



Aeronautical Impact and Night Lighting Assessment

Crookwell 3 Wind Farm

v1.1 30 August 2011

**Prepared for Crookwell Development Pty Ltd
by Aviation Projects Pty Ltd
Lead Author: Keith Tonkin**

AVIATION PROJECTS Pty Ltd / ABN 88 127 760 267

Mobile 0417 631 681 / **Phone** 07 3117 9608 / **Fax** 07 3374 3562

Street 2/43 Upper Brookfield Road, Brookfield Qld 4069

Web www.aviationprojects.com.au

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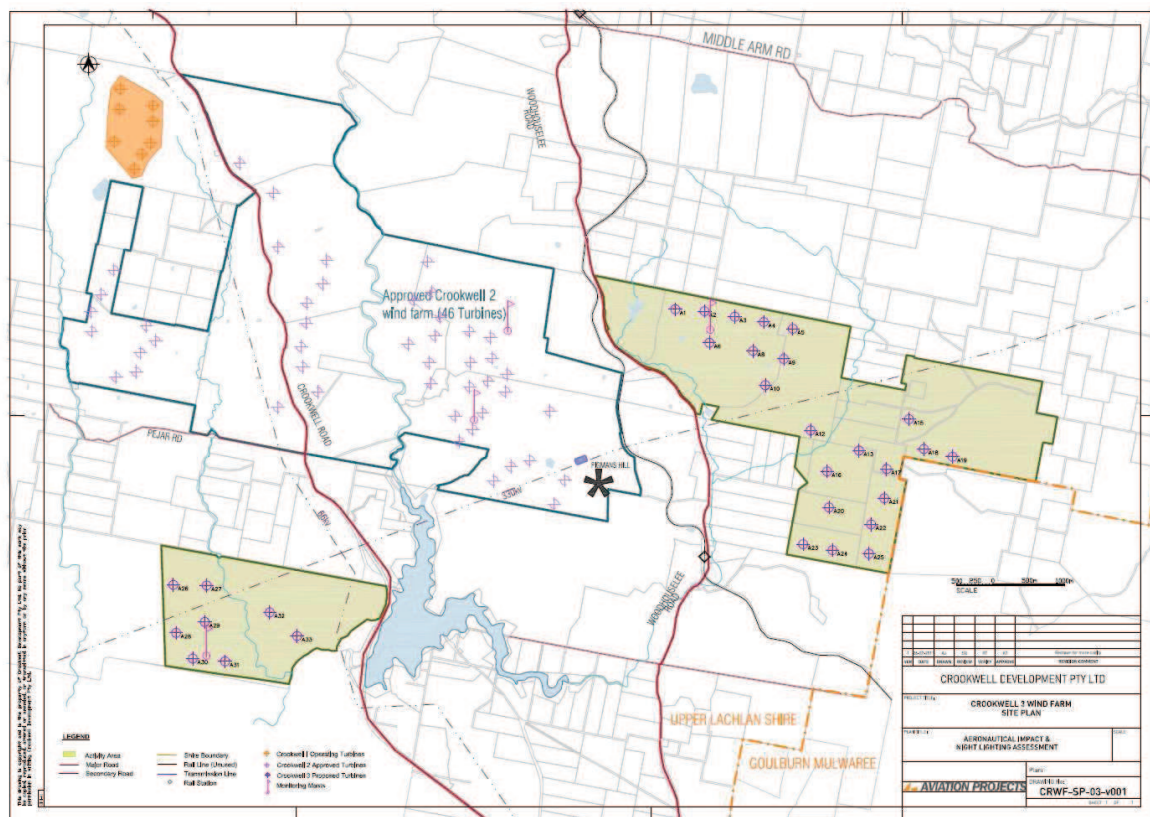
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1. Executive Summary

1.1. Background Information and Purpose of Report

1. Crookwell Development Pty Ltd (CDPL) is part of an international energy group proposing to develop a new wind farm in the Crookwell region of NSW.
2. The project area consists of approximately 1500 hectares in two separate parcels, east and south of the approved Crookwell 2 Wind Farm. These two parcels are referred to as Crookwell 3 East and Crookwell 3 South.
3. The wind farm was originally proposed to comprise between 25 – 35 individual wind turbines standing up to 152 m at the top of the blade tip. At the time of writing, the maximum number of turbines had been reduced to 30. An indicative Site Plan of the wind farm is shown below.



