15 Aviation

15.1 Introduction

Aviation Projects Pty Ltd was commissioned by CDPL to assess the aeronautical and obstacle lighting impacts arising from the Crookwell 3 Wind Farm. The full report appears as Appendix 9.

Under Civil Aviation Safety Authority (CASA) regulations, structures in excess of 110 metres are regarded as ‘tall structures’. As the maximum building height for the turbines under consideration is 152 metres the wind energy facility proposed would be classified as a ‘tall structure’ under the regulations. Accordingly, night lighting is recommended to be used at the proposed Crookwell 3 Wind Farm to reduce the potential hazard to aircraft operations.

15.2 Methodology

Evaluation of the potential aeronautical impact and obstacle marking and lighting has been undertaken in accordance with relevant safety regulations. The assessment considered aviation aspects associated with cumulative impact, visual amenity, hazard/risk and consultation.

The methodology for the aeronautical impact assessment was as follows:

- a site visit was conducted on 18 March 2010;
- a desktop review of supplied materials was conducted;
- relevant regulatory requirements and sources of information were reviewed;
- an assessment of the impact of the proposed wind farm on PANS-OPS and obstacle limitation surfaces of nearby aerodromes was prepared and forwarded to Airservices Australia, Goulburn Mulwaree Council (Goulburn Airport) and Upper Lachlan Shire Council (Crookwell aerodrome) for consideration;
- other stakeholders were consulted in writing and/or by telephone interview as applicable; and
- a lighting design was prepared.

The stakeholders consulted with in relation to the aeronautical impact assessment included Upper Lachlan Shire Council, Goulburn Mulwaree Council, the NSW Rural Fire Service, the Commonwealth Department of Defence, the Civil Aviation Safety Authority, Airservices Australia; the Aerial Agricultural Association of Australia, and the local community and landowners.

The aeronautical impact assessment did not directly assess any visual impacts arising out of the necessary provision of night lighting, however it does include some mitigation options for consideration (refer to Chapter 15.4 below). The landscape impact of night lighting is separately assessed in Chapter 9 – Visual Impacts.

The obstacle marking and lighting assessment was conducted in accordance with the recently withdrawn guideline document - Obstacle Marking and Lighting of Wind Farms (CASA Advisory Circular AC139-18(0)). Although the document has been withdrawn by CASA for review purposes, it has been used for the purposes of risk mitigation for the proposed wind farm, as recommended by CASA.

15.3 Results

In terms of cumulative impact, the report found that the project would result in an increased area that would potentially be restricted from aerial application of agricultural fertilisers and/or pesticides and fire fighting. However, through the consultation process, it was determined that the owners of the site have no intention of using aerial application of agricultural fertilisers and/or pesticides in the future. Furthermore, the report concluded that there are adequate ground-based fire-fighting methods available (refer to Chapter 18 – Fire).
Under the relevant regulatory framework and in accordance with CASA requirements, the proposed wind turbines are considered obstacles. Accordingly, medium intensity obstacle lighting has been identified as a requirement for the proposed wind farm:

- to identify the perimeter of the wind farm;
- at longitudinal intervals not exceeding 900 m;
- so that they are synchronised to flash simultaneously; and
- so that any wind turbines of significantly higher elevation are also identified.

There are other wind farms close by that would also potentially require obstacle lighting. In order to minimise visual impact, the report recommends, where possible, synchronising the flashing of obstacle lights of wind farms within close proximity to each other. In addition, the guidance provided in the withdrawn Advisory Circular (AC) 139-18(0) on the minimisation of visual impact should be adopted in the lighting design.

As a result of the aviation advice, and the recommendations of the CASA guidelines, it is proposed to light 12 of the proposed turbines. The proposed turbines recommended for night lighting are: A26, A31 and A33 (Crookwell 3 South), and A1, A3, A5, A10, A12, A15, A19, A23 and A25 (Crookwell 3 East). A marking and lighting design has been prepared in accordance with applicable regulations and guidance (refer to Figures 50 and 51 – Indicative Obstacle Lighting for Crookwell 3 East and Crookwell 3 South).

Table 22 sets out the distances to two significant aerodromes that are located within the vicinity of the project, near Crookwell and Goulburn as noted in the report:

<table>
<thead>
<tr>
<th>Airfield</th>
<th>Approximate Distance to Wind Farm</th>
<th>Direction from Wind Farm</th>
<th>OLS/PANS OPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goulburn Airport</td>
<td>27km</td>
<td>143 degrees magnetic</td>
<td>OLS: Code 3 instrument non-precision - 4000 m inner horizontal surface, 15,000 m approach and take-off surfaces PANS-OPS – 25 nm sector MSA with 5 nm buffer</td>
</tr>
<tr>
<td>Crookwell Aerodrome</td>
<td>8km</td>
<td>293 degrees magnetic</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

The report concludes that “the proposed development does not impose any significant risk to normal flying operations for nearby aerodromes or aircraft landing areas”. The report deduced that:

- there will be no adverse impact by the proposed wind farm on obstacle limitation surfaces.
- the proposed wind farm will not penetrate any Procedure for Air Navigation Services (PANS OPS) surface.
- Crookwell aerodrome does not have any instrument approach procedures and therefore does not have PANS-OPS surfaces and no further assessment is therefore required; and
- the proposed wind farm will not adversely impact aviation-related communication systems or navigation aids.

In regards to impacts on the current air traffic routes in the vicinity of the wind farm the report found that, in order to avoid the proposed turbines, aircraft would potentially
FIGURE 50
Indicative Obstacle Lighting – Crookwell 3 East

Source: Aviation Projects
FIGURE 51
Indicative Obstacle Lighting – Crookwell 3 South

Source: Aviation Projects
have to fly at a higher altitude or divert around the wind farm. Airservices Australia found that “at a maximum height of 1085 metres (3560 ft) AHD, the proposed wind farm would affect the W10 air route to the north of Goulburn”, however “Lowest Safe Altitude procedures are penetrated by 60 ft and a minor adjustment will be required accordingly”.

The report notes that there is a requirement to notify RAAF AIS of the final turbine locations and heights. The report concludes that the proposed development height, location and distance from radar and associated control zones would be approvable by Airservices Australia. The report further notes that while the proposed wind farm may restrict aerial fire-fighting in the vicinity, the ground-based measures for fighting bush fires present a valid alternative.

In addition, the report found that no aviation-related electric or magnetic fields were identified or notified during the prescribed consultation activities and therefore no adverse effect is anticipated in this regard.

15.4 Mitigation

The report recommended that the following actions be implemented to mitigate the aeronautical impacts of the project:

- The final (approved) turbine coordinates and elevations should be provided to RAAF AIS.
- The rotor blades, nacelle and the supporting mast of the wind turbines should be painted white or off-white.
- An assessment as to whether marking or lighting would be required to enhance the level of safety, in consultation with applicable stakeholders, prior to construction.
- The installation of medium intensity obstacle lighting:
  - to identify the perimeter of the wind farm;
  - at longitudinal intervals not exceeding 900 m;
  - so that they are synchronised to flash simultaneously (both within the wind farm and with other wind farms in the vicinity); and
  - so that any wind turbines of significantly higher elevation are also identified.
- The medium intensity obstacle lights should have the characteristics specified in MOS 139, Chapter 9.
- The guidance provided in withdrawn AC 139-18(0) on the minimisation of visual impact should be adopted in the lighting design.
- The lighting design is subject to final confirmation of applicable regulatory requirements by CASA prior to installation of the lights during construction.
- Ensure the ongoing availability of obstacle lights, a monitoring, reporting and maintenance program should be established in accordance with the requirements set out in MOS 139, Chapter 9.

The proposed obstacle lighting layout should meet the CASA objectives of:

- defining the “general definition and extent of the objects” for each cluster or linear array;
- lighted turbines are to be spaced “at longitudinal intervals not exceeding 900 m” for each cluster or linear array; and
- lighting the most prominent (highest for the terrain) turbine in each cluster or linear array.

Visual impacts can be minimised by restricting the downward component of light to either, or both, of the following:
– Such that no more than 5% of the nominal intensity is emitted at or below 5° below the horizontal.

– Such that no light is emitted at or below 10° below the horizontal.

In addition, in the event the immediate neighbouring landowner(s) would require aerial agriculture spraying of their land adjacent to the wind farm and there is an increase in cost associated with the proximity to turbines, the proponent will cover the reasonable cost increase for the aerial agriculture activity. The landowner seeking compensation for the cost increase must demonstrate and justify this increase with previous records.

Other mitigation measures include vegetation screen planting, as detailed in Chapter 9 – Visual Impacts. As discussed in Chapter 5, the need for night lighting is under review given recent wind farm decisions. If the wind farm does require night lighting it would comply with these specifications and recommendations contained in the aeronautical report.
16 Transport

16.1 Introduction

A report was commissioned by CDPL to assess the transport related impacts arising from the proposed Crookwell 3 Wind Farm. The full report undertaken by URS Australia Pty Ltd (URS) appears as Appendix 10.

The transport impact assessment (TIA) identifies and considers the traffic impact of the project both during the construction and operational phases, along with the cumulative impacts of the adjacent approved Crookwell 2 Wind Farm. It also identifies the likely measures required to improve conditions of the access routes to the site.

16.2 Methodology

In order to establish the conditions and likely requirements for upgrades arising out of the proposal, a site investigation was undertaken in the first half of 2010. Detailed observations were recorded during the inspection and photographs taken to supplement the observations. These are included in Appendix 10.

The report reviewed and includes:

- existing available traffic volumes on the road network and road condition information obtained from the Roads and Traffic Authority (RTA) and Upper Lachlan Shire Council;
- a drive through survey of selected public roads in the vicinity;
- an assessment of the likely traffic volumes and impacts generated by the construction, operation and decommissioning phases of the wind farm, along with the cumulative impact of the adjacent Crookwell 2 wind farm development;
- details of site access roads including how these would connect to the existing road network and any operational or handover requirements; and
- details of measures to mitigate and/or manage the potential impacts.

16.3 Results

In order to ascertain the likely transport related effects arising from the proposed Crookwell 3 Wind Farm, the report assumed an 18 month construction phase, working approximately 288 days of the year with an 11-hour working day (7am- 6pm) and 45 construction personnel on site and 2,603 one-way vehicle movements generated during peak construction month.

As the turbine components would be considered Over Dimensional (OD) loads, the route from Port Kembla to the site is of particular importance. The report specifies the preferred OD vehicles route and access points to the site, which are as follows:

- the preferred port for import of turbine components and equipment is Port Kembla;
- the preferred mode of transport between Port Kembla and Goulburn and Goulburn and the Crookwell site is by road;
- access between Port Kembla and the Hume Highway would be via Main Road 88 (Mount Keira Road) to Goulburn;
- access past Goulburn would be via the Goulburn Bypass;
- the eastern portion of the site would be accessed from Goulburn via Crookwell Road and Woodhouselee Road; and
- the East and South sections of the site would be accessed by:
  - Crookwell 3 East:
    - Option 1 (preferred): Site access via Greywood Siding Road (Crown Road Reserve- not gazetted) and along existing corridor and then left and
travel in a northerly direction towards the southeast corner of the proposed site;
- Option 2 (alternative): Site access via Boltons Lane ‘existing privately used road’ (Crown Road Reserve- not gazetted); and
- Option 3 (alternative): Site access via new access road through Leeston and Hillview Park properties on the opposite side of the road to Rocky Corner property.

- Crookwell 3 South:
- Option 1 (preferred): Site access located on the northern site boundary via Old Crookwell Road along existing road reserve and accessing the site from the north.
- Option 2 (alternative): Site access located on the western side of Crookwell Road approximately 400 to 500 metres north of where Crookwell Road crosses Wollondilly Creek and traverse over Council land in accessing the southeast corner of the Crookwell 3 South site.

Refer to Figures 13 and 14 – Indicative Access & Infrastructure Plans for further detail on access to Crookwell 3 East and Crookwell 3 South.

Two preferred site access routes have been chosen to analyse the performance of the existing road network and model traffic characteristics at the intersections during the peak construction phase of the project. The two chosen intersections are:
- Crookwell Road/Crookwell 3 South access
- Woodhouselee Road/Crookwell 3 East access

SIDRA modelling package was used in this analysis. The results of this modelling indicated that:
- very little impact would occur under the conditions of the ‘worst-case’ scenario provided by the assumptions indicated in this section;
- Woodhouselee Road and Crookwell Road have sufficient spare capacity to allow the turning movements in and out of both site accesses without interfering with the existing road network performance;
- the largest 98% queue length (8 metres) would be experienced during the AM peak hour at the Crookwell 3 South site access however this is insignificant for the purpose of this traffic impact assessment; and
- there is no significant cumulative impact when incorporating the construction phase of the Crookwell 2 development with the proposed vehicle activities of the construction phase of the Crookwell 3 development.

The forecasted construction vehicle volumes generated by the proposed development are based on the Hawkesdale Wind Farm in south-west Victoria, which is a similar project to Crookwell 3, with 31 wind turbines. The peak vehicle volumes generated by the proposal equate to approximately 120 vehicles per day.

The outcome of this study for the proposed Crookwell 3 Wind Farm determines that the impact of the proposal during the construction and operational phases to the existing road network is negligible. In summary:
- There is no significant impact to the existing road network.
- Therefore there is no significant cumulative impact when incorporating the construction phase of the Crookwell 2 development with the proposed vehicle activities of the construction phase of the Crookwell 3 development.
- The impact produced by operational traffic associated with the wind farm will be insignificant.
- Road network improvements are not required to be undertaken given the low vehicle volumes estimated to be generated from the Crookwell 3 Wind Farm development.

- The swept path of OD vehicles may require intersection or road upgrades and this would be determined during the more detailed Transport Management Plan.

- The preferred site access to Crookwell 3 East is to be located along the Greywood Siding road reserve based on existing conditions, minimal vegetation removal and sight distances.

- The selection of the site access to Crookwell 3 South is more restricted with a preferred site access located approximately 400 to 500 metres north of where Crookwell Road crosses the Wollondilly Creek due to location of an escarpment and poor sight lines where the site abuts Crookwell Road.

The report identifies the road network and intersection upgrades required for the Crookwell 2 Wind Farm development. The road and intersection upgrades between Port Kembla and the subject area that would be constructed as part of the Crookwell 2 development include:

- All intersections that require upgrading on the route from Port Kembla to Crookwell, including the Crookwell Road/ Woodhouselee Road intersection

- Crookwell Road (between Woodhouselee Road and Crookwell 3 East site access)

- Woodhouselee Road (between Crookwell Road and Crookwell 3 South site access)

These upgrades are required as part the approved Crookwell 2 Wind Farm and are likely to occur prior to the construction of the proposed Crookwell 3 Wind Farm which requires the use of infrastructure, such as the substation, to be constructed as part of the Crookwell 2 Wind Farm. These road upgrades would also service the site and are not therefore separately required as part of the proposed Crookwell 3 Wind Farm. These upgrades would provide for safe and direct access to both the Crookwell 2 Wind Farm and Crookwell 3 Wind Farm, but will also create improved road conditions which provide tangible benefit to the wider community.

16.4 Mitigation

URS advises that a detailed Transport Management Plan should be developed to outline the finalised transport details and include management and mitigation measures for the project. URS recommends that this document be prepared before the construction phase of the project, to form the foundations for all traffic related activities for the Crookwell 3 Wind Farm.

In order to ensure safety and reduce the impact of the development on the local road network, other recommended mitigation measures include:

- provision of a security bond to be held by the relevant road authority to be used for any unforeseen deterioration in pavement quality;

- detail the frequency for road inspections to be conducted to be compared against the existing conditions (at which representatives are to be present);

- outline prohibited road sections, intersections, times of day or other items for OD and/or construction vehicles to avoid;

- outline expected speed restrictions to be in place surrounding the wind farm sites; and

- minimum signage and line-marking to be installed.
17 Telecommunications

17.1 Introduction

Garrad Hassan was commissioned by CDPL to assess any impacts to telecommunications arising from the proposed Crookwell 3 Wind Farm. The full report undertaken by Garrad Hassan appears as Appendix 11.

Radiocommunications is used as a broad term in the report to encompass all services that rely on electromagnetic or radio waves to transfer information.

The report notes that:

"Wind turbines can potentially cause interference to point-to-point microwave signals through diffraction, scattering or near-field effects. However, it is possible to design around these issues, as the path and interference zone of point-to-point signals is generally well known".

There are two principal methods of transmitting information, being "broadcast (generally described as point to area), and microwave links (generally described as point to point)".

The report identifies the potential for wind farms to interfere with analogue television broadcast signals and microwave signals. This is due to transmissions of domestic television being achieved via analogue broadcast signals which are susceptible to interference, whereas line of sight connections for data, voice and video use microwave links which are less susceptible.

The report states that for analogue television broadcast signals (point to point), large scale interference can generally be avoided by placing the wind turbines at an appropriate distance from the broadcast tower, at a recommended clearance of at least 1 km.

17.2 Methodology

The assessment undertaken included identifying the telecommunications towers located within 50 km of the proposed wind farm and investigating the telecommunication licenses attached to these towers.

An image of the Australian Communications and Media Authority (ACMA) database was analysed in order to ascertain likely interference. A review of the ACMA database for other relevant licences was also conducted.

