress and anxiety caused by anticipated impacts at individual residences; and equity issues associated with the direct financial benefits of the project being experienced by a single landowner (whose property the project would be located on) whilst the impacts are perceived to be impacted by surrounding landowners;
- **visual impacts** – submissions raised concerns regarding the visibility of the wind turbines from surrounding residences, the Scone township and the adjacent Towarri National Park and the visual intrusion of the turbines on scenic landscapes such as "Castle Rock" and the Glen Range. Concerns were also raised regarding potential night lighting, blade glint and flicker impacts;
- **site selection concerns** - many submissions considered that the wind turbine component of the project should be located away from developed areas or in already disturbed areas (such as those impacted by coal mining) and suggested minimum buffer distances to nearest residences ranging from three to 7.5 kilometres. Furthermore, submissions raised concerns regarding the proposed transmissions line route(s);
- **noise and associated health impacts** associated with the wind turbines - submissions specifically raised concerns regarding potential low frequency noise impacts referred to as "wind turbine syndrome";
- concerns regarding the **planning and consultation process and the adequacy of information** provided in the Environmental Assessment – issues raised included that the exhibition period was insufficient to enable appropriate understanding of the Environmental Assessment and that the consultation undertaken by the Proponent and the information presented in the Environmental Assessment was insufficient. A number of submissions raised concerns regarding information circulated by local community groups on the project and stated its disagreement with the views expressed therein.
- **project benefits** – submission highlighted the renewable energy (and associated greenhouse gas reduction) benefits of the project; as well as economic benefits from job creation, opportunities for tourism and opportunities for landowners to diversify rural income. Submission also noted the direct socio-economic contributions proposed by the Proponent to the local community in the form of the Moobi Foundation Charter;
- **flora and fauna** impacts – including the level of vegetation clearing, impacts to endangered ecological communities, impacts to wildlife corridors, potential impact to the adjacent Towarri National Park and potential fatalities of birds and aerial fauna from wind turbine strike;
- **Other issues** that were raised less frequently included:
  - road and traffic impacts – particularly from construction related haulage including over-mass and over-dimensional haulage and associated impacts to road infrastructure;
  - justification for wind generation component of the project;
  - aviation safety concerns of the wind turbines on the operation of the Scone aerodrome;
  - construction related disturbance including dust generation;
  - fire risks - including the risk of wind turbines catching alight and bushfire management;
  - electromagnetic interference of the wind turbines on television and radio reception and telecommunications and electro-magnetic impacts from the transmission lines; and
  - heritage – submissions raised concerns that Aboriginal heritage issues had not been adequately assessed and that relevant indigenous stakeholders had not been consulted during the assessment process. A single submission raised concern regarding impacts to European heritage items.

4.2 Submissions from Public Authorities

Submissions were received from 10 public authorities and one State-owned corporation, as listed below, as well as submissions from Muswellbrook Council and the Upper Hunter Shire Council. Hunter-Central Rivers Catchment Management Authority objected to the proposal unless an "improve or maintain" environmental

outcome could be achieved in relation to biodiversity values. Support for the proposal was received from Energy Australia, a State-owned corporation.

None of the other Government agencies provided support or objected to the project, however raised issues for the Department's consideration in its assessment.

Commonwealth Department of Defence (DoD)

- The DoD stated that the wind turbines would be located on the eastern edge of an area where aircraft from RAAF Base Williamtown conduct low flying and therefore the Proponent will need to liaise with the RAAF base to provide details about the project and then keep them informed of the construction time-frame to ensure flight safety. As the turbines would be defined as tall structures, "as constructed" details of the turbines would also need to be provided to the RAAF AIS in Melbourne.
- Details of wind monitoring masts must also be provided to the RAAF Williamtown Base and the RAAF AIS in Melbourne including height and location details.
- The DoD stated that the project was located outside areas affected by DoD regulations and was unlikely to affect existing communications in the region.
- The DoD indicated that it had no objections to the project provided that the abovementioned requirements were met.

Commonwealth Civil Aviation Safety Authority (CASA)

- CASA did not raise any specific concerns about the project however identified a number of statements and reporting requirements outlined in the Environmental Assessment in relation to aviation which were incorrect.

Commonwealth Air Services Australia (ASA)

- ASA indicated that a number of the wind turbines will affect the circling and other aircraft procedures at the Scone Aerodrome and will intrude into the airspace if they are not reduced to (or below) the maximum allowable heights (table of allowable heights provided with the submission).
- ASA indicated that permanent intrusions into the airspace should not be approved as it may impact the safety, efficiency or regularity of existing operations at the Scone Aerodrome.

Former NSW Department of Environment and Climate Change now incorporated into the NSW Department of Environment, Climate Change and Water (DECCW)

- The DECCW confirmed that an Environment Protection Licence would not be required for the project and that it would have no on-going regulatory role in managing the environmental impacts of the project.
- The DECCW identified several significant issues that warranted further investigations by the Proponent, particularly in relation to potential fauna and indigenous heritage impacts.
- In relation to heritage, the DECCW raised the following concerns:
  - The Environmental Assessment indicated that no Aboriginal sites are located in the vicinity of the proposal when in fact there are an Aboriginal burial, a modified tree and an Aboriginal hearth within one to five kilometres of the study area and DECCW has suggested that the discovery of further significant objects within the study area is likely.
  - The DECCW recommended that the Proponent consider any potential impacts of the proposal on these sites, the sensitivity and significance of these sites and any relationship that may exist between these sites and any Aboriginal cultural values of the area.
  - The DECCW was contacted by a number of stakeholders including representatives from the Wonnarua Upper Hunter Tribal Council and the Giwirr Consultants which alleged that they had not been approached by the Proponent or have been misquoted in their apparent endorsement of the proposal.
  - The Environmental Assessment referred to a binding compensation agreement to be discussed further with the Aboriginal community. The DECCW has recommended that land aspects associated with this agreement be provided to the Department of Planning prior to the application being determined.
  - The DECCW noted that correspondence received from the Wanaruah Local Aboriginal Land Council stated that sites of significance along the ridgelines were not covered by field surveys and objects that were found were not discussed in the documentation.

  - The impact of the proposal on significant Aboriginal values was inadequately discussed, including the impact on the Wedge-tailed Eagle which is regarded as an important totem. The DECCW considered that further studies of this species be undertaken to allow a more thorough assessment of the likely impacts of the proposal and should involve the local Aboriginal community.
- The DECCW raised the following issues regarding flora and fauna impacts:
  - Middlebrook Station site is adjacent to the Towarri National Park and the potential impacts to the DECCW estate have not been comprehensively addressed;
  - Impact of bird strike on birds moving from the adjacent National Park including Wedge-tailed Eagles (and other raptors), Powerful Owls, Micro-bats, Flying-foxes and the Glossy Black-cockatoo;
  - Potential for noise and movement of rotor blades to affect predator raptor behaviour and cumulative noise impacts causing home range habitat displacement;
  - Presence of physical obstacles and their impact on nightly flight paths and foraging;
- The DECCW indicated that any asset protection zones should be provided within the development site and not extend into the DECCW reserve or rely on actions being undertaken by the DECCW. The DECCW considered that fire protection zones and fire fighting access tracks should be located on the land where development is proposed.
- The DECCW recommended, subject to project approval, that a condition be included requiring the Proponent to provide a biodiversity offset that either follows the *Principles for the Use of Biodiversity Offsets in NSW* or Biobanking and that any offset be managed in perpetuity.