4. In response to the requirements of the Director General of the NSW Department of Planning (DGRs), CDPL engaged Aviation Projects Pty Ltd (APPL) to undertake and report on an assessment of the aeronautical impacts and night lighting aspects of the proposed wind farm.

1.2. Methodology

5. The engagement itself was undertaken as per the following process:
 - (a) The scope and deliverables were discussed with and agreed by the CDPL Project Manager;
 - (b) A site visit was conducted on 18 March 2010;
 - (c) A desktop review of supplied materials was conducted;

- (d) Relevant regulatory requirements and sources of information were reviewed;
- (e) 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;
- (f) Other stakeholders were consulted in writing and/or by telephone interview as applicable;
- (g) A lighting design was prepared; and
- (h) A report was prepared and finalised.

1.3. Conclusions

- 6. This assessment, consistent with the DGRs, considered aviation aspects associated with cumulative impact, visual amenity, hazard/risk and consultation.

1.3.1. Cumulative Impacts

- 7. There will be an increased area that will 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 will 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.
- 8. As obstacle lighting has been identified as a requirement for this wind farm, and there are other wind farms close by that will also potentially require obstacle lighting, 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.
- 9. The turbines of the 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 therefore establish the vertical limit for impact on airspace-related aspects of aviation activities.

1.3.2. Night Lighting

- 10. Under the relevant regulatory framework and in accordance with the Civil Aviation Safety Authority's determination, the wind turbines are considered obstacles and the wind farm should be regarded as an extensive object. Accordingly, medium intensity obstacle lighting should be installed:
 - (a) to identify the perimeter of the wind farm;
 - (b) at longitudinal intervals not exceeding 900 m;
 - (c) so that they are synchronised to flash simultaneously; and
 - (d) so that any wind turbines of significantly higher elevation are also identified.
- 11. The medium intensity obstacle lights should have the characteristics specified in Manual of Standards 139—*Aerodromes*, Chapter 9.
- 12. To minimise visual impact, 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.

1.3.3. Aeronautical Impacts

13. The proposed development does not impose any significant risk to normal flying operations provided aircraft are operated in compliance with applicable regulatory and operational control requirements and with the application of good airmanship.
14. Relevant findings are as follows:
 - (a) There will be no adverse impact by the proposed wind farm on nearby aerodromes or aircraft landing areas.
 - (b) There will be no adverse impact by the proposed wind farm on obstacle limitation surfaces.
 - (c) There will be no adverse impact by the proposed wind farm on PANS-OPS surfaces.
 - (d) To avoid the turbine obstacles, aircraft will potentially have to fly at a higher altitude or divert around the wind farm.
 - (e) Airservices Australia found that at a maximum height of 1085 m (3560 ft) AHD, the proposed wind farm will affect the W10 air route to the north of Goulburn. Lowest Safe Altitude procedures are penetrated by 60 ft and will need be adjusted accordingly (minor adjustment).
 - (f) There is a requirement to notify RAAF AIS of the as-constructed turbine locations and heights.
 - (g) In consideration of the proposed development height, location and distance from radar and associated control zones, it is considered that the development will be approvable by Airservices Australia.
 - (h) There will be no adverse impact by the proposed wind farm on aviation-related communications systems.
 - (i) There will be no adverse impact by the proposed wind farm on aviation-related navigation aids.
 - (j) Representatives of each of the owners of the properties on which the proposed wind farm is to be situated advised that aerial application of agricultural fertilisers and/or pesticides had not occurred on their properties for some time, if at all, and was not currently planned to occur in the future.
 - (k) Safe aerial application operations would be possible on properties neighbouring the proposed wind farm, subject to final turbine locations, and subject to a case by case assessment. The use of helicopters enables aerial application operations to be conducted in closer proximity to obstacles than would be possible with fixed wing aircraft due to their greater manoeuvrability.
 - (l) No aviation-related electric or magnetic fields were identified or notified during the prescribed consultation activities and so no adverse effect is anticipated in this regard.
 - (m) Notwithstanding that aerial fire fighting operations will potentially be restricted in the vicinity of the proposed wind farm, ground-based means of fighting bushfires on and near the properties on which the wind farm is proposed to be located remain available and present a valid alternative.