Other services with the potential to experience interference from the project were also identified, and the potential for interference to those services assessed.

Cumulative radiocommunication impacts from the project and the existing Crookwell 1 and approved Crookwell 2 Wind Farms were also assessed.

17.3 Results

An analysis of the area found that two point-to-point microwave links (involving three fixed licenses in total) were identified with a path over the proposed wind farm (refer to Figure 52). A third link was identified 1 km north east of Crookwell 3 South. The report concluded that:

"The interference zone around these point-to-point links have been identified and it has been found that no turbines from the Crookwell 3 Wind Farm are expected to cause interference to those links".

The report states that "For broadcast signals large scale interference can generally be avoided by placing the wind turbines distant from the broadcast tower". It is important to note that no analogue television broadcast towers have been identified within 1 km of the proposed Crookwell 3 Wind Farm (refer to Figure 53). The closest tower is approximately 16 km from the site at Wades Hill. Furthermore, analogue television is gradually being replaced by digital television which is less susceptible to interference.
from wind turbines. Digital television signals from Goulburn and Canberra service parts of the area around Crookwell.

**Figure 52 – Location of point-to-point transmission vectors for fixed licenses**

![Diagram showing point-to-point transmission vectors for fixed licenses near Crookwell 3 Wind Farm.]

**Figure 53 – Location of broadcast transmitters in the vicinity of Crookwell 3 Wind Farm**

![Diagram showing broadcast transmitters in the vicinity of Crookwell 3 Wind Farm.]
The assessment identified 19 point-to-multipoint type fixed licenses proximate to the Crookwell 3 wind farm (refer to Figure 54). The report found that:

“The nearest point-to-multipoint stations are located at Mt Gray near Goulburn, approximately 22 km to the southeast of the Crookwell 3 site. These stations are operated by Telstra. Telstra has been contacted and has indicated that they should be contacted to obtain the location of the plant before any construction work in undertaken at the Crookwell 3 site. Other operators of point-to-multipoint stations within 50 km of the Crookwell 3 site have been contacted, and none have indicated that interference with their services is likely”.

Figure 54 – Location of point-to-multipoint stations within 50 km of Crookwell 3 Wind Farm

An analysis of the vicinity found 4 radio towers within approximately 50 km of the Crookwell 3 Wind Farm. The report found that it is unlikely that the proposed wind farm would have an impact on AM radio; however FM signals may be susceptible to interference from objects such as wind turbines, resulting in ‘hissing and distortion’ of the signal. This can be mitigated by the installation of a high quality antenna. Furthermore, the proposed wind farm would not have an impact upon signal quality once digital radio is introduced into regional areas.

The report found that television interference attributable to the proposed wind turbines could potentially occur for the following:

- "a total of 6 houses when tuned to the Central Tablelands transmitter;"
- "a total of 7 houses if tuned to the Crookwell transmitter;"
- "a total of 31 houses if tuned to the Mt Gray transmitter in Goulburn;"
- "a total of 22 houses if tuned to the Canberra Transmitter".

A number of mitigation measure are proposed in relation to these anticipated impacts (refer to Chapter 17.4 below).

Garrad Hassan reviewed the ACMA database for other licences with transmission frequencies of the UHF band or higher. The licenses identified can be broadly
described as base to mobile station style communications, and these license types are generally not affected by the presence of wind turbines any more than other elements such as terrain vegetation, and other forms of signal obstruction.

The report also found that the proposed Crookwell 3 Wind Farm would not likely have an impact on aviation radar or meteorological radar operations due to the distance of the site from major airports and Bureau of Meteorology radar stations.

In relation to wireless internet, a number of dwellings obtain internet access from a wireless internet service provider, Cirrus Communications. A review of the service indicates that “it is possible that the turbines at Crookwell 3 Wind Farm could cause some impact to the service if they are located between the communications tower and the customers”. A number of mitigation measures have been recommended in the report (see Chapter 17.4 below).

Residents in the vicinity also have access to satellite television and internet. It has been found that no turbine intercepts the line-of-sight of the internet satellite or the most common TV satellites used in Australia.

The assessment concluded that “no issues have been raised by emergency services regarding the potential for interference to radiocommunications assets operated by emergency services in the vicinity of the proposed Crookwell 3 Wind Farm”.

Cumulative telecommunications impacts of the proposed Crookwell 3, existing Crookwell 1 and approved Crookwell 2 Wind Farms were assessed as low for the majority of the services considered in the report. The multiple mitigation options provided in the report are expected to ameliorate any interference encountered that is attributable to the wind farm operations.

17.4 Mitigation

The report identifies the following amelioration options for households that in the unlikely event that television reception is affected:

- realigning the householder’s TV antenna directly towards their existing transmitter;
- tuning householder’s antenna into alternative sources of the same or suitable TV signal;
- the installation of more directional and/or higher gain antenna at the affected residence;
- relocating the antenna to a less affected position;
- the installation of a digital set top box (and UHF antenna if required);
- the installation of cable/satellite TV at the affected residences; and
- installation of a TV relay station.

The conditions of any project approval issued for the project are likely to require the proponent to undertake amelioration options on behalf of the householder at the proponent’s cost in the unlikely event of interference.

In relation to wireless internet the report stated that:

“It is recommended that if interference to this service is encountered following construction of the wind farm, CDPL should work with Cirrus Communications to resolve any interference problems caused by the wind farm. Possible amelioration methods may include:

- Installation of improved or higher antenna at affected dwellings; or
- Installation of a new base station to service dwellings in affected areas”.

In relation to television broadcasting:

“It is recommended that pre- and post-construction surveys be conducted to determine the signal strength and quality of the television signal received at dwellings identified as
having the potential to experience television interference due to the proposed Crookwell 3 wind farm".
18 Fire

18.1 Introduction

A wind farm in a rural area, as with any large scale development, can increase the potential risk of fire to nearby people and property. This includes fire caused by the generators themselves, impacts on the generators caused by fire sparked elsewhere, and potential impacts on the ability to fight fires started elsewhere in and around a wind farm site.

This chapter draws on current literature to describe and detail the potential risk and outlines a range of mitigation measures designed to reduce the risk. The potential risk to third party persons and property depends on a number of factors, including the inherent flammability of the turbine generators, the landscape in which the turbines sit, and the ability of local fire services to respond to any incident.

As a result of increased wind farm development in Victoria and NSW, the Victorian Country Fire Authority (CFA 2007) and NSW Rural Service (RFS 2007) have studied the potential for wind farms to cause fire, and the possible mitigation measures to reduce the risk. The Draft NSW Wind Farm Planning Guidelines (December 2011) recommends that the following hazards and risks should be assessed:

- the risk that a bushfire will damage a wind turbine if the wind farm is located in or near a bushfire prone area
- the risk that the construction and / or operation of the wind farm will create a fire that could spread to nearby areas
- the potential for the wind farm to impact on aerial fighting of bushfires
- fire safety for workers and visitors during the construction and operation phase, ensuring there is appropriate fire fighting equipment and water supplies on site to respond to a bush fire.

These issues are addressed below.

18.2 Degree of Risk

Local communities have expressed concern that wind turbines may increase the risk of bushfires due to the introduction of electrical devices and mechanical components on site (NSW Legislative Council 2009). In addition, residents are concerned that wind turbine fires may be started through lighting strikes (NSW Legislative Council 2009).

Wind turbines manufactured today incorporate the highest quality and safety standards (CFA 2007). Despite this, "the risk of fire always exists when electronics and flammable oils and hydraulic fluids exist in the same enclosure" (CFA 2007). The risk of fire at a wind farm can be associated with malfunctioning turbine bearings, inadequate crankcases lubrication, cable damage during rotation, electrical shorting or arcing occurring in transmission and distribution facilities, and bushfires entering the site (CFA 2007).

The CFA considers that "the risk of wildfire resulting from the wind farm operations is not unduly greater than that resulting from other agricultural and industrial practices which operate within the country area" (DPCD 2009, McArthur 2006 Panel Report). Furthermore, the risk of fire is considered to be in fact minimised by wind farm developments and their associated permit conditions because they introduce more intensive fire planning (DPCD 2009, Mt Mercer 2006 Panel Report).

The NSW Legislative Council (No.5, 2009) concluded in their report that wind farms do not significantly increase the risk of bushfires in rural areas. Wind farm developers are aware of the potential risks and implement appropriate management measures to prevent bushfires from occurring (NSW Legislative Council 2009). It is also important to note that no bushfires have been started through wind farm activity in NSW (NSW Legislative Council 2009).
The potential impacts of wind farm activities on fire is considered lower in comparison to normal power generation sites, as power transmission is located within the turbine towers and underground to the transformers (CFA 2007). Due to modern day manufacturing, the risk of fire at wind farms is ‘very low’ (CFA 2007, AusWind 2007), in terms of both fire damage to wind turbines and fire caused by the turbines. This is because modern turbines are equipped with safety devices to reduce the risk of fire. It is also because:

- the flammable components are located high above the ground;
- there is normally no vegetation around the base of the turbine towers;
- high-voltage connections are underground;
- access tracks act as firebreaks and provide fire fighting access;
- comprehensive lightning protection devices are installed on every wind turbine, including internal lightning conductor rods running all the way to the blade tips; and
- dedicated monitoring and control systems shut down the wind turbines when the threshold temperatures of critical components are reached (AusWind 2007).

Additionally, wind turbines must comply with the Building Code of Australia and Australian Standards, and vegetation around transformers are generally kept below 100 mm (NSW Legislative Council 2009). While it is possible for an electrical failure to cause fire within a wind turbine, the system is designed to contain fire rather than spread it on to the surrounding area (Fenwick 2009). The wind farm could be shut down in the event of a fire situation.

Applications for approval under Part 3A are assessed against Planning for Bush Fire Protection 2006, to ensure that the required measures have been incorporated into the proposal. The ability for the proposed development to comply with Planning for Bush Fire Protection is the objective of this assessment (NSW Rural Fire Service 2007).

The key strategies (‘Bush Fire Protection Measures’) of the Planning for Bush Fire Protection guidelines are:

- Control the types of development permissible in bush fire prone areas;
- Minimise the impact of radiant heat and direct flame contact by separating the development from the bush fire hazard;
- Reduce the rate of heat output (intensity) of a bush fire close to a development through control of fuel levels;
- Minimise the vulnerability of buildings to ignition from radiation and ember attack;
- Enable relatively safe access for the public and facilitate fire-fighting operations;
- Provide adequate water supplies for bush fire suppression operations;
- Implement community education programs, focusing on property preparedness, including emergency planning and property maintenance requirements; and
- Facilitate the maintenance of APZs [Asset Protection Zones], fire trails, access for fire-fighting and on-site equipment for fire suppression.

The mitigation measures proposed below seek to implement these strategies where relevant.

An additional fire risk is the possible lack of experience of the local RFS volunteers, who may have no experience in fighting fires on wind farms. A ‘wildfire prevention and emergency response plan’ would be prepared in consultation with RFS, the NSW Fire Brigade and the State Planning Department, and would address safety, communication, site access and response protocols in the event of a fire in at the proposed wind farm.
18.3 Mitigation

The following mitigation measures proposed by this Environmental Assessment are to be implemented as part of the Crookwell 3 Wind Farm project proposal:

- Consultation with the NSW Rural Fire Service in regard to the adequacy of bushfire prevention measures to be implemented on site during construction, operation and decommissioning.
- Preparation of a bushfire prevention and emergency response plan in consultation with the RFS, the NSW Fire Brigade and the State planning department and the Council.
- Development of workplace health and safety protocols to minimise the risk of fire for workers during construction and during maintenance in the control room and amenities.
- On-site vegetation management during construction and operation to minimise potential sources of fuel.
- Re-organisation of construction activities during periods of high fire danger, including ceasing use of explosives, and management of hot work activities such as welding or cutting.
- Use of materials and equipment during operation that minimise the likelihood of fire.
- Maintenance of vehicles to minimise sparking from exhaust systems.
- Automatic shutdown of any overheating turbine mechanism.
- Shut down of turbines during a bush fire in the area.
- Lightning protection on each turbine.
- Adequate road access for heavy fire-fighting equipment.
- Under-grounding of electrical and communication cables where practicable.
- Access to adequate provision of water supply.
- Vegetation management during a designated Fire Danger Period.
- Careful storage and handling of flammable materials and ignition sources brought onto the site, as per manufacturer’s instructions.
- Storage of appropriate fire fighting equipment onsite during the construction phase, and ensure that a minimum of one person on site is trained in its use.
- Periodical inspection of overhead transmission easements to monitor any regrowth of encroaching vegetation.
- Vehicle turn-around facilities to be provided at every turbine tower site.
- 5-metres wide internal access tracks to be provided that are driveable and permanently clear of vegetation.
- Direct internal access road alignments and direct paths between turbines, and the shortest possible route for the electrical conductors.
- Provision of wind turbine access tracks that continue onto adjacent paddocks and are not dead-ended.
- Implementing a wide fuel break in accordance with RFS, Council and State Government recommendations.
19 Heritage

19.1 Introduction
A report has been commissioned by CDPL in order to assess Aboriginal and Cultural Heritage issues arising from the proposed Crookwell 3 Wind Farm. The full report undertaken by Anderson Environmental Consultants Pty Ltd appears as Appendix 12.

The report outlines the results of a heritage investigation of the proposed wind farm in relation to the potential impact of the proposed activity on indigenous, non-indigenous and cultural heritage values. The assessment also outlines recommendations for mitigation of potential impacts to guide development at the site.

19.2 Methodology
The assessment was conducted in two parts being:
- a desktop assessment; and
- a field assessment and surveys.

The desktop assessment reviewed historical databases and heritage lists to ascertain the level of potential for archaeological and historical value within the proposed wind farm site and to establish a statutory process for further work under the legislative framework.

The survey involved an initial field assessment to determine the possible past use of the land by Aboriginal people based on the land’s topographical, vegetation, sheltering and historical hunting resources. This allowed for an indication of potential underground artefact locations.

Once the areas in which artefacts were predicted to be located were determined, field surveys were undertaken. These field surveys involved the surveying of potential map landscape units by walking transects approximately 10-20 metres apart. The areas surveyed on foot were all of the sites for potential turbine locations as well as the 3 access options. Other landscape areas where there was a high potential to find artefacts were surveyed. Movement and hunting/food gathering areas within the landscape as well as surveys of potential impact areas were also undertaken. Generally movement and food resource corridors are located along creek lines and low flat areas where traverse is easy and water is available.

19.3 Results
In relation to non-indigenous heritage the assessment found that there were no significant items which would be disturbed as part of the proposal. All identified non-indigenous heritage items were well outside any proposed development areas. Furthermore, the heritage significance of these identified items was found to be low and they are typical of many of the items on many farms in the Shire. These items are not listed under the Heritage Act 1977 (NSW) or on any other heritage register including the relevant Local Environmental Plan or recent Cultural Heritage Study of the Upper Lachlan Shire.

In relation to indigenous heritage, the results of the surveys undertaken detected 10 new locations where artefacts were identified as during the field assessments. Anderson Consultants assessed the heritage significance of these artefact deposits as low to moderate, however a precautionary approach to further investigations was recommended.

The results of the surveys detected the following sites and artefact finds in Table 23.
<table>
<thead>
<tr>
<th>Heritage Type</th>
<th>Site and Contents</th>
<th>Location</th>
<th>Impact Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-indigenous</td>
<td>Hillview Park Property homestead and surrounding buildings and the Leeston homestead.</td>
<td>Within and surrounding Crookwell 3 East.</td>
<td>Not listed. No listed non-indigenous heritage items which would be impacted by the proposal.</td>
</tr>
<tr>
<td>Indigenous</td>
<td>Site 1 17 stone fragments</td>
<td>Adjacent to a dam which is filled from a low level gully line. The site is located above the dam on the upstream side.</td>
<td>Low-moderate: There is moderate potential for other artefacts below the surface in this location. This site could be avoided as part of the design.</td>
</tr>
<tr>
<td>Indigenous</td>
<td>Site 2 8 artefacts including quartz and Grey Silcrete fragments. A general mix of cores, flakes and a small tool.</td>
<td>Up the hill approximately 300 metres from site 1 along existing farm track.</td>
<td>Low-moderate: Turbine A17 is close to site 2. Impacts on site 2 can be mitigated or avoided through further micrositing of the turbine.</td>
</tr>
<tr>
<td>Indigenous</td>
<td>Site 3 Single Brown Silcrete flake (tool)</td>
<td>Approximately 40 metres to the east of the marked peg A13.</td>
<td>Low-only 1-2 artefacts found on site.</td>
</tr>
<tr>
<td>Indigenous</td>
<td>Site 4 Two Grey Silcrete flakes.</td>
<td>Towards the northern extremity of the proposed Greywood Siding Road Access.</td>
<td>Low-only 1-2 artefacts found on site.</td>
</tr>
<tr>
<td>Indigenous</td>
<td>Site 5 Two Grey Silcrete flakes with a maximum size of 31mm.</td>
<td>Towards the northern extremity of the proposed Greywood Siding Road Access. South of site 4.</td>
<td>Low-only 1-2 artefacts found on site.</td>
</tr>
<tr>
<td>Indigenous</td>
<td>Site 6 A single flaked core of Grey Silcrete.</td>
<td>Along the proposed Greywood Siding Road access.</td>
<td>Low-only 1-2 artefacts found on site.</td>
</tr>
<tr>
<td>Indigenous</td>
<td>Site 7 One Brown Silcrete Flake.</td>
<td>Along the proposed Greywood siding Road Access near to site 8</td>
<td>Low-only 1-2 artefacts found on site.</td>
</tr>
<tr>
<td>Indigenous</td>
<td>Site 8 41 very small fragments of Brown Silcrete.</td>
<td>On the eastern side of the proposed Greywood Siding Road access.</td>
<td>Moderate- A transitory site. The erosion makes it likely that there are few (if any) artefacts left below the surface.</td>
</tr>
<tr>
<td>Heritage Type</td>
<td>Site and Contents</td>
<td>Location</td>
<td>Impact Significance</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------</td>
<td>----------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Indigenous</td>
<td>Site 9</td>
<td>Creek crossing on the property Wollondilly. High disturbance.</td>
<td>Low- A highly disturbed environment and only one artefact.</td>
</tr>
<tr>
<td></td>
<td>1 fragment of Grey Silcrete being 37mm X 27mm X 12mm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indigenous</td>
<td>Site 10</td>
<td>Wollondilly Property</td>
<td>Low- Low quality site and low number of artefacts.</td>
</tr>
<tr>
<td></td>
<td>7 fragments of quartz generally scattered around this site area.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The report notes that the proposed turbine locations are unlikely to impact any sites other than A17 which is close to Site 2. Impacts on Site 2 can be mitigated or avoided through further micrositing of the turbine. Potential impacts on Sites 1 and 8 can also be avoided in the detailed design of the project.