Former NSW Department of Water and Energy now known as the NSW Office of Water as part of the NSW Department of Environment, Climate Change and Water (NOW)

- NOW considered the groundwater impact risks from the proposal to be minimal and the water supply requirements to be adequately addressed within the Environmental Assessment.
- NOW sought clarification regarding the use of water from existing farm dams on the site for the project.
- NOW indicated that the Construction and Operational Environmental Management Plans for the project should ensure that the project does not result in any adverse impacts or degradation of any watercourse or pollution risks to surface water or groundwater.

NSW Department of Lands (DoL)

- DoL stated that the Environmental Assessment did not mention the network of Crown roads within the boundary of the site and indicated that the Proponent has no right to restrict public access along these roads. DoL noted that a number of turbine generators on both Middlebrook Station and Mountain Station are proposed to be located on Crown roads and not on the Proponent's property.
- No permission has been sought or given for construction of unformed roads, and no information was provided regarding the standard of construction or fate of these roads once constructed.
- DoL stated that the reference to Lot 118 DP 750939 being "Crown Prickly Pear Lease" is incorrect. The land is now covered by Permissive Occupancy 196/4 Scone, held by Middlebrook Scone Pty Ltd for the purpose of "Grazing". Additionally the lot of covered by a Crown reserve for Environmental Protection. Permission for road construction within Lot 118 would need to be sought. The DoL suggested that the Proponent investigate the purchase of Lot 118.
- The Environmental Assessment did not recognise the existence or the impact of the proposal on Water Reserve WR41 within the boundary of Middlebrook Station.
- The proposal may result in the increased risk of bushfire and may need increased security and a perimeter trail which could be utilised as a fire break or fire trail.

Former NSW Department of Primary Industries now incorporated into Industry and Investment NSW (DII)

- The DII submission provided comments from the Mineral Resources Division and stated that there were no concerns regarding the proposal from NSW DII Fisheries, Agriculture or Forestry Divisions.
- DII stated that a more detailed understanding of the potential impacts of the proposal on underlying mineral resources is required.
- DII considers that the project has the potential to significantly impact on the future extraction of coal resources in the vicinity of the turbines and associated infrastructure and therefore design of the project to withstand future ground subsidence should be considered.

- DII indicated that significant coal seam methane gas resources are also likely to be present.
- DII indicated that potential impacts of the proposal on the Clifford Quarry were not discussed. DII considered that quarry operations should be regarded as a constraint to the proposal.
- DII provided a number of recommended conditions of approval for the project.

NSW Rural Fire Service (RFS)

- The RFS did not state a particular position regarding the proposal although provided recommended conditions of approval regarding bush fire protection measures that are required to be implemented by the Proponent.

Hunter-Central Rivers Catchment Management Authority (CMA)

- The CMA indicated that it objects to the project unless an "improve or maintain" environmental outcome is achieved in relation to appropriate biodiversity offsets given the significance of the native vegetation that would be impacted.
- The CMA considered that the project, as presented, did not demonstrate how environmental values are to be improved or maintained with suitable offsets not provided. Offsets should be determined from all clearing of native vegetation not just endangered ecological communities.
- The area has been identified as a key regional biodiversity corridor by the DECCW for connectivity and is within a priority area for conservation enhancement through the Great Eastern Ranges Initiative.
- The erosion and sedimentation control plan must address all aspects of clearing, construction and ongoing operation of the development particularly for works located on steep slopes which have a high potential for erosion.

EnergyAustralia (EA)

- EA indicated its strong support for the proposal in its submission.
- EA also indicated that there is uncertainty regarding impacts on fauna (threatened bird and bat species), long term visual impacts, tourism impacts and cumulative impacts from the proposal.
- EA indicated that the proposal does not quantify the impacts of the proposed transmission options on the environment.

Muswellbrook Shire Council (MSC)

- MSC indicated that it supported the project as it would supply renewable energy.
- MSC indicated its concern with the location of the transmission line option through the Muswellbrook local government area on the scenic amenity of the alluvial flats north of Muswellbrook. MSC was also concerned with the direct impacts of this transmission line option on residents located along the length of the New England Highway.
- MSC recommended that an alternative transmission line option (through the Dartbrook substation) be pursued.
- MSC commented on the traffic impacts associated with the transport of over-dimensional loads to the site and stated that heavy loads should be transported along existing state highway and the existing approved over-dimensional vehicle route through Muswellbrook and that no transport should be permitted during school bus hours. In addition, MSC requested that a pre and post work assessment and dilapidation survey be undertaken on the proposed use of any local roads and requested that a Transport/Traffic Management Plan be prepared for Council approval.

Upper Hunter Shire Council (UHSC)

- The UHSC has raised the following main issues/ concerns in relation to the project:
  - Recommended development contributions totalling 1% of capital cost in accordance with Council's S94 Contribution Plan.
  - Potential devaluation of property values from the construction and operation of wind turbines in proximity to private land.
  - Extent of vegetation clearing including potential impacts on wildlife corridors. Recommended fauna monitoring should be undertaken to ensure that predicted impacts are not exceeded.

- Adequacy of consultation process undertaken with Aboriginal stakeholders.
- Potential construction impacts to heritage items: Castle Rock and the "petrified stump" located along the transmission line route to Scone.
- Noise impacts associated with the wind turbines including low frequency noise (i.e. condition known as "wind turbine syndrome"). Recommended monitoring be undertaken to ensure that noise complaints are investigated and mitigation measures provided to achieve compliance with noise limits. Where measures are ineffective, recommended that further remedial measures be investigated and implemented subject to the approval of the landowner, including consideration of compensation or acquisition and/ or the removal or relocation of turbines.
- Visual impacts from the wind turbines and the effectiveness of vegetation screening.
- Impacts of the wind turbines on the current or future operations of the Scone Local Airport including effects of obstacle lighting.
- Electromagnetic interference attributed to the operation of the wind turbines.
- Dust generation from movements along unsealed roads. Recommended that Yarrandi Road and the section of the access road to Middlebrook Station in the vicinity of a single residence located alongside this road, be sealed.
- Recommended upgrade works to site entrance (including drainage works to ensure that stormwater from entranceways does not impacts on adjacent properties) and to Yarrandi Road (including pavement widening, reconstruction and bitumen sealing). Also recommended that dilapidation reports be prepared on all Council's assets impacted by the development.
- Appropriate bush fire management at wind turbines located close to significant vegetation.
- Expressed preference for a grid connection via Dartbrook substation rather than either the Scone or Muswellbrook options and recommended undergrounding of transmission lines near the Scone Sport complex and near residences that would be unreasonably impacted.
- Recommended that the Proponent construct a viewing area for visitors and the local community to view the development during its construction and operation.
- Recommended conditions of approval in relation to decommissioning (including the requirements for a rehabilitation bond, Community Consultative Committee, complaints line, construction management (including erosion and sediment and dust management).

4.3 Submissions Report

Upon review of the submissions received the Department directed the Proponent to prepare a Response to Submissions. The Proponent's Response to Submissions and Preferred Project Report (including final Statement of Commitments) was received by the Department on 18 September 2009. The report identified changes made to the project as summarised in Section 2.2. The Response to Submissions and Preferred Project Report was made publicly available on the Department's website.

Upper Hunter Shire Council provided an additional submission in response to the Proponent's Response to Submissions and Preferred Project Report, reiterating concerns in relation to: developer contributions, property values, noise and visual impacts of the turbines, aviation safety issues, traffic and transportation impacts (including dust generation at the "Airdrie" property, transmission line connection to the grid, viewing area, decommissioning and rehabilitation and the establishment of a Community Consultative Committee.

A number of public submissions were also received in response to the Proponent's Response to Submissions and Preferred Project Report which re-iterated the key issues raised during the exhibition period, specifically noting that the main benefits of the removal of turbines from Middlebrook Station (particularly in relation to noise) would be limited to associated receivers at Middlebrook Station and would not result in any material visual/noise benefits to surrounding non-associated receivers as three turbines would continue to be retained at Middlebrook Station and no change was proposed at Mountain Station.