1.3.4. Consultation

15. An appropriate and justified level of consultation was undertaken with the following parties:
- (a) Upper Lachlan Shire Council;
 - (b) Goulburn Mulwaree Council;
 - (c) NSW Rural Fire Service;
 - (d) Commonwealth Department of Defence;
 - (e) Civil Aviation Safety Authority;
 - (f) Airservices Australia;
 - (g) Aerial Agricultural [Association] of Australia; and
 - (h) the local community and landowners.

1.4. Recommendations

1.4.1. Notification of tall structures

16. Final (approved) turbine coordinates and elevations should be provided to RAAF AIS at the following address:

Aeronautical Data Officer
RAAF AIS (VBM-M2)
Victoria Barracks
St Kilda Rd
Southbank VIC 3006

Tel: (03) 9282 6400
Fax: (03) 9282 6695

Email: ais.charting@defence.gov.au

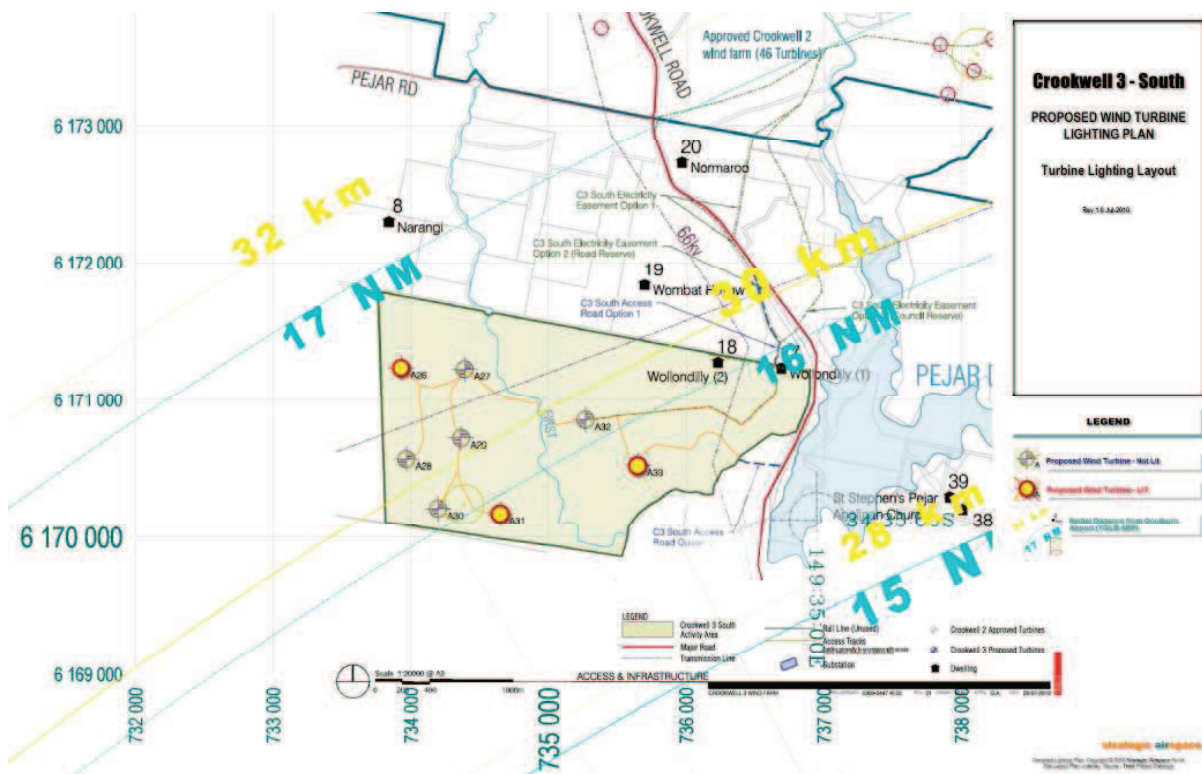
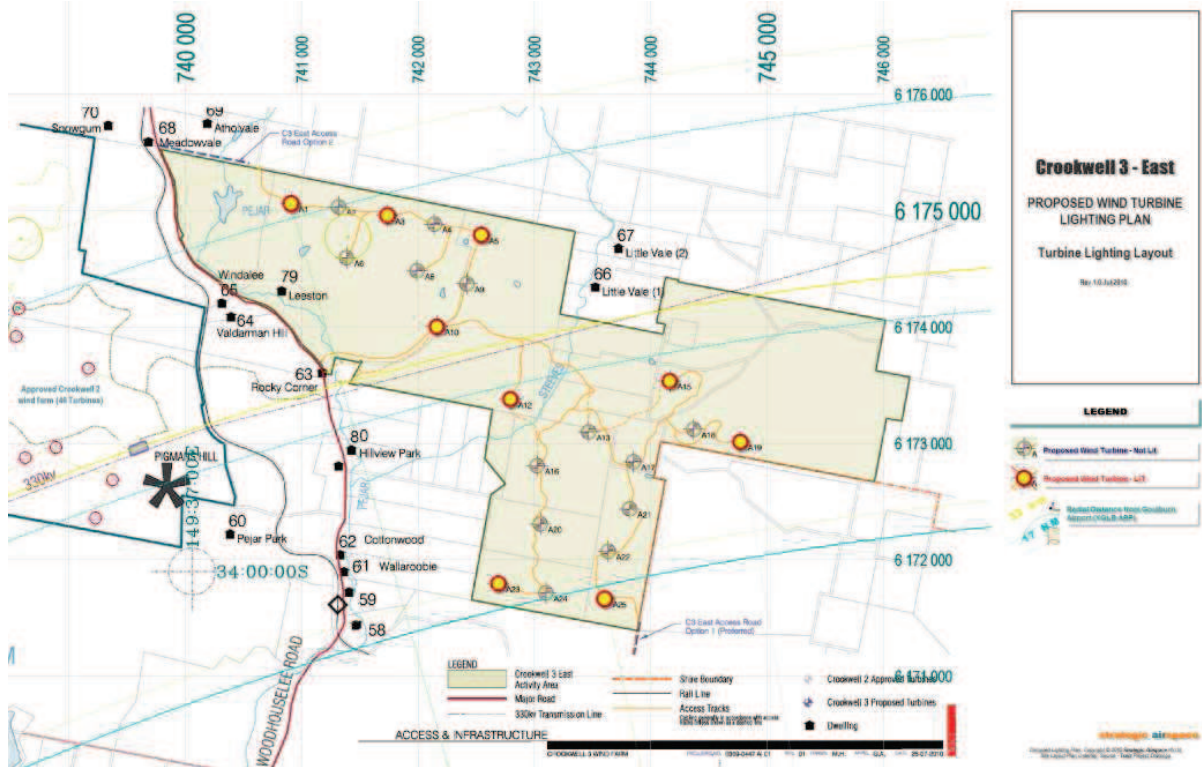
1.5. Marking of turbines