The report notes that additional surveys would be required in the form of surface surveys once the final locations of the roads are confirmed. Further assessment is not deemed to be required in most paddock areas where there is a long history of soil disturbance and pasture improvement.

19.4 Mitigation

The report recommends the following actions in order to preserve areas of potential archaeological significance and amelioration of potential impacts;

- A Cultural Heritage Management Plan be prepared in collaboration with the Pejar Local Aboriginal Land Council to reduce and mitigate the impacts of the project on artefacts.

- If artefacts cannot be avoided then cooperation with Pejar LALC should be undertaken to determine the management of these artefacts.

- In relation to the movement of objects, the distances would not be significant and many of the objects may have been moved in the past via water movement, erosion and vehicle/tractor movements.

- The Cultural Heritage Management Plan should outline management strategies for the management of unrecorded sites within the site.

- If impacts cannot be avoided then further investigation is recommended for Sites 2 and 8.

- Once the proposed access track extents and other disturbance areas are pegged on the ground additional targeted surveys of these areas should be undertaken.

- Careful road planning should be undertaken to utilise and upgrade existing roads where possible to achieve an overall plan to minimise soil disturbance.
20 Geotechnical

20.1 Introduction
Coffey Geotechnics Pty Ltd was commissioned by CDPL in order to assess the potential geotechnical impacts in relation to the proposed the Crookwell 3 Wind Farm. The full report undertaken by Coffey Geotechnics Pty Ltd appears as Appendix 13.

The report was commissioned in order to;
- provide a preliminary understanding of the geological setting and its potential impact on footing type and size for WTGs, monitoring towers, substations and transmission towers;
- consider groundwater and slope stability issues and their implications for footing types, trenching and access tracks;
- make a preliminary assessment of geotechnical constraints that could affect the construction of access roads, hardstand and lay down areas including the use of locally sourced materials;
- provide preliminary indication regarding electrical resistivity and thermal conductivity of site soils; and
- consider the potential for soil erosion and/or soil/groundwater contamination.

20.2 Assessment Methodology
The investigation undertaken consisted of field work involving a site walk and drive over, as well as excavation of seven test pits undertaken on 30 and 31 March 2010.

The site walk and drive over included:
- Field sketches and photographs of the site.
- Making notes regarding the nature of rock outcrop including information such as, rock type, degree of weathering, assessed rock strength, type and likely thickness of soil cover.
- Observations regarding evidence of existing instability and general geomorphology of the site.

Due to the consistent surface geology encountered at Crookwell 3 South and the variability of ground conditions found at the Crookwell 3 East, it was considered that excavating the test pits at Crookwell 3 East would be more beneficial at this stage of the investigation (refer to Figures 55 and 56 – Geotechnical Investigations (Crookwell 3 East and Crookwell 3 South). Accordingly no test pits were excavated at Crookwell 3 South at this stage.

The test pits were excavated using a Caterpillar Backhoe to a depth of between 1.4 metres and 3.0 metres. The subsurface conditions encountered in the test pits were logged by a geotechnical engineer who also collected samples for visual assessment.

The report stated that: “On completion each test pit was backfilled with the excavated spoil and tamped with the backhoe bucket, before being traversed with the backhoe tyres”.

For further details of the engineering logs of the test pits, refer to the full report at Appendix 13.

20.3 Results
The report’s findings were broadly consistent with mapped geology for the region. The site walk demonstrated a generally hilly topography across both Crookwell 3 East and Crookwell 3 South.
FIGURE 55
Geotechnical Investigation – Crookwell 3 East

Source: Coffey
Importantly, the report concluded that “there are no major geological issues that would prevent the construction of the Crookwell 3 Wind Farm, provided the recommendations of this study are followed and further investigation is undertaken at a later stage”.

20.3.1 Crookwell 3 East

The Crookwell 3 East site was found to be between RL 828 metres and RL 940 metres with ground slopes of up to 30 degrees to the horizontal. The Geological Survey of New South Wales (1973) Goulburn map sheet indicates that “the general geology of the east site comprises Ordovician siltstones, sandstones and shales with associated residual soils which are distributed over the southern part of the site and the areas of lower elevation”. The northern part of the site is “underlain by Ordovician siltstones, sandstones and shales as well as Tertiary basalt flows which form caps at the peaks of the areas of high elevation and are generally overlain by variable thicknesses of residual clayey soils”.

**Stratigraphy**

The results of the test pits taken from the Crookwell 3 East site demonstrated varying characteristics. In the areas of Tertiary age volcanics, a layer of clayey silt topsoil 0.25 metres to 0.3 metres thick is present overlying residual clay soils to between 0.5 metres and 1.3 metres below the existing surface level. Underlying the residual soils was ‘extremely to highly’ weathered basalt of ‘low to medium’ strength.

In the areas of Ordovician Age sedimentary deposits a layer of clayey, silty topsoil of approximately 0.2 metres to 0.3 metres was encountered. This overlay contained silty clay, sandy clay and clayey sand soils to depths of between 0.9 metres and 1.4 metres below the surface. The residual soils displayed varying degrees of weathering, of siltstone, sandstone and shale of varying strengths.

The report notes that there is limited knowledge of the underlying condition of the rock below the test pits. The degree of strength of the soils was largely determined by the localised soil conditions.

20.3.2 Crookwell 3 South

The Crookwell 3 South site was found to be between RL 738 metres and RL 849 metres with ground slopes of up to 40 degrees to the horizontal. The Geological Survey of New South Wales (1973) Goulburn map sheet indicates that the general geology of the site comprises predominantly Siluro-Devonian Granites with associated residual soils.

**Stratigraphy**

The fieldwork results of the assessment were broadly consistent with the mapped geology. Although no excavation was undertaken at the Crookwell 3 South site, the surface soils were determined as a mix of silty sands, clayey sands and sandy clays.

The degree of strength of the soils was largely determined by the localised soil conditions.

20.3.3 Groundwater and drainage

The assessment found that for most of the site the permanent groundwater is likely to be at least several metres below ground surface.

Due to the generally ‘hilly topography’ of the site, “drainage during rain events is expected to occur relatively quickly and the local creeks would be expected to rise rapidly”. As a result, the report notes that erosion of non-vegetated surfaces is likely to occur. At the time of the fieldwork, the site was generally well vegetated.

20.3.4 Footing Systems

Two main footing systems are available to be utilised for the wind turbine generators in this project. These consist of:

- gravity footings; and
anchored footings

The use of these different types of footings would largely rely on localised conditions at the base of each individual turbine.

The reinforced concrete gravity footings of the wind turbines are generally expected to be founded 1.5 metres to 3 metres below the existing ground surface. Based on the observations made during the site walk over and the test pits completed to date at Crookwell 3 East, “it is considered that excavations to a depth of about 2m to 3m depth are likely to encounter, highly or less weathered basalt rock, siltstone, sandstone and shale”. Based on the observations made during the site walkover and the location of the proposed WTGs at Crookwell 3 South, “it is considered that footing excavations to a depth of about 2m to 3m depth are likely to encounter residual granitic soils and highly or less weathered granite rock”. The thickness of the materials will be determined for the south site at the detailed design phase.

Anchored footings involve a smaller pad footing restrained by subsurface anchors into rock. The report highlights that the “main parameter governing anchor design will be the allowable bond stress at the rock to grout interface”. Based on Coffey Geotechnics' previous experience with wind farms, “it would be expected that anchors may be constructed to a depth of about 12 metres”.

The report concludes that further geotechnical investigations at the WTG sites to depths of about 20m are recommended to allow footing designs.

20.3.5 Other infrastructure footings

The report notes that the construction techniques required for the development of other buildings and infrastructure proposed as part of the project are far less specialised than in the case of wind turbine installation.

The footings required for infrastructure such as the wind monitoring masts and cable towers would likely uncover a mix of soil types based on their location. Consideration would be given to the engineering requirements for these items at the detailed design stage.

20.3.6 Soil Erosion

Coffey Geotechnics noted from the site walkover that a number of ancient landslides are present at Crookwell 3 East (refer to Figure 55 – Geotechnical Investigation – Crookwell 3 East). The cause of the landslips was presumed to be associated with the contact between the Tertiary age basalts and the underlying Ordovician age sediments. However, “no evidence of recent instability was observed”.

The report recommends that “construction of the wind turbines and related infrastructure should avoid areas close to the contact between the Tertiary age basalts and the underlying Ordovician age sediments and areas of steep topography”. A detailed assessment of the potential landslips in the area would be undertaken once further details regarding the proposed wind turbines and other infrastructure locations are known.

No evidence of natural slope instability was observed at the south site during the site walkover.

It is also recommended that “measures to reduce clearing of natural vegetation and surface water runoff in the construction areas be taken to reduce the likelihood of erosion at the site”. Drainage channels may require protection by rock beaching or similar.

20.4 Mitigation

Based on the preliminary investigations on site, the report outlined the following recommendations and measures to mitigate any adverse geotechnical impacts:

- further geotechnical investigations should be undertaken to provide information for the design of footings, access roads and other infrastructure;
- further geotechnical investigations at the WTG sites to depths of about 20m are recommended to allow footing designs;
- reduce clearing of natural vegetation and surface water runoff in the construction areas to reduce the likelihood of erosion along drainage channels on the site; and
- drainage channels may require protection by rock beaching or similar.
Crookwell 3 Wind Farm
Chapter 21
HYDROLOGY IMPACTS
21 Hydrology

21.1 Introduction

A wind farm in a rural area can have an impact on the hydrology of the area, notably streams, drainage lines, dams and water catchments.

The majority of these potential impacts are confined to the construction phase of the project, however there is potential for longer term impacts if the appropriate management measures are not put in place. Much of the more detailed information on the management of any potential hydrological impacts would be provided as part of the Construction and Operation Environmental Management Plans.

21.2 Existing Environment

The proposal is located within the Sydney Catchment, and more particularly the Upper Wollondilly sub-catchment. Reducing detrimental hydrological impacts is a guiding principle for the proposed development.

The most significant hydrological features in the sub-catchment are the Wollondilly River and Pejar Dam.

The Wollondilly River commences about 7 km east of the Crookwell township, initially flowing south, before flowing south-east and then east through Goulburn where it joins the Mulwaree River and turns to the north-east at Towrang. The river is further joined by the Wingecarribee River. Ultimately the river flows into Lake Burragorang. It has a total length of over 150 km forming part of the major water supply for the Sydney region.

Whilst the Upper Wollondilly River does not pass through the site directly, Crookwell 3 East and Crookwell 3 South are bisected by it.

Pejar Dam, which is adjacent to Crookwell 3 South to the east, was constructed to supply water for Goulburn to the south and is used to augment the water supply in association with Sooley Dam and Rossi Weir.

Both Crookwell 3 South and Crookwell 3 East comprise land that is undulating with a number of ridges and waterways. Steeves Creek runs through Crookwell 3 East and First Creek through Crookwell 3 South. There are several additional incised drainage lines which run through the site.

There are no natural wetland habitats within the site; however there are several dams on each of the properties which are occasionally home to bird life. Within Crookwell 3 East in particular, there are a number of dams linked by drainage lines which are characterised in some locations by incised valleys. Most drainage lines across the site generally only contain water after rain events. Due to the steep topography, the site is quick to drain during and after rain events, but it does show evidence of erosion in a number of locations.

21.3 Impact Assessment

There is the potential that water bodies may be adversely affected during the construction, operation and decommissioning stages of a wind farm project. Direct hydrologic impacts relate to water extraction during construction. Indirect impacts relate to dust and sediment transportation and pollution risk to water bodies, which may result in reduced water quality. Furthermore, materials being transported to and from the sites could pose a risk to waterways.

Water would be required for the production and construction of concrete footings for the turbines and other minor works. In addition, water or chemical treatments may be used on internal roads or access tracks to assist with dust containment. A total of approximately 21.55 ML of water would be required over the construction period. This is a small amount of water used in comparison with some of the other power generation technologies. The total amount of water required for construction will depend on the time of year, moisture present in the ground, final foundation design, and final road design.
The wind farm's construction phase would typically require water for the proposed temporary batching plant(s) and earthworks, dust suppression and also for wash-down areas at the access points to the site to prevent weed and contaminants from entering and exiting the sites.

One of the host landowners with property known as "Hillview Park" holds a current water licence with the purpose for 'conservation of water and water supply for stock and domestic purposes and irrigation'. The volume allocated to the overall licence is 39 megalitres (ML) per year. While the wind farm proposes a number of sites in this locality, the "Hillview Park" property is the location where the effective water use (i.e. concrete batching and related activities) is proposed to occur.

The NSW Office of Water was consulted initially on 30 July 2010, with an introduction of the proposed project and a request for water licensing information. The NSW Office of Water was again consulted on 20 April 2011 in relation to the transfer of water licence from the host landowner to the project to be used during construction phase and to apply for a groundwater licence as a backup provision. Upon further investigation and consultation during the month of May 2011, the most appropriate method to utilise the water resource on the host property was assessed and negotiated. On 7 June 2011, in consideration of the proposed project information provided, the NSW Office of Water advised the following:

A. The Water Management Act 2000 comes into effect in this area with the commencement of the "Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources" (Metro WSP) on 1 July 2011;

B. Upon commencement of the Metro WSP, the current surface water licence will be converted to an access licence and a combined works and use approval, all of which will be subject to the provisions of the Metro WSP;

C. The Water Management Act 2000 allows for temporary trades of water access licence entitlements. A water access licence holder may transfer their water access licence to someone else for a set period of time (not less than six months). This is called a 'term transfer' and is similar to a property rental agreement – the holder of the licence does not change. However, during the period of the term transfer, the transferee is responsible for the water taken, payment of fees and charges and compliance with the terms and conditions of the licence. This does not require an application to the NSW Office of Water: the term transfer just has to be registered by Land and Property Information (LPI) once the agreement is complete. A term transfer does not, by itself, allow water to be taken at a different location.

D. An approved water meter (complying with National Standards) may be required to be installed at the extraction point (i.e. pump) to ensure that the actual extraction volumes are in compliance with the authorised volumes;

E. In relation to the consideration of potential groundwater as a backup water supply, any groundwater licence application received after 30 June 2011 will require a commensurate transfer of water to the site from an existing groundwater licence within the same water management zone. As there is no current groundwater embargo in the area, an application for a groundwater licence may be submitted prior to 30 June 2011 under the Water Act 1912 without the need for a water transfer, subject to environmental assessment.

In consideration that the current site does not have a groundwater licence and all the water under the surface water licence is sourced from the on-site dams, a groundwater licence should be considered on this property as a backup water supply source for the construction phase. On 14 June 2011 an application for groundwater licence was submitted to NSW Office of Water for consideration. The groundwater licence (if approved) is proposed as a backup provision in the event the surface water in the on-
site dams is not sufficient for both agriculture activity and wind farm construction during the drier months of the year.

A term transfer of the water licence was negotiated with the host landowner of Hillview Park property for 33ML, and has been registered on the land title commencing on the 1st May 2012.

It is proposed that water recycling would be implemented during the construction phase. This would include the capture and reuse of water at the wash-down areas in the entrance gates. Water would be reused where possible to reduce the amount required, and this would be detailed in a Water Management Strategy to be included in the Construction Environmental Management Plan.

A number of creek/drainage line crossings would be required for access throughout the site during the construction, operation and decommissioning phases. The construction and maintenance of these crossings has the potential to impact on water quality. At least two water crossings would be required within the Crookwell 3 East site and one in Crookwell 3 South site. The crossings would be designed appropriately and in consultation with qualified engineers to ensure that they do not impact on water quality. Suitable box culverts or pipes would be used as required for the size of the watercourse / drainage line crossing.