4.4 Department's Consideration

The Department's consideration of key issues raised in public and agency submissions is provided in Section 5, The Department's consideration of other issues raised in submissions is provided in Appendix A.

5. ASSESSMENT OF ENVIRONMENTAL IMPACTS

After consideration of the Environmental Assessment, submissions, the Proponent's Response to Submissions/ Preferred Project Report and final Statement of Commitments, the Department has identified the following key environmental issues associated with the proposal:

- Noise and Health;
- Visual Amenity; and
- Flora and Fauna.

All other issues are considered to be adequately addressed by the Proponent's Response to Submissions and/or revised Statement of Commitments.

5.1 Noise

Issue

Wind Turbines

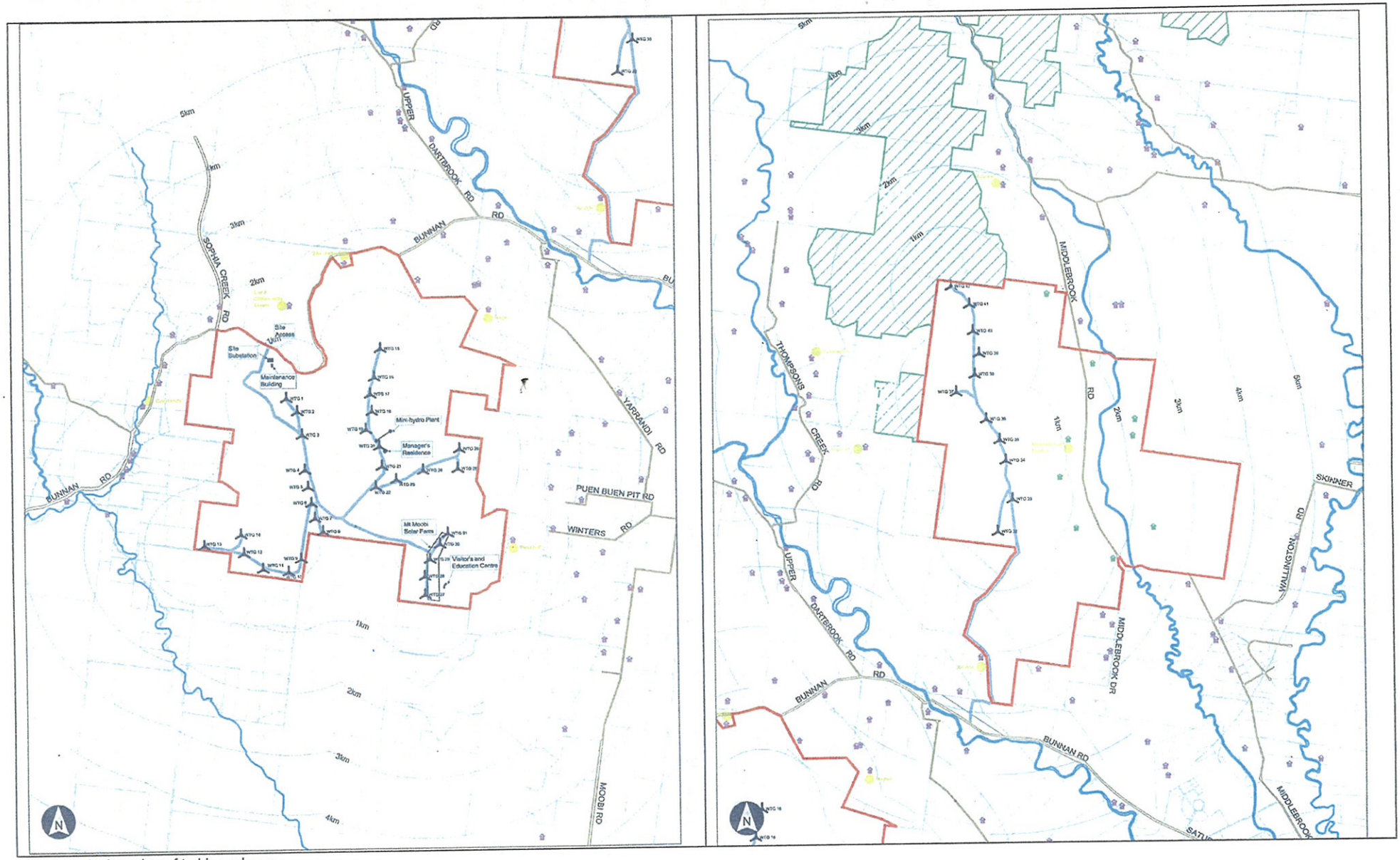
Noise generated by the operation of wind turbines is assessed in New South Wales in accordance with the South Australian Environmental Protection Authority *Wind Farms Environmental Noise Guidelines February 2003* (SA Guidelines). The SA Guidelines requires that the noise generated by the operation of wind turbines do not exceed a noise level of 35 dB(A) L_{Aeq} or the background noise level (L_{A90}) by more than 5 dB(A) (whichever is greater) at surrounding "non-associated" landowners (being land owners which have not entered into a commercial agreement with the Proponent to offset noise impacts). The 2003 SA Guideline does not identify specific noise limits for "associated" landowners noting that this is subject to agreement between parties as part of commercial negotiations. Notwithstanding to protect the amenity of "associated" receivers, the Proponent has proposed a noise limit of 40 dB(A) or background + 10 dB(A) at these receivers, involving no greater than 5 dB(A) additional tolerance in comparison to non-associated receivers. The Proponent has reached an agreement with the landowner of each of the dwellings located at Middlebrook station, and consequently each of these are considered to be "associated" receptors.

Noise generated by wind turbines increases as wind speeds increase. However, as background noise levels are also affected by increased wind speed, the noise generated by wind turbines at a higher speed may be fully or partially masked by a corresponding increase to background noise levels at the receiver from windy conditions. In recognition of this relationship between wind speed and background noise, the SA guidelines requires that applicable noise criteria at receivers are determined on the basis of background noise levels measured at a receiver at those wind speeds relevant to the operation of the wind turbine (i.e. the wind speeds at which a wind turbine would normally commence and cease rotating). The SA guidelines specifically requires background noise levels measured at the receiver to be correlated with wind speeds measured at the wind farm site to confirm this relationship.

Consistent with the requirements of the SA Guideline, the Proponent has measured background noise levels at representative receivers (refer Figure 10) and correlated against wind speeds measured on site (extrapolated to a hub height of 105 metres). To determine applicable noise criteria at receivers, the Proponent has taken the conservative approach of analysing the measured background noise levels for differences between day and night time noise levels. At receivers, where night times noise levels were identified to be noticeably lower than daytime levels (i.e. at least 2 dB(A) difference), averaged night time noise levels were used as the background noise level for determining relevant noise criteria rather than 24 hour averages as allowed under the SA Guideline.

To determine worst case noise impacts, the Proponent has modelled all noise predictions based on the Suzlon Energy A/S S88 (2.1 megawatt) model turbine on the basis that this model had the highest sound power level of all the turbine models (2.1-3 megawatts) under consideration, as well as considering environmental conditions that have the potential to increase noise propagation such as down wind propagation. The Proponent has determined that noise propagation from the site is unlikely to be significantly influenced by temperature inversions (due to the hub heights likely to be situated well above the inversion layers) and therefore not included this factor in its noise modelling.

Figure 10: Nearest Sensitive Receivers (Proponent's Environment Assessment, Exhibited June-July 2009)



Note: original number of turbines shown.