17. The rotor blades, nacelle and the supporting mast of the wind turbines should be painted white or off white.
18. There is no regulatory requirement to mark or light power poles potentially required to support distribution powerlines and nor is it intended to do so; however, a case by case assessment as to whether marking or lighting would be required to maintain an acceptable level of safety should be made, in consultation with applicable stakeholders, prior to construction.

1.6. Lighting of turbines

19. Medium intensity obstacle lighting should be installed:
- (a) to identify the perimeter of the wind farm;
 - (b) at longitudinal intervals not exceeding 900 m;
 - (c) so that they are synchronised to flash simultaneously (both within the windfarm and with other windfarms in the vicinity); and
 - (d) so that any wind turbines of significantly higher elevation are also identified.
20. The following turbines are proposed be lit:
- Crookwell South—A26, A31 and A33; and
- Crookwell East—A1, A3, A5, A10, A12, A15, A19, A23 and A25.
21. The medium intensity obstacle lights should have the characteristics specified in MOS 139, Chapter 9.
22. To minimise visual impact, the guidance provided in withdrawn AC 139-18(0) on the minimisation of visual impact should be adopted in the lighting design.
23. Any other future development or amendment of regulations or guidance by CASA could potentially affect the requirement for lighting and/or applicable design specifications. The lighting design is therefore subject to final confirmation of applicable regulatory requirements prior to the installation of the lights during construction.