The nearest significant local water body is the Pejar Dam, adjacent to Crookwell 3 South, which is currently used to supply water to Goulburn. The capacity of Pejar Dam is currently (as of July 2011) close to full capacity. The importance of managing runoff into this water source is critical. The majority of the works are located away from the dam and drainage lines. The concrete batching plants would be located near turbines A29 in Crookwell 3 South and near A17 in Crookwell 3 East, which is a considerable distance from the dam.

On site, the installation of wind turbine infrastructure is focused on high elevation areas, avoiding drainage lines. The concrete batching plant is to be located on elevated land away from drainage lines and would be bunded in order to prevent materials reaching water bodies. Infrastructure, including the turbines, would also be bunded (if required) to ensure that oil and other chemicals could not escape.

No sewerage or septic system would be installed on the site for the construction phase of this project. Construction staff would be provided with portaloos during this phase. The approved Crookwell 2 Wind Farm includes a control room and facilities building constructed in the south east corner of the Crookwell 2 site. This building and facilities would also be used by staff during the construction phase for the proposed Crookwell 3 project.

In terms of impacts on water bodies during operation, the potential hydrological impacts are considered to be negligible as ground is not proposed to be disturbed during operation. The wind farm would only require minimal traffic on site. The roads and access tracks would be completed within the construction phase and would be maintained to avoid any erosion.

Based on the nature of the project and management techniques to be implemented, it is not expected that any of the local water bodies would be impacted by the proposed development.

21.4 Potential Impacts to Watercourse Crossings and proposed mitigation measures

There is one crossing location proposed on First Creek within Crookwell 3 South, located in proximity of the existing farm track crossing this watercourse. This location will be a host to both an access track and the cabling.

There are two crossing location proposed on Steeves Creek within Crookwell 3 East. The first location will be a host to an access track and cabling, the second location will only host cabling.
The cabling at these three locations can be implemented using the following methods:

1. Installed in a trench through the crossing (pending water level);
2. Installed in a conduit under the watercourse by using directional drilling; and
3. Installed in a conduit and traverse the crossing at ground level adjacent to the access track.

All other watercourses / drainage lines within the Crookwell 3 sites are considered to be minor and intermittent and would most likely only require adequately sized pipes to be installed beneath the access tracks to ensure no restriction to the water flow, and the cabling would be trenched through it.

The proposed crossing of Wollondilly River for the cabling of Crookwell 3 South project to reach the Crookwell 2 Wind Farm substation would be carried out at the same location as the Crookwell 2 Wind Farm cable crossing to avoid additional potential impact to the watercourse crossing location.

These major crossing locations were initially assessed according to the existing and available infrastructure and the characteristic of the crossing in relation to the proposed infrastructure, and followed by consultation with the host landowners. The detailed design phase of the project will consider the final placement and alignment of the access tracks to minimise any adverse impacts to the natural flow of water through the watercourses / drainage lines.

The major potential impacts to the watercourses at the proposed crossing locations and the proposed mitigation measures are outlines as follow:

1. The potential deterioration of surface water quality at the crossings would be mitigated by developing and implementing a Sediment & Erosion Control Plan as a sub-plan of the Construction Environmental Management Plan to include the following considerations:
   a. Site Access Stabilisation
   b. Soil / Earthworks Handling (Stock piling)
   c. Site Drainage
   d. Sediment Control Measures
   e. Monitoring Program (auditing)

2. The potential deterioration of the watercourse or drainage line crossings during the construction and operation phases would be mitigated through designing the watercourse crossings (including major drainage lines) in consultation with a qualified engineer and in accordance with the NSW Office of Water Guidelines for Controlled Activities (August 2010) to minimise impacts on the existing banks, water flow, animal passage and on the movement of flows and ensure that they do not impact on water quality.

3. The potential deterioration of the watercourse or drainage lines adjacent or in proximity of the crossings due to construction vehicle activities would be mitigated by restricting the activity area to the established or designated tracks and watercourse / drainage line crossing locations.

4. The potential deterioration of the water flow through the watercourse / drainage line due to construction of the crossing for the access track would be mitigated by designing the crossings in accordance with the NSW Office of Water ‘Guidelines for Watercourse Crossings’ (August 2010) for Controlled Activities.

5. The potential deterioration of the water flow through the watercourse / drainage line due to construction of the crossing for the cabling would be mitigated by designing the crossings in accordance with the NSW Office of
Water ‘Guidelines for laying pipes and cables in watercourses’ (August 2010) for Controlled Activities.

6. The potential deterioration of the riparian corridors through the watercourse / drainage line due to construction of the crossing for the access track and/or cabling would be mitigated by designing the crossings in accordance with the NSW Office of Water ‘Guidelines for riparian corridors’ (August 2010) for Controlled Activities.

The requirement for restoration and rehabilitation of the land adjacent to the crossing due to earthworks related to the construction of the crossing would be mitigated by developing and implementing a Vegetation Management Plan in accordance with the NSW Office of Water ‘Guidelines for Vegetation Management Plan’ (August 2010) for Controlled Activities.

21.5 Mitigation

The following measures are proposed in order to minimise any impacts on the relevant water bodies:

− Designing the project infrastructure to be at least 40 metres away from major watercourses and drainage lines where possible.
− Water would be primarily sourced from the “Hillview Park” property surface water allocations and groundwater bores (if approved).
− Water would be reused where possible to reduce water consumption. No water would be sourced from creeks or rivers without relevant permits / licences.
− Discharge into creeks, rivers or drainage lines would be minimised through the implementation of an appropriate Construction Environmental Management Plan.
− Vehicles on site would be restricted to established tracks to concentrate any discharge from vehicles and minimise run off into water bodies.
− Infrastructure including the turbines would be bunded (if required) to ensure that materials do not escape.
− Maintenance or re-fuelling of machinery would be carried out on hard-stand areas.
− Concrete batching plants would be designed to capture all concrete wash.
− Sediment and erosion would be controlled as part of a Sediment / Erosion Control Plan, as a sub plan of the Construction Environmental Management Plan. This plan would detail the techniques, which may include:
  - Revegetating disturbed soils.
  - Sediment traps to prevent sediment entering waterways.
  - Infrastructure to be bunded with silt fencing/hay bales or similar to reduce runoff from these areas.
− All sediment and erosion controls implemented during the construction phase along the access tracks would be monitored and maintained.
− Dust suppression would be carried out as required through either watering or chemical means (via environmentally friendly polymer based additives to the water).
− Watercourse crossings (including major drainage lines) will be designed appropriately and in consultation with a qualified engineer and in accordance with the NSW Office of Water Guidelines for Controlled Activities (August 2010) to minimise impacts on the existing banks, water flow, animal passage and on the movement of flows and ensure that they do not impact on water quality.
- Wollondilly River cable crossing would be carried out at the same location as the Crookwell 2 wind farm cable crossing to reduce / avoid additional potential impact to the watercourse crossing location.
- A Water Management Strategy would be developed for the site as part of the Construction and Operational Environmental Management Plans.
- A Spill Control Plan would be developed, as a sub-plan of the Construction Environmental Management Plan.
22 Cumulative Effects

22.1 Introduction

The New South Wales Southern Tablelands has been identified as being highly suitable for wind turbines and the generation of renewable energy. As a result:

- several companies are active in the wider region identifying suitable future wind farm sites; and
- the NSW Government has positioned Crookwell within a designated renewable energy precinct.

When a number of wind farms are proposed or constructed in an area, there is potential for the impacts of one project to combine with the impacts of another to generate greater collective impacts that the single projects themselves. Cumulative effects are the total or combined impacts arising from a number of connected or separate projects, affecting the same environmental issue.

Cumulative impacts are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (CEQ, 2010).”

This chapter assesses the potential cumulative impacts of the proposed Crookwell 3 Wind Farm, the operating Crookwell 1 Wind Farm and the approved Crookwell 2 Wind Farm on the locality.

22.2 General impacts

Assessment agencies and the wind industry itself acknowledge the difficulties associated with undertaking cumulative impact assessments. In the case of this project, undertaking an assessment is limited by a lack of information about the final form and expected impacts of proposed or approved wind farms, and whether surrounding wind farm proposals would actually proceed. It is not uncommon for a permitted wind farm to sit idle for many years before construction commences, if at all. A decision to refuse a particular wind farm based on the unacceptable cumulative impacts of it together with another nearby wind farm relies on the certainty that the adjoining project would proceed. Established planning practice does not allow for the development of a wind farm project to be conditional on the abandonment of another.

The potential for cumulative impacts arising out of a proposal is dependent on the type of impact and the proximity of the projects. For example, shadow flicker has a very localised impact, and therefore requires two very closely placed wind farms in order for cumulative impacts to arise.

Ecology impacts, however, are more regional in that a large number of wind farms in a given region may give rise to impacts to threatened species that depend on the wider region for habitat. Similarly, visual impacts of a wind farm can extend tens of kilometers and, when viewed in conjunction with another wind farm, can result in unacceptable cumulative impact.

A number of wind farms in the Crookwell region either exist or are in various stages of the approvals process. The greatest potential for cumulative impacts arising from the Crookwell 3 Wind Farm proposal is with the approved Crookwell 2 Wind Farm, which is located to the north and west of Crookwell 3 South and Crookwell 3 East parcels respectively. As both projects share infrastructure, it can be assumed that Crookwell 3 would be built at the same time as Crookwell 2 or prior to its commissioning.

Crookwell 2 Wind Farm was originally approved in 2005, with a modification to Development Consent of the wind farm proposal being granted in 2009. The proposed Crookwell 2 Wind Farm includes the following:

- 46 individual 2 MW wind turbines standing 128 metres at top of blade tip on an 80 metre tower;
– internal unsealed tracks for turbine access;
– an electrical sub-station and connection to the existing 330 kV transmission line;
– an underground electrical cable network linking turbines to the proposed substation; and
– a control room and facilities building adjacent to the substation.

As the proposed Crookwell 3 Wind Farm would share most of the major infrastructure with Crookwell 2 Wind Farm, additional substation control rooms or facilities buildings are not required from the Crookwell 3 Wind Farm. The sharing of infrastructure with Crookwell 2 Wind Farm reduces the scale of the project and avoids any unnecessary duplication of structures.

A further cumulative impact can occur from Crookwell 3 in conjunction with the operating Crookwell 1 Wind Farm, located some 5 kilometers to the north west.

22.3 Wind farm developments in the Southern Tablelands

The NSW Department of Environment, Climate Change and Water (DECCW) has established six Renewable Energy Precincts. Precinct 4: NSW/ACT Border Region (within which the Crookwell 3 Wind Farm lies) is home to several wind farms, with a number of others either approved or in planning stages (refer to Figure 7 in Chapter 3 – Site Context). Each of the six Renewable Energy Precincts precincts have been established as locations for the State’s future wind power investment due to the area’s suitability for the technology.

There are currently twelve (12) wind farms proposed, ten (10) wind farms approved and five (5) wind farms in operation in NSW. Of these 27 wind farms, three are located within a 20 km radius of the proposed Crookwell 3 site (the Crookwell 1 Wind Farm, the Crookwell 2 Wind Farm and the Gullen Range Wind Farm).

Table 24 summaries wind farms within the region and includes information on the number of turbines, the status (proposed, approved or in operation) and the proponent for each of the wind farms.

Please refer to Figure 57 – Cumulative Impacts Plan for the project locations.

<table>
<thead>
<tr>
<th>Wind Farm</th>
<th>Proponent</th>
<th>No. of Turbines</th>
<th>Site Area</th>
<th>Total Capacity</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paling Yards Wind Farm</td>
<td>Union Fenosa Wind Australia</td>
<td>up to 59</td>
<td>3,900ha</td>
<td>250 MW</td>
<td>Proposed</td>
</tr>
<tr>
<td>Black Springs Wind Farm</td>
<td>Wind Corporation Australia Ltd</td>
<td>9</td>
<td>635ha</td>
<td>18.9 MW</td>
<td>Approved</td>
</tr>
<tr>
<td>Blayney Wind Farm</td>
<td>Eraring Energy</td>
<td>15</td>
<td>*</td>
<td>9.9 MW</td>
<td>In Operation</td>
</tr>
<tr>
<td>Capital 1 Wind Farm</td>
<td>Renewable Power Ventures Pty Ltd [now Infigen Energy]</td>
<td>63</td>
<td>1,200ha</td>
<td>140 MW</td>
<td>In Operation</td>
</tr>
<tr>
<td>Capital 2 Wind Farm</td>
<td>Infigen Energy</td>
<td>41</td>
<td>*</td>
<td>100 MW</td>
<td>Approved</td>
</tr>
<tr>
<td>Collector Wind Farm</td>
<td>Transfield Services (Australia)</td>
<td>60-80</td>
<td>3,300ha</td>
<td>160 MW</td>
<td>Proposed</td>
</tr>
</tbody>
</table>
## Visual Impacts

It is acknowledged that a cumulative landscape and visual impact may result from a wind farm being constructed in conjunction with other nearby wind farm developments. The landscape and visual impact assessment (LVIA) prepared by Green Bean Design determined that there would be some intervisibility between Crookwell 3 Wind Farm, and other wind farm turbines within the 10km viewshed. The LVIA notes that:

- ‘Direct’ cumulative visual impacts may occur where two or more wind farms have been constructed within the same locality, and may be viewed from the same view location simultaneously.

- ‘Indirect’ cumulative visual impacts may occur where two or more wind farms have been constructed within the same locality, and may be viewed from the same view location simultaneously.

### Wind Farm Details

<table>
<thead>
<tr>
<th>Wind Farm</th>
<th>Proponent</th>
<th>No. of Turbines</th>
<th>Site Area</th>
<th>Total Capacity</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conroy’s Gap Wind Farm</td>
<td>Origin Energy</td>
<td>15</td>
<td>*</td>
<td>30 MW</td>
<td>Approved</td>
</tr>
<tr>
<td>Crookwell 1 Wind Farm</td>
<td>Eraring Energy</td>
<td>8</td>
<td>*</td>
<td>4.8 MW</td>
<td>In Operation</td>
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<tr>
<td>Crookwell 2 Wind Farm</td>
<td>Crookwell Development Pty Ltd</td>
<td>46</td>
<td>2,088ha</td>
<td>92 MW</td>
<td>Approved</td>
</tr>
<tr>
<td>Crookwell 3 Wind Farm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Proposed</td>
</tr>
<tr>
<td>Cullerin Wind Farm</td>
<td>Origin Energy Pty Ltd</td>
<td>15</td>
<td>*</td>
<td>30 MW</td>
<td>In Operation</td>
</tr>
<tr>
<td>Flyers Creek Wind Farm</td>
<td>Flyers Creek Wind Farm Pty Ltd</td>
<td>44</td>
<td>*</td>
<td>80-132 MW</td>
<td>Proposed</td>
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<tr>
<td>Golspie Wind Farm</td>
<td>Wind Prospect CWP</td>
<td>Up to 100</td>
<td></td>
<td>250 MW</td>
<td>Proposed</td>
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<tr>
<td>Gullen Range Wind Farm</td>
<td>Epuron Pty Ltd [Gullen Range Wind Farm Pty Ltd]</td>
<td>73</td>
<td>*</td>
<td>168 MW</td>
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<tr>
<td>Gunning Wind Farm</td>
<td>Acciona Energy</td>
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<td>*</td>
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</tr>
<tr>
<td>Hampton Wind Farm</td>
<td>Hampton Wind Park Company</td>
<td>2</td>
<td>*</td>
<td>1.2 MW</td>
<td>In Operation</td>
</tr>
<tr>
<td>Rugby Park Wind Farm</td>
<td>Suzion Energy Australia Pty Ltd [and Windlab]</td>
<td>up to 52</td>
<td>*</td>
<td>290 MW</td>
<td>Proposed</td>
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<tr>
<td>Rye Park Wind Farm</td>
<td>Epuron Pty Ltd</td>
<td>80-110</td>
<td>*</td>
<td>120-374 MW</td>
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<tr>
<td>Taralga Wind Farm</td>
<td>RES Australia Pty Ltd</td>
<td>62</td>
<td>*</td>
<td>186 MW</td>
<td>Approved</td>
</tr>
<tr>
<td>Woodlawn Wind Farm</td>
<td>Woodland Wind Pty Ltd</td>
<td>23</td>
<td>*</td>
<td>46 MW</td>
<td>In Operation</td>
</tr>
<tr>
<td>Yass Wind Farm</td>
<td>Epuron Pty Ltd</td>
<td>152</td>
<td>*</td>
<td>266-500 MW</td>
<td>Proposed</td>
</tr>
</tbody>
</table>

* Information not available
location but not within the same field of view (i.e. the viewer has to turn their head in order to view both wind farms).

- ‘Sequential’ cumulative visual impacts may arise as a result of multiple wind farms being observed at different locations during the course of a journey (e.g. from a vehicle travelling along a highway or from a network of local roads), which may form an impression of greater magnitude within the construct of short term memory.

The report found that there are opportunities for ‘direct’ and ‘indirect’ views from residential dwellings and ‘sequential’ views from some surrounding road corridors between Crookwell 3 and other wind farms. No townships would be able to see multiple wind farms, but receivers to the north and the south west of the Crookwell Wind Farm cluster may see elements of all three wind farms when developed (Crookwell 1, 2 and 3). There is also a cumulative visual impact when driving between Goulburn and Crookwell and Goulburn and Taralga.