The Proponent's assessment has identified that the noise generated by the wind turbines would achieve relevant noise limits at all but three non-associated residences. Of these, "Mastin" and "Lot 6 Clifton Hills Estate" are expected to exceed the criterion only in the night time period and between 1-4% and 4-13% of the time respectively, depending on the season (refer Table 3). The remaining receiver, Peakhill, (the closest non-associated resident to the site at 1.3 kilometres from the nearest turbine) is expected to exceed criterion in both the day and night time period between 5 and 39% of the time depending on the season (refer Table 3). With respect to the associated receivers, the Proponent's assessment indicates that the applicable criterion would be exceeded in the night time period up to 13% of the time depending on the season (refer Table 3).

Table 3: Predicted Noise Levels at Associated and Non-Associated Receivers (Proponent's Environment Assessment, Exhibited June-July 2009)

Location	Day / Night	Season	Exceedance of Criteria – 35 or background + 5 (dBA)					
			0-1dBA	1-2dBA	2-3dBA	3-4dBA	4-5dBA	Total
Peakhill	Day	Autumn	13%	5%				18%
		Spring	14%	6%				20%
		Summer	5%	2%				7%
		Winter	21%	10%				31%
	Night	Autumn	7%	3%	6%	4%	1%	21%
		Spring	8%	3%	5%	4%	1%	21%
		Summer	2%	0%	1%	1%	<1%	5%
		Winter	10%	5%	11%	9%	4%	39%
Lot 6 Clifton Hill	Night	Autumn	3%	1%				4%
		Spring	5%	3%				8%
		Summer	9%	4%				13%
		Winter	3%	1%				4%
Mastin	Night	Autumn	1%					1%
		Spring	1%					1%
		Summer	<1%					<1%
		Winter	4%					4%

Location	Day / Night	Season	Exceedance of Criteria – 40 or background + 10 (dBA)					
			0-1	1-2	2-3	3-4	4-5	Total
Middlebrook Station	Night	Autumn	1%	<1%				1%
		Spring	1%	1%				2%
		Summer	<1%	<1%				1%
		Winter	4%	2%				6%
Middlebrook Accommodation	Night	Autumn	3%	1%				4%
		Spring	3%	1%				4%
		Summer	1%	<1%				1%
		Winter	9%	4%				13%

Note: Results based on original number of turbines.

Based on an analysis of wind shear gradient data on site (rate of wind speed change from top to bottom of the turbine), the Proponent has concluded that some of the noise exceedances may be characterised by modulation related effects (i.e. "whooshing" sound resulting from wind speed at the top of the rotor blade being sufficiently different to the wind speed at the bottom of the blade, during wind turbine operation). Modulation is most likely to occur at night time when steep speed gradients can form in more stable atmosphere. Modulation is expected to be felt at wind shear gradients above 0.2. The Proponent has identified that the wind shear gradients associated with the project are likely to be between 0.15 to 0.24.

The Proponent has determined the level and frequency of exceedance predicted at "Mastin" and "Lot 6 Clifton Hills Estate" to not be significant and not warranting specific mitigation. However, the Proponent has committed to undertaking noise monitoring to determine whether any of the noise exceedances are characterised by modulation effects, and where this is the case to manage impacts through sector management (i.e. ramping down or shutting down of specific turbines to minimise times of worst impact). In relation to the greater level of impact predicted at "Peakhill", the Proponent has proposed "sector management", meaning the reduction or cessation of operation of those turbines predicted to result in exceedances at those periods of time/season in which the

exceedance is predicted to occur, to mitigate and manage impacts (including in relation to modulation effects). As noise impacts at associated landowners are expected to be subject to an informed noise agreement, no specific mitigation measures are proposed at these receivers.

Ancillary Infrastructure

Noise generated by the operation of stationary facilities is assessed in New South Wales in accordance with the *NSW Industrial Noise Policy* (EPA, 2000) (INP). The Proponent has therefore assessed the mini-hydro, solar and substation components of the project consistent with the requirements of the INP. Under the INP the most stringent project specific noise limit that can apply to a sensitive receiver in the daytime, evening and night time periods for $L_{Aeq(15\ minute)}$ noise is 35 dB(A) and 45 dB(A) for peak noise events ($L_{A1\ (1\ minute)}$) in the night time period. The noise limits under the INP apply to all receivers unless an alternative noise agreement is entered into between the Proponent and the affected receiver.

The Proponent's assessment indicates that the operational noise generated by the mini-hydro, solar and substation components of the project would comfortably achieve the L_{Aeq} noise criteria of 35 dB(A) at nearest sensitive receivers and at Clifton Hills Estate under neutral metrological conditions (refer Table 4).

Table 4: Predicted Operational Noise Levels for Stationary Industrial Facilities (Proponent's Environment Assessment, Exhibited June-July 2009)

Project Component	Nearest Receiver	Predicted Noise Levels at Nearest Receiver	Predicted Noise Levels at Other Receivers
Substation and Transformer	Lot 6 Clifton estate (1.5km)	22 dB(A)	10 dB(A)
Solar PV Plant	Peak Hill (1.3km)	10 dB(A)	5 dB(A)
Min-Hydro	Several (2.5 km)	25 dB(A)	-

Given the low levels of noise expected to be generated, the Proponent has concluded that these components are unlikely to measurably add to the noise generated by the wind turbine component of the project to result in cumulative noise. With respect to the substation, the Proponent has identified that noise generated by this component is likely to include a low frequency component or "hum". The INP requires the addition of a 5 dB(A) penalty to predicted noise levels to take into account annoyance characteristics such as low frequency noise. Even including the 5 dB(A) penalty, the operational noise associated with the substation (i.e. 27 dB(A)) is expected to comfortably achieve INP criteria of 35 dB(A). The Proponent has also stated that none of the project components would be expected to generate any peak noise events that would affect sleep disturbance and therefore would not exceed the L_{A1} noise goal of 45 dB(A). The Proponent has proposed the following measures to mitigate and manage noise associated with these project components:

- design the substation so as to achieve an overall low noise level of 20 dB(A) at the nearest sensitive receiver;
- provide a four metre bund along the northern/ eastern edge of the substation to further shield Clifton Estates from noise associated with this facility; and
- enclose the hydro plant turbines to provide acoustic shielding at nearest sensitive receivers.

Submissions

The overwhelming majority of submissions raised concerns regarding noise related to operational noise generated by wind turbines in particular low frequency or infra-sound impacts referred to submissions as "wind farm syndrome". Upper Hunter Council also raised concerns regarding wind turbine noise recommending comprehensive noise performance monitoring and complaints management mechanisms and the requirement to undertake remedial measures should noise criteria not be achieved. In particular, Council recommended that the Proponent should be required to remove or relocate turbines to ensure that noise criteria are not exceeded or where noise impacts are unavoidable to compensate or acquire the property.

Consideration

Wind Turbines

A number of submissions raised concerns regarding the general adequacy and representativeness of the Proponent's noise assessment. A key issue with wind farm noise assessment is ensuring that there is good correlation between wind speeds at the wind farm site (at hub height) and background noise levels at the

receiver. Where this is not the case there is potential for noise impacts at the receivers to be underestimated (if wind turbines are generating noise under high wind conditions at the ridge lines and there is no corresponding wind conditions at lower lying receiver site to offset the impact). The Department is satisfied that the Proponent has undertaken a conservative assessment with due consideration to factors that have the potential to affect noise impacts at receivers, including:

- consideration of lower night time background noise levels at receivers where a noticeable difference exists between daytime and night time noise in calculating applicable noise criteria rather than automatically applying 24-hour averages;
- calculation of hub height wind speed based on site-specific wind shear derived from long term on site monitoring data, rather than assumed wind sheer coefficients based on manufacturer test conditions (to ensure that wind speeds on site are accurately represented in modelling); and
- consideration of topographical effects, noise absorption by air and down wind propagation factors under relevant wind speeds in all directions to ensure that worst case impacts at receivers located in different locations are modelled.