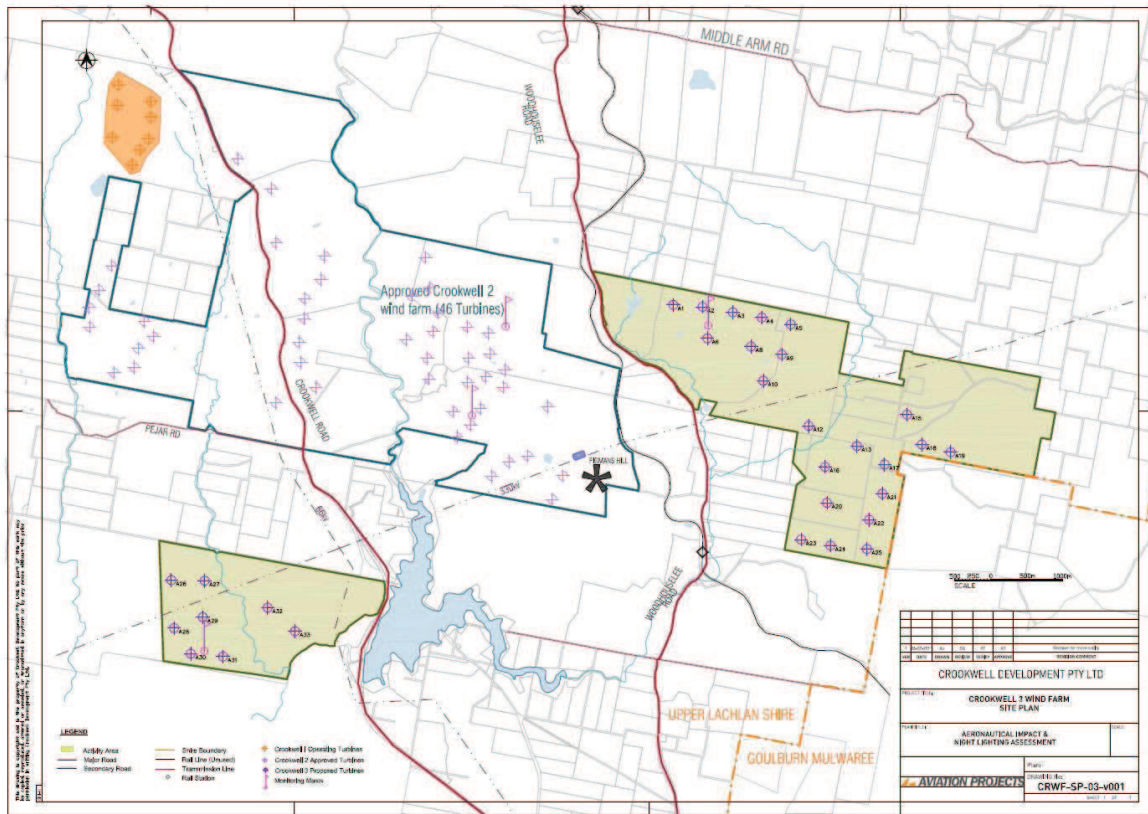
24. To ensure the ongoing availability of obstacle lights, a monitoring, reporting and maintenance program should be established in accordance with the requirements set out in MOS 139, Chapter 9.
25. Proposed turbine lighting layouts are represented in the figures below.



2. Background Information and Purpose of Report

2.1. Situation

1. Crookwell Development Pty Ltd (CDPL) is part of an international energy group proposing to develop a new wind farm in the Crookwell region of NSW.
2. CDPL, the proponent, is seeking project approval for the construction and operation of a wind energy facility to be known as the Crookwell 3 Wind Farm (the project). The project is to be located on two separate land parcels known as Crookwell 3 East (with an area of 1100 Hectares) and Crookwell 3 South (with an area of 400 Hectares) (the Site).
3. The project comprises a number of elements, including:
 - (a) 30 individual wind turbines standing up to 152 m at top of blade tip with a capacity of up to 3.4MW each (some of the turbines may be fitted with obstacle lighting as required);
 - (b) 30 individual kiosks for the housing of 33 kV Transformers and 33 kV Switchgears and associated control systems to be located in the vicinity of the wind turbine towers (in some turbine models being considered the kiosk's equipment are integrated within the tower or nacelle);
 - (c) internal unsealed tracks for turbine access;
 - (d) upgrades to local road infrastructure as necessary to provide access to the site;
 - (e) an underground electrical and communication cable network linking turbines to each other within the site boundary and then using either an underground or overhead connection between the Crookwell 3 site boundaries and the Crookwell 2 site boundary to reach the substation approved as part of the Crookwell 2 Wind Farm;
 - (f) up to 3 wind monitoring masts fitted with various instruments such as anemometers, wind vanes, temperature gauge and potentially other electrical equipment; and
 - (g) a maximum of two temporary concrete batching plants during the construction phase only, to supply concrete for the foundations of the turbines and other associated structures.
4. Grid connection will be achieved via a connection to the 330 kV transmission line which bypasses the site. The project will utilise and be connected to the single substation, control room and facilities for the grid connection, approved as part of the Crookwell 2 Wind Farm.
5. Crookwell 3 East and Crookwell 3 South may be developed in stages.
6. Figure 1 shows the proposed indicative layout of the project and is subject to further detailed design.