However, the LVIA concluded that “there is unlikely to be a significant increase in visual impact arising from cumulative impacts”. Collectively, the Crookwell Wind Farm cluster represents the average size of a modern wind farm, however across a number of sites.

The LVIA concluded that:

- Overall, the Crookwell 3 Wind Farm is not considered to significantly increase the magnitude of visual impact for the majority of residential view locations within the Crookwell 3 wind farm 10km viewshed.
- The potential for the occurrence of ‘direct’ and ‘indirect’ cumulative visual impact is mitigated to a degree by the screening or partial filtering of views toward approved and existing wind farms.
- Sequential views from local roads would be mitigated to some extent by undulating landform and tree cover alongside road corridors.

As tall structures, some of the wind turbines may (depending on the legislation at the time of construction) require obstacle lighting. The LVIA noted that only a relatively small number of residential dwellings within 3km of the lit turbines would experience some degree of potential visual impact, together with an increased cumulative impact from the approved Crookwell 2 Wind Farm. The impact can be significantly reduced by curtains or blinds being drawn at night time.

Furthermore, the intensity of the visual impact of night time lighting would tend to “diminish over 3 to 4km from the lit turbines, and would be more likely to be screened by topography and vegetation surrounding individual residential dwellings”.

The LVIA found that “night time lighting associated with the wind farm is unlikely to have a significant visual impact on the majority of public view locations”. The duration of visibility to motorists would tend to be very short and partially screened by the undulating landform along some sections of local road corridors.

### 22.5 Ecological Impacts

Significant environmental impact has occurred in the vicinity of the site due to the clearing of native vegetation for grazing and subsequent settlement. The vegetation across the site is represented for the most part by cleared grazing paddock, most of which is highly disturbed. Parts of these cleared areas (primarily at the lower altitudes) “would have once represented the Endangered Ecological community of White Box- Yellow Box-Blakely’s Red Gum Grassy Woodland and Derived Native Grassland however these areas are now largely cleared and pasture improved”.

The wind turbines are proposed to be located primarily on cleared grazing lands, as are the access roads and other associated infrastructure. Some vegetation clearance is required for turbines and tracks, but not in area deemed to be significant. The results of the initial and targeted field surveys detected no Endangered Ecological Communities or individual threatened flora or fauna species listed under either the
EPBC Act or the TSC Act within the site. As no significant impact on flora and fauna is likely as a result of the wind farm, the cumulative impact of the project on flora and fauna is likely to be low.

The cumulative ecological impacts arising from the Crookwell 3 Wind Farm in conjunction with other nearby wind farms is considered low.

22.6 Noise Impacts

The potential cumulative noise impacts generated from the turbines in the existing Crookwell 1, approved Crookwell 2 and proposed Crookwell 3 Wind Farm has been predicted and assessed. Exceedances of the SA EPA Guideline limit were predicted for all four investigated WTG models, with the Vestas V90 WTG layout resulting in 8 exceedances. Of the 116 identified receivers surrounding the site, 16 houses were predicted to receive noise levels above the limit prescribed by the SA EPA Guideline by one or more of the WTG models.

However the noise impact assessment noted that the conservative assumptions would potentially overestimate noise levels. The report states that:

“The noise modelling procedure undertaken as part of the noise impact assessment relies on a number of conservative assumptions, the foremost being that noise propagates downwind from each source. This will overestimate the predicted noise level where receptors have WTGs located around them in more than a singular direction or quadrant as wind is not able to blow in more than one directional quadrant simultaneously. This exact scenario describes the relative positioning the receptors identified as exceeding SA EPA Guideline levels have with respect to WTGs from Crookwell 2 and Crookwell 3. The degree to which this conservative assumption potentially over-estimates noise levels has been evaluated by predicting noise at compliance critical receptors using alternative algorithms and specific wind directions of easterly and westerly versus all downwind. The predicted degree of conservatism of the all downwind assumption is expected to be greater than the predicted exceedances.”

Furthermore, a mitigated operation scenario was considered where a select few turbines (Vestas V90) from both the approved Crookwell 2 Wind Farm and the proposed Crookwell 3 Wind Farm are operated in a ‘low noise’ mode. The resulting reduction in cumulative noise levels at potentially affected receptors “was sufficient to reduce the total number of cumulative noise exceedances to 1 (House 70 Exceedance of 0.3 dBA at 8.2 m/s) which would be considered only marginal”.

The results of the assessment found that “all non-host properties are predicted to be within the nominated World Health Organisation (WHO) Guideline noise limits”. The noise impact for the receivers that are predicted to experience noise levels exceeding the ‘Background + 5 dBA’ intrusive criteria is expected to be minimised by the mitigation measures such as the verification of noise levels at commissioning, extensive monitoring, preparing and implementing a Noise Management Plan, and options such as operating turbines on ‘low-noise’ mode and providing acoustic upgrades at dwellings. The mitigation measures are outlined in Chapter 24 – Statement of Commitments.

The noise impact assessment also found that the cumulative noise impacts arising from ‘worst case’ scenarios for construction noise, blasting impacts and traffic generation were generally within acceptable levels.

22.7 Aeronautical Impacts

It is acknowledged that an increase in the number of wind farms in a given area would increase the number of hazards that pilots must avoid during flights. Therefore additional wind farms in the region can create a cumulative aeronautical impact. In the context of a typical flight however, the additional area representing a potential hazard arising from the construction of a new wind farm is negligible and would not create unreasonable additional impacts for aircrafts.
Whether a wind farm is a hazard to aircrafts is more a function of its visibility and height rather than its horizontal spread.

The risk is mitigated through notification to the relevant authorities in order to include the wind farm layout on local aeronautical mapping systems.

The aviation impact assessment prepared by Aviation Projects Pty Ltd noted that there would be an increased area that would potentially be restricted from the conduct of aerial application of agricultural fertilisers and/or pesticides and fire fighting. However, owners of those properties on which the wind farm would be situated have no intention of using aerial application of agricultural fertilisers and/or pesticides in the future, and there are alternate (ground-based) fire fighting methods available.

Obstacle lighting has been identified as a possible requirement for the project. Surrounding wind farms would also potentially require obstacle lighting such as Crookwell 2, and it would be preferable to synchronise the flashing of obstacle lights of wind farms within close proximity to each other (wherever possible) to minimise visual impact. Visual impacts can be minimised by restricting the downward component of light to either, or both, of the following:

- Such that no more than 5% of the nominal intensity is emitted at or below 5° below the horizontal.
- Such that no light is emitted at or below 10° below the horizontal.

The turbines of the proposed Crookwell 3 Wind Farm are proposed to be higher than those of the existing Crookwell 1 Wind Farm and the approved Crookwell 2 Wind Farm, and would therefore establish the vertical limit for aviation activities. Therefore, aircraft would potentially have to fly at a higher altitude or divert around the project, and Airservices Australia found that a minor adjustment to the W10 air route to the north of Goulburn would be required accordingly.

The report concludes that “the proposed development does not impose any significant risk to normal flying operations for nearby aerodromes or aircraft landing areas”.

### 22.8 Traffic Impacts

In the event that approved Crookwell 2 Wind Farm and the proposed Crookwell 3 Wind Farm are constructed simultaneously, rather than sequentially, there is potential for cumulative traffic impacts arising out of the construction phases of these two projects.

It is considered that the Goulburn Highway has sufficient capacity to cater for a large number of wind farms in the region to be built simultaneously without compromising the road network capacity. An analysis of the Crookwell 3 site access routes was conducted in the traffic impact assessment (TIA) prepared by URS, which found that;

“There is no significant cumulative impact when incorporating the construction phase of the Crookwell 2 development with the proposed vehicle activities of the construction phase of the Crookwell 3 development”.

The outcome of TIA determined that the impact of the proposal during the construction and operational phases to the existing road network is negligible.

The TIA detailed the road and intersection upgrades between Port Kembla and the subject site that would be constructed as part of the Crookwell 2 Wind Farm, which include:

- all intersections that require upgrading on the route from Port Kembla to Crookwell, including the Crookwell Road/ Woodhouselee Road intersection;
- Crookwell Road (between Woodhouselee Road and Crookwell 3 South site access); and
- Woodhouselee Road (between Crookwell Road and Crookwell 3 East site access),

These upgrades, which are required as part the Crookwell 2 Wind Farm development, are likely to occur prior to the construction of the proposed Crookwell 3 Wind Farm.
which will share infrastructure to be constructed as part of the Crookwell 2 Wind Farm. These upgrades would provide for safe and direct access to both wind farms, but also create improved road conditions which provide tangible benefit to the wider community.

### 22.9 Economic and Social Impacts

The cumulative social and economic impacts arising out of several wind farms within a region can be both positive and negative.

The cumulative economic impacts are outlined below:

- if a number of wind farms are constructed sequentially then this allows for an industry to be developed in the region – generating ongoing work and continuing skill improvement for local people;
- greater wind farm development in the region increases the opportunity for local business to capture more of the investment locally;
- tourism generated by wind farms, and visits to viewing platform such as Crookwell I, are likely to increase with greater wind farm development; and
- greater diversification of the local economic base away from agriculture.

The cumulative social impacts are outlined below:

- the building of several successful wind farms in the region can decrease fear associated with an unknown infrastructure development;
- multiple wind farms can add to the annoyance of those opposing any single wind farm;
- there is potential for multiple wind farms to alter the character of the region – whilst some residents and visitors may consider wind farms positively add to the character of the region others may consider that several wind farms in the region are a negative addition to the character;
- the increased contributions to Upper Lachlan’s Community Enhancement Fund arising out of multiple wind farms can be put to greater use in the local community; and
- multiple wind farms can assist in the positioning of the region as a leader in renewable energy and the generation of new opportunities for local residents.
23 Consultation

23.1 Introduction

CDPL understands the need to effectively communicate with residents and all relevant stakeholders through a program of community consultation. An analysis of public consultation undertaken and recommendations of future actions was included in the Socio – Economic report included as Appendix 5.

The Draft National Wind Farm Guidelines (July 2010), the EARs and the Upper Lachlan Shire Council DCP require wind farm proponents to consult with communities prior to development.

In addition, the Draft NSW Wind Farm Planning Guidelines (December 2011) recommends that wind farm proponents establish a Community Consultative Committee. CDPL is currently in the process of setting up a Community Consultative Committee for the project. Refer to Appendix 1 for further information.

CDPL has developed a community consultation and engagement program aimed at providing the community and stakeholders with factual information about the project and gathering feedback about their concerns and interests, which can subsequently be addressed in the approvals process and influence the project design where appropriate.

As part of this planning application, the consultation program involves:

- identification of stakeholder groups;
- newsletters widely distributed in the region;
- a door-knock consultation and survey;
- consultation with the local community;
- a second independent round of consultation with concerned community members;
- consultation with particular focus on any neighbours that have houses within 2km of a wind turbine proposed as part of the project;
- consultation with Upper Lachlan Shire Council;
- hosting of a widely advertised Information Day for residents and other stakeholders during the public exhibition period;
- consultation with State Government agencies, specially the NSW Department of Planning and Infrastructure, Office of Environment and Heritage (OEH) [previously NSW Department of Environment, Climate Change and Water (DECCW)], NSW Department of Transport and Infrastructure (DTI), NSW Department of Industry and Investment, Department of Defence, and other Government bodies; and
- establishing a Community Consultative Committee (CCC).

The consultation activities commenced many years ago at the beginning of the project and are proposed to continue throughout the various phases of the project, including after construction. The consultation timeline will be dynamic and will be updated as required to suit the planning process and feedback from key stakeholders.

23.2 Objectives

The key objectives of the stakeholder consultation are to ensure that stakeholders are:

- informed of the proposed wind farm;
- aware of the approvals process;
- aware of the details of the project, including specialist information that the proponent is required to lodge in its application; and
granted an opportunity and platform to ask questions, raise potential issues or concerns, and inform the design and development of the proposed facility.

Information was given throughout the consultation process to date to ensure that local residents are aware of the process after the application is submitted to the Department of Planning and Infrastructure. Further consultation will occur following lodgement of this EA to advertise the public exhibition of this EA and the submission period.

23.3 Stakeholder engagement

Planning for the proposed Crookwell 3 Wind Farm included initial consultation with the key stakeholders, primarily the owners of land on which the proposed wind farm is sited. The scope of consultation was then broadened to include the local councils, government agencies, neighbouring landowners and the wider local community.

The consultation with stakeholders (refer to Table 25 – Stakeholders and Table 26 – Stakeholder Consultation Mechanisms) that has taken place prior to the submission of this EA includes:

- telephone discussions;
- emails and letters;
- a Planning Focus Meeting where government agencies were invited to the site and informed about the project on 17 March 2010;
- publication and distribution of a newsletter in the region in March 2010;
- a door-knock consultation survey, whereby the proponent visited households within 3 to 5 km of the proposed wind farm on 28, 29 and 30 April 2010;
- responses to further information requests from some residents in relation to aspects of the proposal;
- a second independent round of consultation with concerned community members;
- formal briefings and meetings with MPs, councillors, council officers, and relevant government agencies and departments;
- advertisement of the project in the Voice newspaper;
- telephone consultation and household visits with neighbours that have houses within 2km of a proposed wind turbine, providing an update on the proposal and the process, and offering photomontages to be prepared from their property on May 2012;
- consultation with the local council regarding the establishment of the CCC; and
- advertisement of the CCC in the online and printed publications of the Crookwell Gazette and Goulburn Post and also in the Voice newspaper.

Additional stakeholder engagement and consultation activities that are proposed to take place following the lodgement of this EA include:

- publication and distribution of a second newsletter in the region providing an update on the proposal and the process;
- responses to website, phone and written further information requests in relation to aspects of the proposal;
- meetings with government agencies;
- hosting of a Community Information Day, whereby interested members of the community have the opportunity to talk directly with CDPL and the consultant team;
- establishing a Community Consultative Committee; and
- requesting and responding to submissions in the public exhibition period.
The individual issues raised in the engagement and consultation process have been valuable in guiding the development of the proposed wind farm. A number of revisions to the site plan and turbine layout have been specifically influenced by stakeholder input.

The project team intends to continue the consultation process through the planning, construction and operation of the proposed wind farm. It is proposed that the consultation process would be reviewed to assess its effectiveness over these stages.

Table 25 – Stakeholders

<table>
<thead>
<tr>
<th>Sector</th>
<th>Relevant Persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Community</td>
<td>Landowners who would host turbines on their land</td>
</tr>
<tr>
<td></td>
<td>Landowners within a 3-5km radius of the wind farm</td>
</tr>
<tr>
<td></td>
<td>Residents of Crookwell Township</td>
</tr>
<tr>
<td></td>
<td>Other interested community members</td>
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<tr>
<td>NSW Government Agencies</td>
<td>Upper Lachlan Shire Council (ULSC)</td>
</tr>
<tr>
<td></td>
<td>Goulburn Mulwaree Shire Council (GMSC)</td>
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<tr>
<td></td>
<td>NSW Department of Planning and Infrastructure (DoPI)</td>
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<tr>
<td></td>
<td>NSW Department of Environment, Climate Change &amp; Water (DECCW)</td>
</tr>
<tr>
<td></td>
<td>Catchment Management Authorities (CMAs) – Hawkesbury Nepean Southern Catchment Area</td>
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<tr>
<td></td>
<td>NSW Department of Transport and Infrastructure (DTI)</td>
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<tr>
<td></td>
<td>Road and Traffic Authority (RTA)</td>
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<tr>
<td></td>
<td>Rail Infrastructure Corporation</td>
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<td></td>
<td>NSW Department of Industry and Investment</td>
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<td></td>
<td>Livestock Health and Pest Authorities State Management Council</td>
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<td></td>
<td>Electricity Transmission Authority (TransGrid)</td>
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<td>Land and Property Management Authority – Crown Lands Division</td>
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<td>Rural Fire Service (RFS)</td>
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<td></td>
<td>Office of Renewable Energy Regulator (ORER)</td>
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<td>Federal Government Agencies</td>
<td>Civil Aviation Safety Authority</td>
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<td>Airservices Australia.</td>
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<td></td>
<td>Department of Defence.</td>
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<td>Department of the Environment, Water, Heritage and the Arts.</td>
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<tr>
<td>Non-Government Organisation</td>
<td>Local Aboriginal Land Councils (LALCs)</td>
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<td></td>
<td>Local tourism Organisation(s)</td>
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<td>Local Community Group</td>
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<td>Local Environmental Group(s)</td>
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<td></td>
<td>Industry Groups (ICNNSW)</td>
</tr>
<tr>
<td>Other Stakeholders</td>
<td>Local newspapers</td>
</tr>
</tbody>
</table>

Environmental Assessment – Crookwell 3 Wind Farm
Table 26 – Stakeholder Consultation Mechanisms

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Newsletter</th>
<th>Group meeting</th>
<th>(Email, Letter, Phone)</th>
<th>Ad in local papers</th>
<th>Website</th>
<th>Information Day (future)</th>
<th>Personal meeting</th>
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<tr>
<td>Neighbours</td>
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<tr>
<td>Local Government</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<td>✓</td>
</tr>
<tr>
<td>State Government agencies and MPs</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>Commonwealth civil aviation authority/ Air Services Australia</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Local media organisations</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

23.4 Consultation program and activities

CDPL’s approach to community consultation involves:

- providing the community with factual information about the project; and
- gathering feedback from the community and stakeholders about their concerns and interests, which can subsequently be addressed in the approvals process.