A significant concern raised by submitters was that the noise generated by the wind turbines would include high levels of low frequency sound which could cause health related symptoms such as head aches, nausea and anxiety referred to as "wind turbine syndrome". Low frequency noise refers to sound energy at the lower end of the human hearing spectrum (below 200 hertz) including infra-sound which relates to sound energy generally beyond the spectrum of human hearing (below 20 hertz) which is "felt" rather than heard. Although sensitivities between people varies, in general the ear becomes decreasingly sensitive to sound energy above and below frequencies between 500 to 4000 hertz where the majority of speech signals are contained, meaning that sound energy in low frequencies has to be very high for such sounds to be perceived. Low frequency noise is generated by a range of sources including machinery (such as refrigerators and fans), all forms of transport and natural sources such as thunder and therefore normally comprises a component of ambient background noise. Extensive literature reviews in Australia (e.g. undertaken as part of the SA Guidelines) and overseas (the British Wind Energy Association, 2005) have indicated that sound energy generated by modern wind turbines is not characterised by a high level of low frequency noise including infra-sound. The literature reviews have identified that whilst high levels of low frequency noise was a characteristic of earlier wind turbine models in which blades were located down wind of the tower (which lead to this effect through blade interaction with wind turbulence generated around the tower), this fault has been designed out of modern turbines (with blades now located up-wind of the tower) and reviews of operational wind farms sites have not identified low frequency sound to comprise a significant component of the sound energy generated by modern wind farms such as to result in adverse health impacts. On this basis, the Department is satisfied that subject to modern design standards, the wind turbines associated with the Kyoto Energy Park are unlikely to pose a significant risk of low frequency noise generation.

A number of submissions raised concerns regarding the potential audibility of the wind turbines and noted that the project would result in unacceptable noise impacts to surrounding receivers and as yet undeveloped residential lots. The Department notes that the acceptability of noise impacts associated with wind turbines is not related to audibility but rather whether applicable noise criteria would be met. In this regard, the Department notes that the Proponent has predicted exceedences of applicable criteria at the associated receivers located at Middlebrook Station as well as three non-associated receivers: Lot 6 Clifton Hills Estate, Mastin and Peakhill. With respect to the associated receivers, the Department agrees with the Proponent that predicted exceedences are unlikely to be significant given the low level (i.e. by no more than 2 dB(A) in all cases) and low incidence (i.e. 1-13% of time depending on season) of exceedence predicted. Furthermore, as predicted impacts are based on the original number of turbines, the Department notes that impacts at these receivers are likely to be significantly reduced given the removal of eight turbines from Middlebrook Station on the basis of minimising aviation hazard impacts (refer Section 2.2). The Department notes that no specific mitigation measures are proposed at these receivers as they would be subject to an informed noise agreement. The Department supports this approach.

With respect to the non-associated receivers, the Department considers that as with the receivers at Middlebrook station the predicted exceedences at Mastin and Clifton Hills Estate (existing residence and unoccupied lots) are unlikely to be significant due to the low level and low incidence of exceedences (i.e. no greater than 1 dB(A) exceedence, at no more than 4% of the time depending on the season at Mastin and no greater than 2 dB(A) exceedence, at no more than 13% of the time depending on the season at Clifton Hills Estate). Notwithstanding the Department considers that these exceedences may nevertheless pose a source of nuisance impacts at these

receivers. Consequently, the Department considers that these receivers should be subject to sector management to ensure that applicable criteria are achieved at all times (unless alternative noise agreements are reached between parties) and has recommended conditions of approval in this regard. On the basis of predicted impacts at Lot 6 Clifton Hills Estate which indicates that impacts to other as yet undeveloped lots in the estate are likely, the Department considers it reasonable that the project be required to achieve noise criteria at the estate as a whole to protect the noise amenity of lots which are expected to be developed in the future. The Department is satisfied that with the implementation of this measure the noise impacts of the project can be managed to achieve acceptable noise outcomes at these receivers.

Based on the Proponent's assessment, the Department notes that there may be some occasions noise exceedences at nearest receivers occur as a result of wind shear factors on site causing modulation related noise. Wind shear gradients on site are generally expected to be lower than the shear threshold (0.2) which causes modulation, however is expected to exceed the threshold under certain atmospheric conditions of stable atmosphere at night time. The Proponent has proposed to manage any modulation related noise exceedences using sector management. The Department is satisfied that sector management would provide an effective and appropriate means of controlling modulation related noise exceedences. In this regard, the Department notes that sector management targeted towards those high risk meteorological conditions where modulation effects are likely to be generated, would effectively eliminate the risk of modulation related noise impacts from the project. The Department has incorporated requirements in relation to sector management in its conditions of approval to ensure appropriate management of this issue.

With respect to noise impacts at Peakhill, the Department considers that given the extent and frequency of impact (up to 5 dB(A) exceedances up to 39% of the time depending on the season), this receiver is likely to be significantly impacted by noise from the wind farm component of the project. Given the expected frequency of impact, the Department does not consider that impacts at the receiver can be effectively managed through sector management as suggested by the Proponent. The main impacts to this receiver are expected to be generated by a cluster of five turbines located on the Moobi plateau. Given the receiver's location generally equidistant from each of the turbines in the cluster, it is likely that the majority if not all of the turbines in this cluster would need to be removed to result in an appreciable noise benefit at this receiver. In this case, the Department has had to balance whether the residual noise impacts to this receiver would outweigh the renewable energy benefits of the five turbines in themselves and their importance to the overall viability of the project. In this instance the Department considers that where an alternative option exists which would provide an acceptable solution to the receiver, which would avoid the need to remove the turbines, this option should be pursued. In this regard, the Department has recommended that the receiver be granted acquisition rights meaning that the receiver should they so wish can request for the Proponent to buy his/ her property at existing market value. The Department notes that in its submission on the project, the landowner of the Peakhill property has specifically requested that acquisition be considered as a mitigation option for this property. Nevertheless, the Department notes that the requirement for acquisition would not preclude the resident from reaching an alternative noise agreement with the Proponent at any time (should they so wish) which may be in the form of financial or other in kind compensation to offset the noise impacts of the project. The Department considers that this would provide a balanced outcome between the strategic benefits of the project and the local impacts to the resident.

To ensure that the wind turbines are designed and built to achieve applicable noise limits, the Department has recommended a range of operational monitoring and performance verification requirements that must be implemented by the Proponent as well the requirement for an integrated approach to noise monitoring, verification and complaints management with consideration to cumulative impacts from other project components (refer below).

Ancillary Infrastructure

The Department considers the noise assessment undertaken by the Proponent to be acceptable and consistent with the requirements of the INP. Whilst the Proponent has not specifically predicted noise levels under adverse weather conditions (such as high wind or temperature inversions), the Department considers that the risk of exceedence of noise limits would be low given the low levels of noise expected to be generated at source given the small scale of the facilities and proposed mitigation measures (including acoustic shielding and enclosures); the facilities being at ground level meaning that noise would be partially shielded by intervening barriers such as topography etc compared to higher elevation and exposed structure such as wind turbines; and the distance to nearest receivers (>1 kilometre).

The Department notes that for the low frequency component of noise to be perceived as an impact, the overall sound level itself needs to be high. Given the very low levels of noise expected to be generated by the substation, the Department is satisfied that the facility is unlikely to pose a significant risk of low frequency noise impact at nearest receptors.