■ Figure 1 Crookwell 3 Wind Farm Site Plan

7. An Aviation Plan showing the proposed Crookwell 3 Wind Farm, along with the operating Crookwell 1 and approved Crookwell 2 wind farms and associated wind monitoring masts is provided at **Annexure 1**. A larger scale copy of the Site Plan shown at Figure 1 is also provided at **Annexure 1**.
8. A list of proposed turbine locations and heights, and wind monitoring mast description, location and heights is provided at **Annexure 2**. Note that the coordinates are provided in WGS 84 format.
9. In response to the requirements of the Director General of the NSW Department of Planning (DGRs), CDPL engaged Aviation Projects Pty Ltd (APPL) to undertake and report on an assessment of the aeronautical impacts and night lighting aspects of the proposed wind farm.

2.2. Background

2.2.1. Director-General’s Requirements (DGRs)

10. Following receipt of the major project application for the proposed Crookwell 3 Wind Farm, the Director-General of the NSW Department of Planning provided Director-General’s requirements (DGRs) under covering letter dated 7 April 2010 for the preparation of the Environmental Assessment.
11. This report, consistent with the DGRs, considers aviation aspects associated with cumulative impact, visual amenity, hazard/risk and consultation. The relevant provisions of the DGRs are extracted below along with details of where the required information is contained in this report.

Cumulative Impacts

‘an assessment of the key issues outlined below, during construction, operation and decommissioning (as relevant). The Environmental Assessment must assess the worst case as

well as representative impact for all key issues considering cumulative impacts, as applicable, from the surrounding Crookwell 1 Wind Farm (existing), other approved wind farms in the viewshed of the project, and the Crookwell 2 Wind Farm (approved), including associated key ancillary components;

12. Cumulative impacts are discussed in the Conclusions section.

Visual Impacts

'assess the impact of ... night lighting from the wind farm;'

13. The impact of night lighting is discussed in the Obstacle Marking and Lighting section.

Hazard/Risks

'Hazard/Risks– the EA must include an assessment of the potential impacts on aviation safety considering nearby aerodromes and aircraft landing areas, defined air traffic routes, aircraft operating heights, radar interference, communication systems, and navigation aids. In addition, the EA must assess the impact of the turbines on the safe and efficient aerial application of agricultural fertilisers and pesticides in the vicinity of the turbines. ... Potential hazards and risks associated with electric and magnetic fields and bushfires must be assessed.'

14. The identified hazards are discussed under various headings in the Aeronautical Impacts section

Consultation

'The Proponent must undertake an appropriate and justified level of consultation with the following parties during the preparation of the EA.'

15. Of the parties listed in the DGRs, the following were formally consulted in the preparation of this assessment:
 - (a) Upper Lachlan Shire Council;
 - (b) Goulburn Mulwaree Council;
 - (c) NSW Rural Fire Service;
 - (d) Commonwealth Department of Defence;
 - (e) Civil Aviation Safety Authority;
 - (f) Airservices Australia;
 - (g) Aerial Agricultural [Association] of Australia; and
 - (h) the local community and landowners.

16. Details of the consultation activities undertaken are provided in the Consultation Section.

2.3. Purpose of Report

17. The purpose of this report, consistent with the DGRs, is to consider aviation aspects of the proposed Crookwell 3 Wind Farm associated with cumulative impact, visual amenity, hazard/risk and consultation, and provide conclusions and recommended actions.

2.4. Report Structure

18. This report is structured around the following sections:

- (a) Background Information and Purpose of Report;
- (b) Methodology;
- (c) Stakeholder Consultation;
- (d) Aeronautical Impacts;
- (e) Obstacle Marking and Lighting;
- (f) Conclusions;
- (g) Mitigation Actions Required; and
- (h) Annexures.