The details of the engagement and consultation program for this project are outlined below.

23.4.2 Project inception

During initial concept and strategy development, CDPL approached landowners in the Crookwell area with a proposal to host a monitoring station to assess the suitability of the area and determine whether there was an adequate and consistent wind resource to support a commercial wind farm. After determining that the wind conditions in the area where favourable, CDPL commenced consultation with adjacent neighbouring property owners to establish their interest in being involved in the proposed wind farm.

The discussions with landowners over leasing arrangements were, as with all wind farm and other large commercial projects, necessarily confidential.

Once the project gained some certainty, broader consultation was also undertaken with identified stakeholders in Crookwell and the greater region, as outlined below.

23.4.3 Consultation with government and non-government organisations

CDPL has conducted considerable consultation with government agencies and relevant organisations in relation to the proposed Crookwell 3 Wind Farm (refer to Table 25 above).

A Planning Focus Meeting was held on 17 March 2010 at the site, in which government agencies were invited to be informed and discuss the proposed Crookwell 3 Wind Farm. The attendees at the meeting were representatives from:
– CDPL and its consultants;
– the NSW Department of Planning and Infrastructure;
– the Sydney Catchment Authority;
– the NSW Rural Fire Service;
– the Upper Lachlan Shire Council;
– the Department of Environment, Climate Change and Water (DECCW);
– the Hillview Park Landowner;
– the Leeston Landowner; and
– the Wollondilly Landowner.

The following modes of consultation will continue to be used with the above organisations throughout the planning process:
– Face-to-face meetings; and
– Regular project liaison including emails and telephone calls,

The Department of Planning and Infrastructure (DoPI) is the main government agency in the approvals process. Regular liaison with the DoPI will occur throughout the assessment process.

23.4.4 Newsletter

In March 2010 a newsletter was prepared providing details and a map of the proposal. It introduced CDPL and UFWA and also included the scope of issues to be explored by the project team. The newsletter informed the community about the details of the proposed wind farm, the planning process and the next steps in the project. Additionally, company contact details were provided for telephone, post, email and internet.

The newsletters were distributed in March 2010 to:
– all landowners and residents within a 5km radius of the wind farm sites;
– the Crookwell Township which is located more than 10km from the site boundaries; and
– relevant government agencies and other identified community interest groups.

The newsletter was subsequently posted on the UFWA website. A copy of the newsletter is found at Appendix 14.

It is proposed that subsequent newsletters would be published and distributed as part of the community engagement process. The next newsletter is proposed to be distributed before the exhibition phase advising residents of the opportunity to submit. The newsletters will provide general information about the project, the planning and approvals process, details of the planned community information day session, and project updates.

The distribution of the next newsletter is proposed to be expanded to include any additional interested parties identified in the interim period. The newsletter will also be made available to the wider community at the local Council offices and the information centres.

23.4.5 Advertisements

In April 2010, CDPL issued a media release informing the community of the ‘Door knock’ that was to be conducted at the end of the month. This advertisement included CDPL’s freecall number for interested members of the community to contact the company. A copy of the media release is found at Appendix 15.
CDPL also advertised the proposal in the Voice newspaper in January 2011, informing the public of the project status, updates on the proposal, and the planning process. It also included CDPL’s freecall number. A copy of the advertisement is found at Appendix 15.

23.4.6 Door-Knock survey

On 28, 29, and 30 April, 2010, CDPL conducted a ‘door knock’ consultation of households within a 3 to 5 km radius of the proposed wind farm. The purpose of face-to-face door-knock meetings was to “provide stakeholders with detailed information about the project and the approvals process and to provide opportunity for the individuals to have their say” and enable CDPL to gather information about residents’ views and any concerns.

CDPL representatives visited 118 properties; of which approximately 50 had no property owner present or there was no house or ability to enter the property (e.g. entry to property was prohibited).

The survey found the following:

– Of the respondents who were either supportive or highly supportive, a large number still had high levels of concerns about a range of issues, including electromagnetic interference, land values and noise.

– 100% of the respondents who indicated they were neutral towards the project (representing 26% of all respondents) were concerned or very concerned about a range of issues. Given the level of concerns that existed amongst this cohort, there is significant risk that they may oppose the project if these risks are not adequately addressed.

– A number of respondents concerned about the project met as a group had their comments recorded collectively - had the meetings occurred individually, the number of people opposed would have been higher.

– Opponents indicated areas where they would like to see improvements from wind farm developers, namely responsiveness, transparency, compensation, community investment and regional planning and development. This provides an opportunity for CDPL to consider these issues and respond so as to improve CDPL’s standing with these stakeholders become their wind farm developer of choice.

A record of correspondence was maintained for each door-knock meeting. In the event that the community member(s) were not home at the time of the door-knock, the resident(s) were provided with an opportunity for follow-up consultation via a letter with the time and date of the visit and contact details. CDPL followed up with 7 of these property owners between May and June 2010 either over the phone or in person.

23.4.7 Second round consultation

To further strengthen the community consultation strategy, CDPL engaged Futureye to interview a select group of six highly-concerned community members over the phone between 14 June and 8 July, 2010 in order to further understand the issues which underpin their concerns.

These stakeholders were selected “based on recommendations by CDPL and a Futureye analysis of the concerns raised during the initial CDPL door-knock surrounding the proposed Crookwell 3 development”.

Futureye has synthesised these community members’ views under nine thematic headings. The thematic issues and the proponent’s responses are discussed in Table 27 below. These issues are further discussed in the socio-economic report found at Appendix 5.

CDPL has developed initial responses to address these concerns and is “committed to taking further action on these concerns depending on the consultation and engagement requirements delineated in any future licence that might be approved”.

Environmental Assessment – Crookwell 3 Wind Farm

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23.4.8 Consultation with neighbours within 2km

CDPL identified 18 non-host landowners with a potential residence within 2 km of a proposed wind turbine. Of the 18 locations identified, 15 were confirmed to be residences, one (1) had approval for construction of a dwelling, one (1) was an unused church and another one (1) was a shed.

Using the contact information gathered during the door-knock in 2010, consultation over the phone took place between 1 and 4 May, 2012 to update these landowners on the proposed wind farm project and arrange face to face meetings.

On 8 and 9 May, 2012, CDPL conducted face to face meetings with seven (7) of the 18 non-host landowners with potential dwellings within 2 km of a proposed wind turbine. The other non-host landowners where either not agreeable to a meeting, not available at the time or contact over the phone or during the site visit was not possible.

The purpose of the face-to-face meetings was to:

- provide the landowners with the latest proposed layout
- identify issues and potential measures to mitigate any adverse impacts:
- enquire of their interest in entering a neighbours agreement:
- inform them of the upcoming lodgement of the Environmental Assessment; and
- inform them of their right to lodge a submission to the Crookwell 3 Wind Farm proposal during the public exhibition phase.

CDPL also offered to have photomontages prepared for each property. Of the 18 non-host landowners, four (4) declined a photomontage.

In relation to the neighbour agreement, raised only during the face to face meetings, all 7 landowners consulted were interested in starting conversations to consider an agreement.

Notes were taken and recorded for each face to face meeting (refer to Appendix 16 for the template used). In the event that the non-host neighbouring landowner was not reached on the phone or was not home at the time of the door-knock, the resident was provided with an opportunity for follow-up consultation and preparation of photomontage offered via a letter, which stated the time and date of the visit and contact details (refer to Appendix 16). CDPL followed up and was able to get in contact with four (4) of these property owners during May 2012 over the phone.

A correspondence register has been created to record all consultation with the identified neighbours with an existing or approved dwelling within 2km of a proposed wind turbine.

23.4.9 Community Consultative Committee

On 8 May 2012 a meeting was held at the Upper Lachlan Shire Council (ULSC) to discuss the Crookwell 3 Wind Farm proposal and the steps towards forming the Community Consultative Committee (CCC). Following the meeting, a Charter proposal for the CCC was sent to ULSC for their review and consideration.

The purpose of the CCC is to provide a forum for regular, open discussion between representatives of CDPL, the community, Council and other stakeholders about issues relating to the development of the wind farm. If the project is approved, the CCC will provide a forum for ongoing communication with the community during the construction, operation and decommissioning phases. The members of the committee will comprise, in accordance with the Draft NSW Wind Farm Planning Guidelines:

- an independent chairperson,
- 5 to 7 representatives of the local community and other stakeholders,
- 1 representative of the local council, and

– 2 representatives of the proponent.

In June 2012, CDPL issued a media release informing the community that it is seeking nominations from local community members and/or affected stakeholders to represent the community for the proposed Crookwell 3 Wind Farm's CCC. This advertisement included the selection criteria, as well as the submissions closing date (17 August 2012), contact details and CDPL’s freecall number for queries.

The media release was advertised in the online and printed publications of the Crookwell Gazette and Goulburn Post, the Voice newspaper and the ULSC noticeboard. A copy of the advertisement and schedule is found at Appendix 17.

After the submissions closing date and in accordance with the Draft NSW Wind Farm Planning Guidelines, the Director General will appoint the local community and other stakeholders’ representatives. The Director General may review the appointment of community and other stakeholder representatives from time to time.

Once the CCC is established the meetings will be held in accordance with the Guidelines. If the project is refused, the committee will be abandoned.

CDPL will encourage Committee members to discuss issues and disseminate information about the Crookwell 3 Wind Farm proposal with the wider community, including special interest groups. CDPL will keep minutes of all meetings of the Committee, to be presented to the Council, Committee members, and published on the website.

23.4.10 Community Information Day

A community Information Day is proposed to be held in the Crookwell Township during the public exhibition period. This will take form of an information session where interested members of the community will have the opportunity to talk directly with CDPL representatives and the consultant team about the proposed wind farm. A range of experts in their fields will attend the Information Day to answer any questions and provide further details relating to the project.

The Information Day will include display of posters explaining the project and the approvals process. The session will be advertised in local papers two weeks prior to the session occurring. The timing of the information day is intended to coincide with the start of the exhibition period, allowing interested parties an opportunity to learn more about the project to inform their submission. The information day will also advertise the exhibition period and invitation for submissions.

Following the public exhibition period, the proponent will respond to the issues raised by submissions and, potentially, make changes to the project to address those issues. In this way, further feedback received at the information day may be incorporated into the wind farm design.

Feedback forms will be available to all attendees, to provide an opportunity for the community to formally comment on the project. Comments received through this feedback will be documented as part of the community consultation process.

23.4.11 Website and information line

CDPL has established a dedicated e-mail address, website and a freecall 1800 number that is to be included on all project material to allow stakeholders to make contact and make enquiries or comments relating to the Crookwell 3 Wind Farm project.

Any comments or complaints received through this process will be recorded on a ‘Record of Contact Form’ and actioned if necessary.

UFWA provides information to the public on approved and proposed wind farm developments via the website www.unionfenosa.com.au. The website provides information on wind energy, renewable energy targets and information about the company history and structure. In regard to this project, the March 2010 newsletter that
was distributed in region was posted on the website, as well as the media release advising the local community of the ‘door knock’ dates in April 2010.

CDPL endeavour in all correspondence to answer the community’s questions in a timely manner in relation to the proposed wind farm.

23.4.12 Documentation of stakeholder input into the approvals process

In order to adequately respond to local community members and stakeholders’ enquiries, records of all correspondence was compiled and distributed to the relevant consultant for their review and consideration as part of this consultation program.

23.4.13 Public Exhibition of the Environmental Assessment

Once this EA is placed on public exhibition by the DoPI, the community and stakeholders will be invited to make a submission and have the opportunity to have their say on the project. Notices will appear in the local newspapers and be included in letters to be sent to neighbouring property owners to advise that the exhibition period has commenced.

23.5 Key Issues Identified

The key issues identified during the consultation process, by both public agencies and the community, the proponent’s responses, and the sections of the EA where the issues have been addressed are shown in Table 27 below. These issues are further discussed in the full socio-economic report found at Appendix 5.

Table 27 – Issues raised during consultation process and CDPL Response

<table>
<thead>
<tr>
<th>Thematic Issue</th>
<th>Highly critical resident concerns</th>
<th>CDPL Response and Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Engagement and Information</td>
<td>Inaccuracies in information presented during information days and that the information provided is not necessarily what was included in the final report that was lodged with DP&amp;I.</td>
<td>Some of these criticisms may apply to the preliminary illustrations that were displayed during the Crookwell 2 information day that was held prior to the finalisation and lodgement of the modification application. To avoid future discrepancy between the pre-lodgement information and the public exhibition information, Crookwell 3 will not be publically displaying the Environmental Assessment results until deemed adequate by DP&amp;I.</td>
</tr>
<tr>
<td>Dissatisfaction with the company’s responsiveness and feedback to enquiries they had made.</td>
<td>CDPL reviewed communications with community member and sought advice on how it may better ensure its responses to the community’s queries address these concerns. In accordance with the draft NSW Wind Farm Planning Guidelines CDPL is in the process of establishing a Community Consultative Committee as a forum for open discussion between the community, council, other stakeholders and the proponent. Refer to Section 23.4.9 Community Consultative Committee.</td>
<td></td>
</tr>
</tbody>
</table>

1 This was in particular reference to visual images of the wind farm layout and a perception that the images were misleading.
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach</td>
<td>CDPL seeks to validate the information provided with the aim of ensuring it meets the community’s needs through ongoing consultation. Refer to Section 23.4.9 Community Consultative Committee.</td>
</tr>
<tr>
<td>Subject experts provided</td>
<td>CDPL is committed to preparing accurate information that addresses the environmental assessment requirements and is relevant to community’s needs.</td>
</tr>
<tr>
<td>provided by CDPL did not meet</td>
<td></td>
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<tr>
<td>the expectations of some</td>
<td></td>
</tr>
<tr>
<td>community members on some topics</td>
<td></td>
</tr>
<tr>
<td>(e.g. fauna).</td>
<td></td>
</tr>
<tr>
<td>Health / Noise</td>
<td>CDPL recognises that this may stem from media stories and conflicting reports about noise impacts on health. Refer to Chapter 11 – Health.</td>
</tr>
<tr>
<td></td>
<td>CDPL is committed to addressing community concerns and provide information about noise related impacts including the acoustic assessment as part of a future information day and providing the community with information sheets about noise related impacts. Refer to Chapter 10 – Noise.</td>
</tr>
<tr>
<td>Wind Farm Technology</td>
<td>Recognition that wind power is one of the only viable commercial forms of renewable energy that can be deployed in a short timeframe to address state, federal, and international energy challenges.</td>
</tr>
<tr>
<td></td>
<td>CDPL is committed to providing further information about this energy source at its future community information day. For more details regarding the benefits of wind energy refer to Section 6 – Project Justification.</td>
</tr>
<tr>
<td>Community Development and</td>
<td>Cumulative impacts have been assessed as part of the Crookwell 3 Environmental Assessment. Refer to Chapter 22 – Cumulative Effects for information on visual, ecological, noise, aeronautical, traffic and economic and social cumulative impacts.</td>
</tr>
<tr>
<td>Regional Planning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Belief that the state government’s regional planning should consider community impacts when approving a wind farm by approving projects in less dense areas with government-subsidised funding to extend a transmission line to connect wind turbines to existing electricity infrastructure.</td>
</tr>
<tr>
<td></td>
<td>CDPL is in the process of negotiating a voluntary planning agreement under which it is proposed that CDPL will contribute an annual monetary contribution of amount of $1,666 (adjusted annually to changes in the CPI) per operating turbine forming part of the Crookwell 3 Wind Farm.</td>
</tr>
<tr>
<td><strong>Environmental Assessment</strong> – Crookwell 3 Wind Farm</td>
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</tr>
<tr>
<td><strong>Criticism of some structures and governance of community enhancement funds and the belief that there should be a greater linkage between expenditure from the funds and the impacts of the wind farm.</strong></td>
<td>These annual contributions would be paid into a Community Enhancement Fund which will fund local projects within a radius of up to 30km of the Crookwell 3 Wind Farm, including projects aimed at ameliorating any impacts from the Crookwell 3 Wind Farm.</td>
</tr>
<tr>
<td><strong>Flora and Fauna</strong></td>
<td>CDPL is committed to monitoring and developing baseline data with regards to specific bird species and communities and offsetting any potential flora and fauna impacts arising from the proposal.</td>
</tr>
<tr>
<td>Impacts on flora and fauna, particularly on specific bird species, such as the wedge tail eagle.</td>
<td>Chapter 14 – Flora and Fauna provides an assessment of the potential flora and fauna impacts of the proposed Crookwell 3 Wind Farm.</td>
</tr>
<tr>
<td>Bird mortality within families of birds, which can potentially impact breeding cycles and future populations.</td>
<td>Chapter 14 – Flora and Fauna provides an assessment of the potential flora and fauna impacts of the proposed Crookwell 3 Wind Farm.</td>
</tr>
<tr>
<td><strong>Property Values</strong></td>
<td>CDPL acknowledge potential negative and positive impacts on property prices and recognise that these are generally confined to the short term due to buyer uncertainty about future developments in the region. Refer to Chapter 8 – Economic and Social Impacts for an assessment of the impacts on property values.</td>
</tr>
<tr>
<td>Wind farm proposal impacts on property values.</td>
<td>CDPL is working with the local community and council to address the underlying issues behind the Upper Lachlan DCP buffer zones in order to get a positive outcome for landholders interested in subdividing their land.</td>
</tr>
<tr>
<td>Belief dwellings cannot be constructed within 2 kilometres of a wind turbine without diminishing the potential to subdivide land due to the Upper Lachlan DCP.</td>
<td>CDPL is committed to providing information and engaging with landholders in a manner which mitigates any potential tension caused in the community arising from the proposed wind farm development. CDPL is establishing a Community Consultative Committee as a forum for open discussion between the community, council, other stakeholders and the proponent. Refer to Chapter 23 – Consultation.</td>
</tr>
<tr>
<td><strong>Community Division</strong></td>
<td></td>
</tr>
<tr>
<td>Belief proposed wind farm developments have created divisions and tensions within the community and that wind farm developers are not helping to address these issues.</td>
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</tbody>
</table>
## Buffer Zones