In summary, based on the Proponent's assessment, the Department is satisfied that the noise generated by the mini-hydro, solar and substation components of the project would be low to inaudible and unlikely to pose a significant noise risk to nearest sensitive receivers or undeveloped lots at Clifton Hills Estate in themselves or by adding to noise generated by the wind turbines to result in cumulative noise impacts. Notwithstanding, the Department has recommended stringent operational noise verification requirements as part of its conditions of approval to ensure that the facilities are designed and operated incorporating all reasonable and feasible mitigation measures to achieve acceptable noise levels at nearest receivers, with consideration of cumulative impacts from the wind turbines.

5.2 Visual Amenity

Issue

Due to their height and elevated location (along ridge lines), the wind turbines are expected to be highly visible features within the landscape. Wind turbines also have the potential to result in visual impacts from shadow flicker (i.e. the rapid movement of turbine blades creating flickering shadows when the sun is located behind the face of the turbine) and blade glint (i.e. the reflection of sunlight from turbine components). Night lighting that may be required at the top of the turbines for aviation safety reasons (to facilitate obstacle identification by pilots) also has the potential to result in visual intrusion at surrounding receivers. On the above basis, the wind turbines are recognised as the main component of the project that is likely to result in visual impacts at surrounding receivers. In comparison, the other project components on site (solar plant, mini-hydro, visitor's centre, manager's residence, maintenance shed and internal transmission cabling) are not expected to constitute visually intrusive features as they would be generally low to the ground and shielded from nearest sensitive receivers by distance and intervening topography and vegetation, and in the case of internal transmission cabling would not be visible due to being undergrounded. The overhead transmission line connection to the existing electricity grid would constitute a new visual feature in locations where the transmission lines are not replacing existing transmission line infrastructure.

The ridgelines associated with the energy park site are characterised by several scenic landscape features including the highly forested areas at the northern end of Mountain Station and adjoining Towarri National Park and distinctive geological features such as Castle Rock. The valley areas below the ridgelines are generally rural in character with cleared pasture areas, scattered vegetation and rural residential blocks transitioning into the built up areas of the township of Scone. The northern areas of Middlebrook Station are zoned as 7(a) (Environmental protection – Scenic Zone) under the Upper Hunter Council *Scone Local Environmental Plan 1986* (LEP) and Castle Rock is listed as a "heritage landscape" in the LEP. The proposed route corridors for the overhead transmission lines generally follow existing infrastructure corridors alongside roads through rural land and some built up areas in the outskirts of Scone.

The Proponent has undertaken a visual impact assessment of the wind turbines (including photomontages) considering potential impacts at surrounding rural residential receivers, the township of Scone, views from local roads and at the nearby Towarri National Park (from informal walking trails and public viewpoints). To determine likely visual *impact*, the Proponent has considered the interaction of 'visual effect' with 'visual sensitivity' factors. The Proponent's assessment identifies visual effect as being the proportion of a receiver's primary view shed that is taken up by the turbines. Key factors affecting visual effect include the scale of the visual feature (in this case the size and height of the turbines) and visibility (that being intervening barriers that would fully or partially screen the view including topography, vegetation and the built environment). The Proponent's assessment indicates that the significance of visual impact at a particular receiver would depend on the extent to which visual effect factors interact with 'visual sensitivity' factors. In this regard a key visual sensitivity factor has been identified to be distance. For example, it is considered that a receiver that has a proportion of its primary view shed taken up by the wind turbines (visual effect) would likely to be more affected if the receiver was located closer to the turbines such that the turbines dominated the receiver's foreground view, than if the receiver was located further away allowing greater landscape context and lessening the scale of the turbines with distance (visual sensitivity); even if increased distance meant than a greater portion of the receiver's view shed would be taken up by wind farms.

Other important 'visual sensitivity' factors that could affect the significance of visual impact through interaction with 'visual effect' include: the duration of views (with receivers travelling along roads expected to be less sensitive than fixed view points such as residences); the number of turbines visible from different directions at a specific location; the scenic quality of the landscape (with receivers being more sensitive to effects on more scenic landscapes); and existing landuse (there being higher sensitivity where the view is considered to be integral to the nature of the landuse such as recreational or conservation areas).

With consideration to the above factors, the Proponent's assessment identified that residences in the vicinity of Thompson Road, Lower Sparks Creek Road, Dart Brook Road, Middlebrook Road and to a lesser extent Yarrandi Road, Moobi Road and Saturn and Middlebrook Roads (associated with residential development on the western outskirts of Scone), have the potential to experience a high level of visual impact from the turbines (refer Figure 11). The impact to the new residential subdivision, Clifton Hills Estate was considered likely to be high, particularly if new dwellings should be built oriented towards the turbines at Middlebrook Station. The assessment indicated Towarri National Park may be highly impacted (as recreational landuse within the National Park was likely to be highly aligned to the undisturbed nature of the area) however this impact is likely to be mitigated by the National Park not containing any formal recreational facilities for the public (such as viewing points or formal walking or camping facilities apart from informal trails) and the perception of visitors to the National Park considering the renewable energy benefits of the turbines. Moderate visual impacts were predicted for the township of Scone (largely due to its distance to the site) and to receivers travelling along surrounding roads (due to the transient nature of the views).

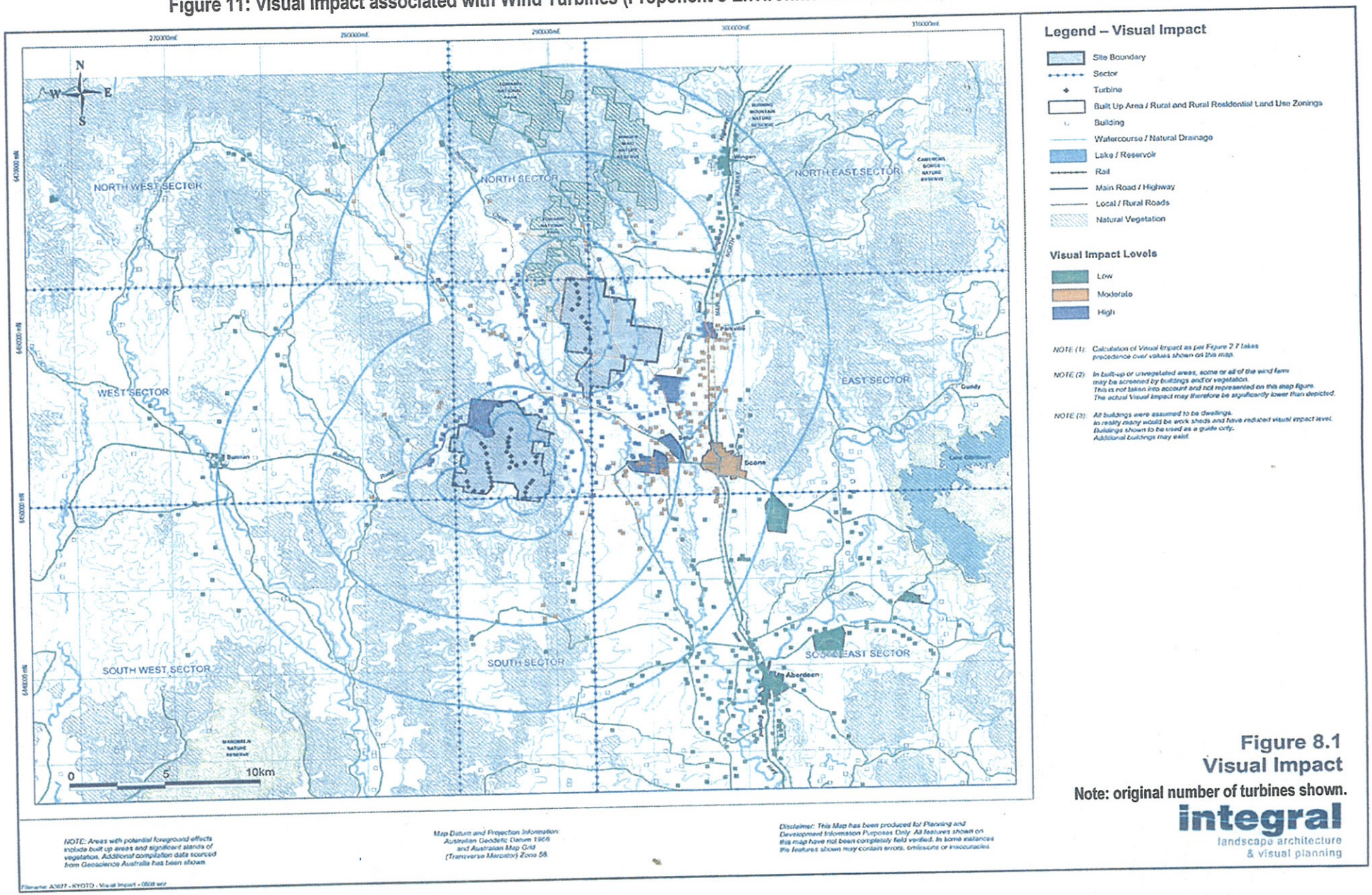
The Proponent has stated in its Response to submissions/ Preferred Project Report that the extent of impacts at many of the above receivers as well as to Towarri National Park are likely to be significantly reduced with the removal of eight turbines at the Middlebrook site on the basis of minimising aviation hazard impacts (refer Section 2.2), which were proposed to be located within the more scenic northern parts of the site. To minimise residual visual impacts at affected residents, the Proponent has committed to undertaking investigations of receivers predicted to be highly impacted to determine opportunities for screen planting at properties should this be agreed to by the residents. Investigations will include consideration of the main location of impact within the property, noting that impacts to views from primary living areas in a dwelling such as family and dining areas are likely to be less acceptable to residents than impacts to views from tertiary areas such as bathrooms and laundries.