<table>
<thead>
<tr>
<th><strong>Enforcement of a two-kilometre buffer area between any wind turbine and a residential property.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CDPL acknowledges community concerns about issues of proximity to wind farms.</strong></td>
</tr>
<tr>
<td><strong>CDPL is committed to a 1km minimum buffer from all non-host landowner dwellings, perceived by the company as good practice, and seeking neighbours agreement with all non-host landowner with dwellings within 2km of a proposed wind turbine.</strong></td>
</tr>
<tr>
<td><strong>Understanding visual impacts on properties, ‘look and feel’ of the region and people wanting to locate in the area.</strong></td>
</tr>
<tr>
<td><strong>CDPL is committed to implementing recommendations from detailed noise and visual impact assessments undertaken as part of the environmental assessments. Refer to Chapter 9 – Visual for the assessment of the landscape and visual impacts of the Crookwell 3 Wind Farm.</strong></td>
</tr>
</tbody>
</table>

## Aerial Agriculture

<table>
<thead>
<tr>
<th><strong>Impacts to aerial agricultural applications (increased cost and difficulty)</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Potential impacts arising from Crookwell 3 Wind Farm on aerial agriculture applications have been addressed in Chapter 15 – Aviation.</strong></td>
</tr>
</tbody>
</table>

## Electro Magnetic Interference

<table>
<thead>
<tr>
<th><strong>Concerns about interference to radio and TV reception.</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Concerns about impacts arising from EMI around the WTGs are addressed Chapter 17 – Telecommunications.</strong></td>
</tr>
</tbody>
</table>

## Decommissioning

<table>
<thead>
<tr>
<th><strong>Concerns about what will happen with the wind farm and land after its operational life.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CDPL is committed to the decommissioning and rehabilitation of the wind farm. A Decommissioning and Rehabilitation Plan has been prepared for the Crookwell 3 Wind Farm as part of this assessment. Refer to Appendix 4.</strong></td>
</tr>
</tbody>
</table>

## Distribution of Benefits

<table>
<thead>
<tr>
<th><strong>Neighbours perceived as being equally impacted by wind turbines receive no financial benefit, particularly prevalent where the lease recipient was absent from the property, while the non-participating neighbour was in residence.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CDPL is committed to the Community Enhancement Program with the aim of directly benefiting the community.</strong></td>
</tr>
<tr>
<td><strong>CDPL is also seeking neighbours agreements with all non-host landowner with dwelling within 2km of a proposed wind turbine.</strong></td>
</tr>
</tbody>
</table>

The feedback provided during the consultation process to date resulted in a number of significant changes being made to the project to address some of the major issues raised. Changes made to the project since its inception include:

- removing 3 turbines from the initial proposed layout to reduce the potential visual impact and shadow flicker exposure to the nearby dwellings;
- relocating turbines to increase buffer distances to houses to reduce the potential noise and visual impact to nearby dwellings;
- increased screening vegetation to reduce the potential visual impact to the nearby dwellings;
- changes to the access tracks for avoidance or reduction in native vegetation removal;
- changes to the access road entrances to avoid disturbance to nearby dwellings; and,
– changes to the proposed powerline and cabling connecting the project to the approved Crookwell 2 substation, to reduce potential visual impact and removal of native vegetation.

Futureye Pty Ltd note in their report that: “CDPL has taken a beyond compliance approach to consulting the community stakeholders for the Project. CDPL has developed a community consultation and engagement program aimed at providing the community with factual information about the project and gathering feedback from the community and stakeholders about their concerns and interests. These concerns and interests can subsequently be addressed in the approvals process and fed back into the project design where appropriate”.

23.6 Recommendations

Futureye Pty Ltd makes a number of recommendations in their report in regards to the consultation program for the proposed Crookwell 3 Wind Farm development. Futureye recommend that CPDL:

– progress a number of recommendations in consultation with the NSW government, local council, the community at-large, and highly critical community members;

– revise the current consultation strategy with processes which address the issues raised by the highly-concerned stakeholders (including health impacts associated with noise);

– implement the revised consultation strategy in a coordinated, whole-of project and transparent manner throughout the planning process, construction, operational and closure phases of the project; and

– formalise, maintain and promote a consultation register, grievance mechanism and issue resolution tracking mechanism which is integrated into CDPL day-to-day operations as well as supplier agreements,

CDPL appreciate that the consultation program is a critical element in understanding and managing community and stakeholder expectations of the project.
This table outlines the tasks and actions that Crookwell Development Pty Ltd is committed to undertaking if the proposed Crookwell 3 Wind Farm is approved. These commitments seek to ensure that further specific details are provided on certain aspects of the wind farm, and that relevant standards are met throughout the construction, operation and decommissioning phases.

In the Table 28 below, some commitments address more than one sector, such as vegetation replanting that assists in minimising visual impacts and improving biodiversity. Commitments have been included only once in the following table, in the sector deemed to be the most relevant.

### Table 28 – Statement of Commitments

<table>
<thead>
<tr>
<th>Sector</th>
<th>Issue</th>
<th>Commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Micrositing</td>
<td>1. Ensure that micrositing or any minor changes to the project do not create any material increase in overall environmental impact. In the event of any significant changes to the proposed wind turbine layout, an updated noise assessment and visual impact assessment will be submitted prior to construction.</td>
</tr>
<tr>
<td>Pre-construction compliance</td>
<td>Pre-Construction Compliance Report</td>
<td>2. The proponent will submit a Pre-Construction Compliance Report to the Director-General at least two weeks prior to the commencement of construction (or such later time agreed to by the Director-General). The Pre-Construction Compliance Report will include details of the compliance with all applicable pre-construction conditions of approval.</td>
</tr>
<tr>
<td></td>
<td>Construction Environmental Management Plan</td>
<td>3. The proponent will prepare a Construction Environmental Management Plan (CEMP) and submit it as a draft for approval to the Director-General at least two weeks prior to the commencement of construction (or such later time agreed to by the Director-General). The CEMP will address the construction impacts of the project including the specific matters set out below. The proponent will implement the CEMP as approved by the Director-General.</td>
</tr>
<tr>
<td>Pre-operational compliance</td>
<td>Operation Environmental Management Plan</td>
<td>4. The proponent will prepare and implement an Operation Environmental Management Plan (OEMP) and submit it as a draft for approval to the Director-General at least one month prior to the commencement of operation (or such later time agreed to by the Director-General). The OEMP will address the operational impacts of the project including the specific matters set out below. The proponent will implement the OEMP as approved by the Director-General.</td>
</tr>
<tr>
<td>Economic and Social</td>
<td>Effect on local economy</td>
<td>5. Full time jobs and contractors for the construction and future decommissioning will be sourced locally where economical and if the skills and available labour exist within the community.</td>
</tr>
<tr>
<td></td>
<td>Community Consultation</td>
<td>6. The proponent will develop and maintain a community consultation and engagement program</td>
</tr>
<tr>
<td>Sector</td>
<td>Issue</td>
<td>Commitment</td>
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<tr>
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<tr>
<td></td>
<td></td>
<td>aimed at:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Providing the community with factual information about the project; and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Gathering feedback from the community and stakeholders about their concerns and interest, which can be subsequently addressed in the approvals process.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A dedicated email address, website and free call 1800 number will be available and responded to for the life of the project.</td>
</tr>
<tr>
<td>Community Enhancement Fund</td>
<td>7.</td>
<td>The proponent will contribute an annual monetary contribution of amount of $1,666 (adjusted annually to changes in the CPI) per operating turbine forming part of the Crookwell 3 Wind Farm. These annual contributions will be paid into the Upper Lachlan Shire Council’s Community Enhancement Fund which will fund local projects within a radius of 20-30km of the Crookwell 3 Wind Farm. CDPL proposes that the local projects which will eligible for funding from the Community Enhancement Fund will be projects aimed at:</td>
</tr>
<tr>
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<td>- enhancing any aspect of the local environment including, but not limited to, ameliorating any impacts from the Crookwell 3 Wind Farm; or</td>
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<td>- providing any community service or facility.</td>
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<td>Visual</td>
<td>Visual impact to nearby properties</td>
<td>8. Screening planting will be undertaken by the proponent in locations agreed between the proponent and local landowners within 3km of the proposed turbines, where the planting is seen as effective and is desired by the landowner to limit the view to the proposed wind turbines. It will involve a variety of dense native vegetation, including both trees and shrubs, and will be carried out at no cost to the landowner.</td>
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<td>9. The wind generator blades, tower and nacelle will be treated/painted with a non-reflective white or off white colour and matt finish to reduce glare and minimise blade glint.</td>
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<td>10. No advertising, signs or logos will be mounted on turbine structures, except those required for safety purposes.</td>
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<td>11. The height of earth stockpiles will be restricted to minimise visibility from outside the site.</td>
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<td>12. Activities that require night time lighting will be minimised, and low lux (intensity) lighting designed with the light projecting inwards will be used where necessary to minimise glare at night.</td>
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|                        | 13.                     | Should obstacle lighting be required, the lighting will comply with CASA standards to minimise unnecessary light spill. The downward component of light will be restricted to either, or both, of the following:  
- Such that no more than 5% of the nominal intensity is emitted at or below 5° below the horizontal; and  
- Such that no light is emitted at or below 10° below the horizontal. |
| Cumulative visual impact to nearby properties | 14.                     | Should obstacle lighting be required, the flashing of obstacle lights of wind farms within close proximity will be synchronised to each other (wherever possible) to minimise visual impact. |
| Noise                  | Construction noise      | 15. Undertake construction activities associated with the project that would generate audible noise at any non-involved residence during the standard construction hours as outlined below,  
- Monday to Friday: 7:00am to 6:00pm  
- Saturdays: 7:00am to 1:00pm  
- Sundays: No construction  
In the event that it is required to undertake other audible works outside the above construction hours, prior approval will be obtained from the relevant authority.  
The CEMP will contain mechanisms to prevent any unreasonable impact of construction noise on sensitive receivers. |
|                        | Blasting                | 16. The proponent will ensure that any blasting complies with the ANZECC guideline.                                                                                                                          |
| Operational Noise      |                          | 17. The proponent will undertake routine noise monitoring, assessment and reporting at compliance critical locations.                                                                                         |
|                        |                          | 18. During commissioning the actual received turbine noise level will be verified and determined through extensive monitoring.                                                                                  |
|                        |                          | 19. The proponent will ensure that operational noise levels will comply with the South Australia EPA Environmental Noise Guidelines principal acceptability criteria that the wind farm LA90 (10 min) noise should not exceed the greater of an amenity limit of 35 dBA or the pre-existing background noise by more than 5 dBA at each integer wind speed from cut in to rated power at any non-host property or residential receiver where noise agreements (in accordance with Section 2.3 of the SA EPA Guidelines) have not been entered into with the property owner. |
|                        |                          | 20. The proponent will ensure that the operational noise |
21. When the turbine model is known, a *Noise Management Plan* will be prepared and implemented as part of the OEMP to ensure that if the selected turbine does not comply under the predictive noise modelling, mitigation will be undertaken so that SA EPA Guideline standards are met.

22. In circumstances where undue turbine noise impacts are identified during operations then an ‘adaptive management’ approach will be implemented to achieve compliance with the applicable noise limits. This will include:
   - Identifying exactly what conditions or times lead to undue impacts.
   - Operating selected turbines in a reduced ‘noise optimised’ mode during identified times and conditions (sector management).
   - Providing acoustic upgrades (glazing, façade, masking noise etc) to affected dwellings.
   - Turning off turbines that are identified as causing the undue impact during identified times and conditions.

23. A collaborative noise impact mitigation strategy will be employed in order to address the cumulative noise impacts arising from the Crookwell 1, Crookwell 2 and Crookwell 3 Wind Farms which includes:
   - developing a mitigated noise operation layout;
   - applying acoustic treatment to impacted dwellings.
   - entering into noise agreements, in accordance with Section 2.3 of the SA EPA Guidelines, with selected neighbouring landowners; and

If negotiations for agreements are unsuccessful then the following adaptive management approach is proposed:
- Verify actual WTG noise levels through comprehensive noise monitoring.
- Evaluate turning off WTGs during specific wind direction and speed that are identified as causing the exceedances and undue impact on
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<td>the affected dwellings.</td>
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<td>- Evaluate the acoustic design of the dwellings and provide acoustic upgrades (glazing, façade, masking noise etc) to the affected dwellings.</td>
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<td></td>
<td>- Upon landowner initiated acquisition request, proceed with negotiations and give consideration to acquire the affected dwelling.</td>
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<td>- If the above options are unsuccessful, the WTG(s) will be taken offline for further investigation and if impact is not able to be resolved then remove the WTG(s) causing the unresolved exceedances from the layout.</td>
</tr>
<tr>
<td>Health</td>
<td>Health and safety of persons</td>
<td>24. Where properties are found to exceed the relevant SA EPA Guideline criteria the proponent will commit to, at the dwelling owner’s request, undertaking a detailed acoustic assessment of the dwelling and designing and installing appropriate building acoustic treatments to reduce the impact of turbine noise. The type of acoustic treatment required will depend upon the construction of dwelling and desired noise reduction, however, treatment may include;</td>
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<td>- Provision for mechanical ventilation.</td>
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<td>- Upgraded glazing and seals.</td>
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<td></td>
<td></td>
<td>- Upgraded doors and seals.</td>
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<td>- Provision for low level noise masking.</td>
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<td>25. The proponent will provide accessible information to the public on wind farm impacts including the benefits, and project details, process and updates.</td>
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<td>26. Warning signs will be installed to alert the public to the risk of unauthorised site entry.</td>
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<td>27. Access to the wind turbines and associated infrastructure will be restricted to reduce personal injury and public hazards, including:</td>
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<td>- Locked access to towers and electrical equipment.</td>
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<td>- Warning signs with postings of 24-hour emergency numbers.</td>
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<td>- Fenced storage yards for equipment and spare parts.</td>
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<td>28. Wind turbines will be equipped with sensors that can react to any imbalance in the rotor blades and shut down the turbine if necessary.</td>
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<td>29. Cable markers will identify the path of the underground cabling to prevent accidental digging around the cable trenches.</td>
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<td>30. The turbines and associated infrastructure will be</td>
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<td>31. The turbine model considered will have rotor over-speed protection and built-in redundancies, and be certified against the relevant standards including:</td>
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<td>- IEC 61400-23 [Wind turbine generator systems, Full-scale structural testing of rotor blades];</td>
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<td>- IEC 62305-1 / 3 / 4 [Protection Against Lightning];</td>
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<td>The turbine supplier will have incentives in their contract to provide the highest availability and efficiency, therefore enforcing a stricter and more effective maintenance regime.</td>
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<td><strong>Flora and Fauna</strong> 32. Where trees are removed the relevant land owner will be consulted and a suitable native species which does not affect the wind resource will be planted in place of the removed vegetation.</td>
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<td>33. The CEMP will contain mechanisms to prevent the spread of weeds and animals. Mechanisms may include:</td>
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<td>- Machinery wash downs</td>
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<td>- Staff training</td>
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<td>- Soil and fill screening</td>
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<td>- Other commonly used techniques</td>
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<td>- Coordinated management regimes managed by the wind farm developer.</td>
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<td></td>
<td><strong>34. Bat Monitoring and Habitat Tree Inspections</strong> 34. Bat Monitoring and Habitat Tree Inspections - Once the roads are pegged by surveyors potential habitat trees (that require removal) will be identified by an ecological survey.</td>
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<td>- These trees will be stage watched at dusk using infra-red spotlights and anabat detectors to determine usage by any threatened microchiropteran bats.</td>
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<td>- Accessible tree hollows that require removal will be inspected for fauna by infrared telescopic camera prior to removal to ensure that no species are present in the hollow and harmed during removal.</td>
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<td></td>
<td><strong>35. Bird Monitoring and Bat Strike Monitoring</strong> 35. Bird Monitoring and Bat Strike Monitoring - An additional baseline pre-commissioning survey will be undertaken at each turbine site during the spring/summer season. This will provide baseline data for the bird and bat strike monitoring study which will be undertaken during the first year or the operation of the wind farm.</td>
</tr>
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</table>
36. A Vegetation/Ecological Restoration Plan will be developed as part of the CEMP and will address the post-construction works to be undertaken to rehabilitate the areas that are disturbed as part of the construction works once construction is finalised.

37. A Riparian Vegetation Management Plan will be developed as part of the CEMP and will address the issues associated with the proposed creek crossings where any native vegetation is proposed to be disturbed.

38. The proponent will seek to extend the management contract with the owner of the “Hillview Park” property beyond December 2013. It is proposed that the offset for the proposed clearing of approximately 2.34 ha of native vegetation for the whole project will be provided by two formal Property Vegetation Plan agreements (PVPs) to be entered into with Hawkesbury Nepean Catchment Management Authority (HNCMA) once the turbines and project are approved. It is proposed that these PVPs would cover a total of approximately 60 ha of the remnant vegetation located within the site being:

   a. 15 ha in perpetuity; and
   b. an additional 45 ha for the life of the wind farm,

and that the proponent would provide sufficient funds each year for feral animal control and management of these two agreement areas.

39. All temporary and construction facilities will be located so as to avoid vegetation loss and the land will be rehabilitated to its former state at the conclusion of the construction stage.

40. Raw materials for the concrete batching plant will be sourced from external suppliers, and the material would be as clean as possible to minimise the potential of introducing weeds to the site.

41. The water for the concrete will either be sought on site subject to a separate licence issued by the NSW Office of Water, or transported to the site via tanker trucks.

42. Once the turbine locations are finalized, the proponent will notify the RAAF Aeronautical Information Service (AIS) of the location and height details of the turbines.

43. An assessment will be undertaken in consultation with applicable stakeholders prior to construction as to whether marking or lighting will be required to enhance the level of safety.

44. If required, medium intensity obstacle lighting will be
- To identify the perimeter of the wind farm;
- At longitudinal intervals not exceeding 900m;
- So that they are synchronised to flash simultaneously (both within the wind farm and with other wind farms in the vicinity); and
- So that any wind turbines of significantly higher elevation are also identified.

The obstacle lights will have the characteristics specified in MOS 139, Chapter 9.

45. A monitoring, reporting and maintenance program will be established in accordance with the requirements set out in MOS 139, Chapter 9 to ensure the ongoing availability of obstacle lights.

46. The proposed obstacle lighting layout will meet the CASA objectives of:
- Defining the “general definition and extent of the objects” for each cluster or linear array;
- Lighted turbines to be spaced “at longitudinal intervals not exceeding 900 m” for each cluster or linear array; and
- Lighting the most prominent (highest for the terrain) turbine in each cluster or linear array.

47. The need for obstacle lighting will be reviewed at regular intervals by the proponent.

48. In the event the immediate neighbouring landowner(s) would require aerial agriculture spraying of their land adjacent to the wind farm and there is an increase in cost associated with the proximity to turbines, the proponent will cover the reasonable cost increase for the aerial agriculture activity. The landowner seeking compensation for the cost increase must demonstrate and justify this increase by reference to previous records.

Transport

49. A detailed Transport Management Plan will be developed as part of the CEMP to include the finalized transport details and include management and mitigation measures for the project. This will be prepared before the construction phase of the project and will form the foundations for all traffic related activities.

50. A road profile assessment (road dilapidation report) will be carried out prior to movement of heavy and oversize vehicles for the construction phase and any deterioration in pavement quality as a result of the project’s road usage will be fixed.

51. Regular road inspections will be conducted and compared against the existing conditions (and
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<th>Sector</th>
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<tbody>
<tr>
<td>Traffic flow</td>
<td>Speed restrictions will be in</td>
<td>Speed restrictions will be in place surrounding the wind farm sites.</td>
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<tr>
<td>and capacity</td>
<td>place surrounding the wind</td>
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<td>farm sites</td>
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<tr>
<td>Tele-</td>
<td>Traffic flow and capacity</td>
<td>Access tracks will only intersect with government roads at nominated access points.</td>
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<tr>
<td>communications</td>
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<td></td>
<td>Television signal</td>
<td>Where necessary to address any impacts on resident’s television reception as a result of the project, the proponent will undertake one or more of the following measures as agreed with the resident at the proponent’s cost:</td>
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<tr>
<td></td>
<td>strength reduced</td>
<td>- Realigning the householder’s TV antenna directly towards their existing transmitter.</td>
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<td>- Tuning householder’s antenna into alternative sources of the same or suitable TV signal.</td>
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<td>- The installation of more directional and/or higher gain antenna at the affected residence.</td>
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<td>- Relocating the antenna to a less affected position.</td>
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<td>- The installation of a digital set top box (and UHF antenna if required).</td>
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<td>- The installation of cable/satellite TV at the affected residences.</td>
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<td>- Installation of a TV relay station.</td>
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<td>Interference with wireless</td>
<td>The proponent will work with Cirrus Communications to resolve any interference problems caused by the wind farm. Possible amelioration methods may include:</td>
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<td>internet</td>
<td>- installation of improved or higher antenna at affected dwellings; or</td>
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<td></td>
<td>- installation of a new base station to service dwellings in affected areas.</td>
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<td>Interference with television</td>
<td>Pre- and post-construction surveys will be conducted to determine the signal strength and quality of the television signal received at dwellings identified as having the potential to experience television interference.</td>
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<td></td>
<td>broadcasting</td>
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<td>Fire</td>
<td>Increased risk of fire</td>
<td>As part of the OEMP, a Bushfire Risk Management Plan will be developed based on the guidelines ‘Planning for Bushfire Protection’ (RFS, 2001).</td>
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<td>ignition or spread</td>
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<td>The proponent will consult with the RFS during periods of high fire danger, and generally to ensure the RFS are familiar with the development.</td>
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<td></td>
<td>The proponent will consult with the RFS in regard to the adequacy of bushfire prevention measures to be implemented on site during construction, operation and decommissioning.</td>
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<td>Workplace health and safety protocols will be</td>
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<tr>
<td>Environmental Assessment</td>
<td>Fire fighting systems</td>
<td>68. Vehicle turn-around facilities will be provided at every turbine tower site.</td>
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<td>69. 5-metre wide internal access tracks will be provided that are driveable and permanently clear of vegetation.</td>
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<td>Shadow Flicker</td>
<td>70. Screening structures or planting of trees to block shadows cast by the turbines will be installed where needed.</td>
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<td>71. Turbine control strategies which shut down turbines as necessary will be used.</td>
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<td>Heritage</td>
<td>72. A Cultural Heritage Management Plan will be prepared in collaboration with the Pejar Local Aboriginal Land Council.</td>
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<td>73. Once the proposed access track extents and other disturbance areas are pegged on the ground additional targeted surveys of these areas will be undertaken.</td>
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<td>74. Micro-siting of turbine A17 will occur during detailed design stage to mitigate impacts on Site 2.</td>
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<td></td>
<td>Land Resources and Geotechnical</td>
<td>75. The Soil and Water Management Plan will be prepared as part of the CEMP and will detail the measures and techniques to preserve soil resources.</td>
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<td>76. Further geotechnical investigations at the turbine sites to depths of about 20m will be undertaken to ensure stability and prevent erosion.</td>
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<td>Issue</td>
<td>Commitment</td>
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<td>77.</td>
<td>Further geotechnical investigations will be undertaken to provide information for the design of footings, access roads and other infrastructure.</td>
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<td>78.</td>
<td>Clearing of natural vegetation and surface water runoff in the construction areas will be minimised to reduce the likelihood of erosion along drainage channels on the site; and,</td>
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<td>79.</td>
<td>Details of any rock blasting, and associated management techniques, will be provided in the CEMP.</td>
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<td>80.</td>
<td>The hardstand area will be removed following construction and reseeded with improved pasture.</td>
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<td>81.</td>
<td>Cut and fill for site tracks will be minimised and disturbed soils will be revegetated as soon as possible after construction.</td>
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<tr>
<td>Hydrology</td>
<td>82.</td>
<td>Water Management Plans will be developed for the site as part of the CEMP and the OEMP. These will control risks to water quality associated with construction and operation and detail the range of techniques used to prevent land and water degradation.</td>
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<td>83.</td>
<td>A Spill Control Plan will be developed as a sub-plan of the CEMP.</td>
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<td>84.</td>
<td>The CEMP prepared for the project will detail a range of best practise techniques designed at avoiding negative impacts on water quality by minimising runoff and avoiding sedimentation. This will include techniques to restrict flow speeds, incorporate sediment controls devices, and maximising natural drainage.</td>
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<td>85.</td>
<td>Sediment and erosion will be managed as part of a Soil Management Plan, to be prepared as part of the CEMP. This plan will detail the necessary management controls and techniques during construction and operation of the wind farm, including:</td>
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<td>- Revegetating disturbed soils.</td>
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<td></td>
<td>- Sediment traps to prevent sediment entering waterways.</td>
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<td>86.</td>
<td>Infrastructure will be bundled with silt fencing/hay bales or similar to reduce runoff from these areas and ensure that oil and other chemicals could not escape.</td>
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<td>87.</td>
<td>Discharge into creeks, rivers or drainage lines will be minimised through the control measures in the CEMP.</td>
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|        | 88.   | Vehicles on site will be restricted to established tracks to concentrate any discharge from vehicles.
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<td>89.</td>
<td>Maintenance or re-fuelling of machinery will be carried out on hard-stand areas.</td>
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<td>90.</td>
<td>Concrete batching plants will be designed to capture all concrete wash.</td>
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<td>91.</td>
<td>Dust suppression will be carried out as required through either watering or chemical means (environmentally friendly polymer based additives to the water).</td>
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<td>92.</td>
<td>A sediment and erosion control plan will be developed as a sub-plan of the CEMP. The control plans implemented during the construction phase along the access tracks will be monitored and maintained.</td>
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<td>93.</td>
<td>Watercourse crossings will be designed appropriately and in consultation with hydrological engineers and in accordance with the NSW Office of Water Guidelines for Controlled Activities (August 2010) to minimise impacts on the existing banks, water flow, animal passage and on the movement of flows and ensure that they do not impact on water quality.</td>
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<td>94.</td>
<td>The design of the water course crossings will consider the flow pattern of the drainage lines and ensure that sufficient allowance is made for unaffected flows for most rain events. This will be managed through the Soil Management Plan forming part of the CEMP.</td>
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<td>95.</td>
<td>The watercourse crossings for access tracks and cabling will adhere to the NSW Office of Water Controlled Activities, Guidelines for Watercourse Crossings (August 2010), and Guidelines for laying pipes and cables in watercourses (August 2010).</td>
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<td>96.</td>
<td>The roads and access tracks will be completed within the construction phase and will be maintained to avoid any erosion.</td>
</tr>
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<td>97.</td>
<td>Safeguards will be enforced to control and minimise fugitive dust emissions.</td>
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<tr>
<td>Water extraction</td>
<td>98.</td>
<td>Water will be reused where possible to reduce water consumption (as detailed in the Water Management Plan to be included in the CEMP and OEMP).</td>
</tr>
<tr>
<td>Water crossings</td>
<td>99.</td>
<td>Water would be primarily sourced from the “Hillview Park” Property surface water allocations as per the term transfer provisions approved by the NSW Office of Water.</td>
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<td>100.</td>
<td>The major potential impacts to the watercourses at the proposed crossing locations and the proposed mitigation measures are outlines as follow:</td>
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<td>- The potential deterioration of surface water</td>
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<td>quality at the crossings would be mitigated by developing and implementing a Sediment &amp; Erosion Control Plan as a sub-plan of the Construction Environmental Management Plan to include the following considerations:</td>
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<td></td>
<td>1. Site Access Stabilisation</td>
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<td>2. Soil / Earthworks Handling (Stock piling)</td>
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<td>3. Site Drainage</td>
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<td>4. Sediment Control Measures</td>
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<td>5. Monitoring Program (auditing)</td>
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<td>- The potential deterioration of the watercourse or drainage line crossings during the construction and operation phases would be mitigated through designing the watercourse crossings (including major drainage lines) in consultation with a qualified engineer and in accordance with the NSW Office of Water Guidelines for Controlled Activities (August 2010) to minimise impacts on the existing banks, water flow, animal passage and on the movement of flows and ensure that they do not impact on water quality.</td>
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<td>- The potential deterioration of the watercourse or drainage lines adjacent or in proximity of the crossings due to construction vehicle activities would be mitigated by restricting the activity area to the established or designated tracks and watercourse / drainage line crossing locations.</td>
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<td>- The potential deterioration of the water flow through the watercourse / drainage line due to construction of the crossing for the access track would be mitigated by designing the crossings in accordance with the NSW Office of Water ‘Guidelines for Watercourse Crossings’ (August 2010) for Controlled Activities.</td>
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<td>- The potential deterioration of the water flow through the watercourse / drainage line due to construction of the crossing for the cabling would be mitigated by designing the crossings in accordance with the NSW Office of Water ‘Guidelines for laying pipes and cables in watercourses’ (August 2010) for Controlled Activities.</td>
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<td>- The potential deterioration of the riparian corridors through the watercourse / drainage line due to construction of the crossing for the access track and/or cabling would be mitigated by designing the crossings in accordance with the NSW Office of Water ‘Guidelines for riparian corridors’ (August 2010) for Controlled Activities.</td>
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<td>Sector</td>
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|        |       | Activities.  
The requirement for restoration and rehabilitation of the land adjacent to the crossing due to earthworks related to the construction of the crossing would be mitigated by developing and implementing a Vegetation Management Plan in accordance with the NSW Office of Water ‘Guidelines for Vegetation Management Plan’ (August 2010) for Controlled Activities. |
| Resource Impacts | Waste generation | 101. Portable toilets will be provided in the temporary construction area. |
|                  | Building Materials | 102. The existing 60m monitoring masts will be removed and reused elsewhere once the construction phase is complete. |
|                  |                  | 103. Where possible, the existing footings, access tracks and other infrastructure would be reused for any replacement turbine(s) during the operation phase. |
| Decommissioning and Rehabilitation | Responsibility for decommissioning | 104. The proponent is responsible for the decommissioning of the wind farm infrastructure, and the landowner is not liable for this obligation (this is demonstrated in the land lease agreements with each of the wind farm participating landowners as shown in the Decommissioning and Rehabilitation Plan (DRP)).  
105. The DRP will be reviewed and revised as required every 5 years for the duration of the project. During each review, the effectiveness of the plan will be reassessed against its objectives, and cost estimates and funding arrangements will also be reviewed by an independent consultant.  
106. The proponent commits to undertaking all decommissioning and rehabilitation works outlined in the DRP within the 18 months after the end of the wind farm’s operational life (including any replacement of the turbines as contemplated by commitment 108 below).  
107. During the operational life of the project, any turbine that cannot be repaired and is deemed permanently unworkable (due to environmental, social, economic or other unforeseen issues) will be decommissioned and dismantled, and its location rehabilitated within 18 months. |
|                  | Landscape impacts resulting from decommissioning | 108. At the completion of the wind farm’s operating life, the turbines will either be replaced or the land will be rehabilitated to its previous or better condition.  
109. Tracks considered surplus to the farmers’ requirements will be rehabilitated and revegetated by introducing soil, mulch and grass seeds or local prevenance. |
|                  | Recycling | 110. During decommissioning, all materials will be removed from the site and recycled appropriately. |
Crookwell 3 Wind Farm
Chapter 25
CONCLUSION
Conclusion

This Environmental Assessment has detailed and assessed a proposal by Crookwell Development Pty Ltd, the proponent, and its successors and assigns to develop an up to 30 turbine wind farm known as the Crookwell 3 Wind Farm. The project site is split into two separate parcels to the east and south of the approved Crookwell 2 Wind Farm.

This EA has found that the proposed wind farm would have a range of negative and positive impacts on the site and region, and that, with appropriate conditions and mitigations measures detailed, the negative impacts can be minimised.

In relation to the positive impacts, the EA found that if approved the wind farm would:

- generate 40 full time positions during construction, and 6 full time ongoing positions during the operation;
- invest $90-110 million in the economy;
- generate up to 214,444 MWh of clean, renewable energy, enough to power up to 33,225 households;
- displace 208,654 tonnes of greenhouse gases or the equivalent of taking 48,188 cars off the road; and
- contribute up to $49,980 per year to the Upper Lachlan Shire Council’s Community Enhancement Fund, to be spent on local projects benefiting the local community.

Most notably, the proposed wind farm would make a small but important contribution to reducing the dangerous impacts of anthropogenic climate change, such as droughts, floods, extreme weather events and sea level rise.

In relation to the negative impacts, the EA found that the wind farm has the potential to have a low to moderate impact on landscape values, have a limited impact on local communications facilities, increase noise for some residents, and result in the clearing of non-significant vegetation.

These risks can be minimised by the extensive range of management plans that would be prepared before construction, and ongoing monitoring on the compliance of the wind farm when constructed to established standards. These commitments are detailed in Chapter 24 – Statement of Commitments.

The EA also found that the proposed Crookwell 3 Wind Farm is compatible with the existing land uses of the area and complies with relevant planning and environmental controls applicable to the site.

This EA concludes that the proposed Crookwell 3 Wind Farm will offer a number of significant benefits and can be constructed with minimal impact to the existing environment providing that the mitigation measures detailed in the Statement of Commitments are implemented.
References


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