At present there are no assessment guidelines governing shadow flicker in New South Wales however, the standard specified in the Victorian Planning Guideline *Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria September 2009* (of ensuring that the duration of shadow flicker does not exceed more than 30 hours per year) is considered to also be acceptable for the New South Wales situation. The draft *South Australian Planning Bulletin for Wind Farms, August 2002* indicates that shadow flicker would be insignificant at separation distances of greater that 500 metres between a turbine and receiver. As a conservative approach, the Proponent has modelled shadow flicker levels up to a distance of one kilometre from each turbine. Only one receiver (a dwelling owned by the landowner of Middlebrook and Mountain stations) is located within one kilometre of the turbines. At worst case, the modelling indicates that the duration of shadow flicker at this dwelling would be no greater than seven hours in a year which is well within the Victorian standard and as such no specific mitigation measures are proposed.

With respect to blade glint, the Proponent has identified that this issue can be effectively managed through the use of low reflectivity matt finishes and committed to the use of such finishes as part of the detailed design for the project. The aviation hazard lighting requirements for the project have yet to be determined and are proposed to be undertaken in consultation with aviation authorities during the detailed design of the project.

With respect to the overhead transmission lines, the Proponent proposes to install either 66 or 132 kilovolt transmission lines using approximately 18.5-26 metres high concrete transmission poles. Along existing transmission line corridors, this would involve the replacement of existing 11 kilovolt lines which comprise approximately 11-12.5 metres high timber transmission poles. Where the transmission involves the replacement of existing lines, the visual impact of the new line is not expected to be significantly different from the existing line; however, the transmission line would create a new visual element outside of existing transmission line corridors. The Proponent has committed to undertaking screen planting where necessary to help visually integrate the lines to the existing environment.

Figure 11: Visual Impact associated with Wind Turbines (Proponent's Environment Assessment, Exhibited June-July 2009)



Submissions

A significant number of submissions raised concerns regarding the potential visual impacts of the proposed wind turbines on surrounding residences, the Scone township, the adjacent Towarri National Park and on scenic landscapes such as "Castle Rock". Concerns were also raised regarding potential night lighting, blade glint and flicker impacts. A number of submissions also raised concerns regarding the potential visual impacts of the proposed new overhead transmissions lines. Upper Hunter Shire Council questioned the effectiveness of screening vegetation in mitigating the visual impacts of the wind turbines and Muswellbrook Council raised concerns regarding the potential visual impacts of the overhead transmission lines on the scenic amenity of the "alluvial flats" north of Muswellbrook.

Consideration

The Department is satisfied that the visual impacts of the solar plant, mini-hydro, visitor's centre, manager's residence, maintenance shed and internal transmission cabling are likely to be negligible for the reasons outlined in the Proponent's assessment (and identified in the preceding sections) and has focused its assessment on the potential visual impacts of the wind turbines and the overhead transmission line options.

Wind Turbines

With respect to highly visible structures such as wind turbines, a key factor influencing the significance of visual impacts is viewer perception, which is highly subjective and can in some cases override all other influencing factors (with some receivers located close to turbines not necessarily experiencing any negative reaction, whilst other receivers located well away experiencing a strong negative reaction to the structures). Notwithstanding, the Department accepts that the Proponent has undertaken a robust assessment with due consideration to factors that can be reasonably considered to influence the level of visual impact.

The Department notes that the visual impact map generated by the Proponent's assessment of wind turbines (reproduced as Figure 11) identifies approximately 98 buildings in the "high impact" zone. However, the Department notes that the assessment is based on highly conservative modelling including assuming that 100% of the buildings identified are occupied dwellings although a large percentage are likely to be farms sheds, stables and the like given the predominant rural landuse and topography being the predominant parameter factored into visibility considerations of 'visual effect' although views are likely to be fully or partially screened at many locations by intervening vegetation and/ or the built environment. Furthermore, the Proponent's assessment has conservatively assumed high 'visual sensitivity' for receivers up 7.5 kilometres away from the turbines, although the assessment identifies that between 2.5-7.5 kilometres, distance from turbines would be sufficient for views to be in the middle-ground with greater landscape context. With consideration to the above issues, the Department considers that the actual number of receivers likely to be 'highly' impacted by the turbines would be considerably less than identified in the Proponent's worst case visual impact map. The Department also accepts the Proponent's assertion that the removal of eight turbines from Middlebrook Station is likely to have significantly reduced the level of predicted impacts (which were based on the original number of turbines) to receivers to the west of Middlebrook Station, particularly along Thompson Creek, Upper Dartbrook and Lower Sparkes Creek roads.

With respect to intrusion on scenic areas, the Department notes that the wind turbine component of the project would not be impacting on any areas of outstanding scenic value identified at a state or regional level including any identified tourist landmarks. With respect to local scenic amenity, the Department is satisfied that the modified project has effectively reduced if not eliminated visual intrusion to those scenic areas identified to be of high local scenic value in the majority of submissions (including the highly forested areas adjacent to the Towarri National Park and distinctive geological features associated with Castle Rock). The Department notes that the removal of eight turbines from Middlebrook Station means that there would no longer be any project component located within land zoned for "Environmental Protection – Scenic Zone" under the Upper Hunter Council LEP. In this regard, the Department is satisfied that the residual visual impacts of the modified project on recreational users of the Towarri National Park would be negligible.

With respect to residential receivers, the Department considers that the presence of the turbines is unlikely to cause significant visual intrusion to receivers within or in the outskirts of the township of Scone due to their distance from nearest turbines (i.e. 7-11 kilometres). With respect to rural residential receivers in close proximity

to the site (generally within 2.5 kilometres), the Department accepts that due to the scale of the turbines at close distances and elevated location along ridgelines, the turbines have the potential to impose a strong visual influence on specific viewpoints of receivers. Notwithstanding, the configuration and location of the turbines are such that individual receivers are not expected to be significantly visually impacted in multiple directions or be "hemmed in" by turbines without any visual relief in any direction. The Department also notes that the vast majority of rural residential receivers would be located greater than 2.5 kilometres from nearest turbines, where the turbines are not expected to dominate foreground views. Of those within 2.5 kilometres, no non-associated receivers are expected to be located within one kilometre of the site where, turbines have the potential to dominate near-foreground views.

To minimise impacts, the Proponent has proposed to further investigate and confirm the significance of impacts at affected receivers and undertake compensatory planting in consultation with affected landowners to help screen and filter views of the turbines. Upper Hunter Council has questioned the effectiveness of screen planting. However, the Department is satisfied that if implemented sensitively with consideration to landowner requirements, the proposed measure would be effective at minimising and managing visual impacts to acceptable levels at most receivers and has consequently reflected this commitment in its recommended conditions of approval. Whilst the Department accepts that some residual visual amenity impacts may remain at specific receivers, even after the implementation of all reasonable and feasible mitigation measures, the Department does not consider that this residual impact would be sufficient to outweigh the overall strategic benefits of the project such as to warrant project refusal.

With respect to the Clifton Hills Estate, the Department notes that potential impacts at undeveloped lots can be largely mitigated through the appropriate design of dwellings with consideration to the location of the turbines (including orientation of primary living spaces away from the turbines). The Department has recommended conditions of approval to ensure that the requirement to undertake compensatory planting extends to undeveloped blocks within Clifton Hills estate (should this be agreed to by the landowner) to minimise any residual visual impacts that cannot be mitigated through dwelling design. With respect to visual intrusion on receivers travelling along surrounding roads, the Department is satisfied that impacts are unlikely to be significant due to the transient nature of the views.

Apart from visual intrusion through their size and scale, the Department has also considered the potential visual impacts of the wind turbines from shadow flicker, blade glint, aviation hazard lighting related intrusion. Whilst a number of submissions have raised significant concern regarding the potential for shadow flicker impacts, the Department is satisfied that due to all surrounding receivers being located beyond the distance (i.e. >500 metres) at which shadow flicker is expected to be of significance, the risk of significant shadow flicker impacts at surrounding receivers would be negligible. This is confirmed by the Proponent's modelling which indicates that the frequency of shadow flicker at the closest receiver to nearby turbines (i.e. an associated landowner dwelling) would be limited to seven hours in a year which is well below the Victorian standard of 30 hours per year. The Department agrees with the Proponent that the risk of blade glint impacts can be effectively managed to ensure no significant impacts through the use of appropriate non-reflective finishes on the turbines structures, and has recommended conditions of approval in this regard. With respect to the potential for aviation hazard lighting requirements to result in visual intrusion at night time, the Department notes that whilst the exact requirements have yet to be finalised in consultation with aviation safety authorities, there would be opportunity to minimise the potential for visual intrusion through sensitive design (including installation of low spill lighting and lighting being installed in every other turbine rather than each turbine). The Department has incorporated conditions of approval requiring that the detailed design of the turbines be progressed with adequate consideration to sensitive lighting design in consultation with aviation safety authorities

Transmission Lines

The Department is satisfied that the proposed overhead transmission line options identified by the Proponent would not impact on any areas of high scenic value as the options are generally proposed to follow existing transmission corridors along roadways, rural land and some built up areas in the outskirts of the township of Scone (for the 66 kilovolt option to the Scone substation). Muswellbrook Council has raised concerns regarding potential visual intrusion of the 132 kilovolt option on the scenic amenity of the "alluvial flats" north of Muswellbrook. The Department does not consider that the area identified by Council involves any specific scenic significance compared to other rural and pastoral landscapes that are proposed to be traversed by the

transmission line. Furthermore, the Department notes that works at this location would involve replacement of existing transmission line infrastructure which already visually intrudes on this area and therefore considers that the Proponent's proposal would not result in any significant visual impacts at this location.

Where the proposed overhead transmission line connection would involve replacement of existing transmission infrastructure, the Department is satisfied that the new line would not result in significant visual impacts as it would not involve any significant change to the function, scale or nature of the existing transmission infrastructure. Whilst the transmission line would introduce a new visual element to a small percentage of land which does not currently include transmission line infrastructure, the Department considers that the proposed infrastructure is unlikely to constitute a significantly visually intrusive element given their relatively minor size and scale (consistent with normal rural or suburban transmission infrastructure). Further, given that the proposed routes are proposed to be contained largely within existing cleared rural land, the transmission easement required for the project is not expected to create a significant visual "scar" of disturbance across otherwise undisturbed land. The Department notes that all transmission line easements on new land would be subject to appropriate compensation as part of easement negotiations with relevant landowners.

5.3 Flora and Fauna

Issue

Energy Park Site

Middlebrook and Mountain Stations are both located on high ground which forms an escarpment to the west and north-west of Scone. The Mountain Station site is characterised as being heavily cleared, as a result of past land management practices for pastoral activities, and has modified native vegetation. The Middlebrook Station site is less disturbed in comparison, and borders the Towarri National Park on its northern and western boundary.

The Proponent's assessment identified a number of vegetation communities on site (refer Figure 12). Of these:

- no threatened flora species were recorded within the subject landholdings;
- seven isolated clumps of *Cymbidium canaliculatum* (commonly known as the Tiger Orchid or Black Orchid) were recorded over the two landholdings. *Cymbidium canaliculatum* is listed as an endangered population in Part 2 of Schedule 1 of the *Threatened Species Conservation Act 1995*. The Environmental Assessment indicated that this species would not be affected by the proposal; and
- Two variants of the White Box Yellow Box Blakely's Red Gum Woodland were located on the subject site (the Box-Woodland (grassy variant) and Box-Ironbark Grassy Woodland). This community is listed as an endangered ecological community (EEC) in Part 3, Schedule 1 of the *Threatened Species Conservation Act 1995* and as critically endangered under the *Environment Protection and Biodiversity Conservation Act 1999*. This EEC occupies an area of 360 hectares on Middlebrook Station and 289 hectares on Mountain Station.

The Proponent originally identified that the energy park site would require the disturbance of approximately 21.15 hectares of native vegetation including 5.9 hectares of White Box Yellow Box Blakely's Red Gum Woodland EEC (refer Table 5). However following the reduction of turbines at Middlebrook Station, the Proponent has identified that the extent of vegetation disturbance would be reduced to 13.15 hectares including the extent of EEC disturbance reduced to 2.3 hectares (refer Table 5). The majority of disturbance would be limited to the Mountain Station site with the extent of EEC clearance at Middlebrook Station reduced to nil (refer Table 5). The Proponent has identified that the majority of vegetation disturbance would be limited to already disturbed areas rather than intact tracts of native vegetation and involve the selective removal of scattered and isolated stands of vegetation largely following existing disturbed areas such as access tracks.

Table 5: Vegetation Disturbance

Vegetation Disturbance (Hectares)	Environmental Assessment			Revised Project		
	Mountain Station	Middlebrook Station	Energy Park Total	Mountain Station	Middlebrook Station	Energy Park Total
EEC	2.3	3.6	**5.9**	2.3	0	**2.3**
Total Native Vegetation	12.55	8.5	**21.05**	12.55	0.6	**13.15**