2.5. Literature or Other Material Relied Upon

19. The references and material detailed below have been relied upon for the preparation of this report.

2.5.1. References

20. References used or consulted in the preparation of this report include:
- (a) Advisory Circular (AC) 139-18(0)—*Obstacle Marking and Lighting of Wind Farms* dated July 2007 (withdrawn from publication);
 - (b) Aerial Agricultural Association of Australia, *Windfarm Policy* and *Powerlines Policy*, both dated November 2009;
 - (c) Aeronautical Information Package; including AIP Book A/L 63 effective 3 June 2010, and En Route Supplement Australia dated 3 June 2010 2010;
 - (d) *AS/NZS ISO 31000:2009 Risk management—Principles and guidelines*, Standards Australia;
 - (e) Civil Aviation Regulations 1988 (CAR) as amended on 1 October 2009, including CAR 157;
 - (f) Civil Aviation Safety Regulations 1998 (CASR), First Edition January 2003 as amended;
 - (g) International Civil Aviation Organization (ICAO) Doc 8168 *Procedures for Air Navigation Services—Aircraft Operations* (PANS-OPS);
 - (h) ICAO Standards and Recommended Practices, Annex 14—*Aerodromes*; and
 - (i) Manual of Standards Part 139 – *Aerodromes*, version 1.4 dated April 2008.

2.5.2. Supplied material

21. Material provided by CDPL and relied upon in the preparation of this report includes:
- (a) Turbine coordinates v2 dated 16 July 2010;
 - (b) Site Plan and Aviation Plan as provided in Annexure 2; and
 - (c) Director General's Requirements and associated correspondence from referral agencies.

2.6. Acronyms

22. A list of acronyms used in this report is provided for reference below.

AAAA	Aerial Agriculture Association of Australia
AC	Advisory Circular
AGL	above ground level
AIP	Aeronautical Information Package
AIS	Aeronautical Information Service
AMSL	above mean sea level
A/SMGCS	Advanced Surface Movement Guidance and Control System
ATSB	Australian Transport Safety Bureau
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation 1988
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation 1998
DGRs	Director General's requirements
HF	high frequency
ICAO	International Civil Aviation Organization
MOS 139	Manual of Standards Part 139-- <i>Aerodromes</i>
OLS	obstacle limitation surface
PANS-OPS	Procedures for Air Navigation – Aircraft Operations
PRM	precision radar monitoring
RFS	Rural Fire Service
RPT	regular public transport
VHF	very high frequency

3. Methodology

3.1. Work Method

23. The engagement itself was undertaken as per the following process:

- (a) The scope and deliverables were discussed with and agreed by the CDPL Project Manager;
- (b) A site visit was conducted on 18 March 2010;
- (c) A desktop review of supplied materials was conducted;
- (d) Relevant regulatory requirements and sources of information were reviewed;
- (e) An assessment of the PANS-OPS and OLS was prepared and forwarded to Airservices Australia, Goulburn Mulwaree Council (Goulburn Airport) and Upper Lachlan Shire Council (Crookwell aerodrome) for consideration;
- (f) Other stakeholders were consulted in writing and/or by telephone interview as applicable;
- (g) A lighting design was prepared; and
- (h) A report was prepared and finalised.

3.2. Project Resources

24. The following consultants were involved in the conduct of this assessment:

- (a) Mr Keith Tonkin, Managing Director, Aviation Projects Pty Ltd;
- (b) Mr Michael Sullivan, Consultant, Aviation Projects Pty Ltd;
- (c) Mr Michael Gahan, Consultant, MJG Aviation; and
- (d) Ms Cathy Pak Poy, Consultant, Strategic Airspace Pty Ltd.

25. Further information about these consultants is provided at **Annexure 6**.

4. Stakeholder Consultation

26. Consultation requirements were specified in the DGRs. In particular, there was a requirement to clearly describe the consultation process and indicate the issues raised by stakeholders during consultation and how these matters have been addressed.
27. Details and results of the consultation activities are provided in the table below.
28. Copies of the applicable correspondence are provided at **Annexure 5**.

Agency/Contact	Activity/Date	Response/Date	Issues Raised During Consultation	Action Proposed
Upper Lachlan Shire Council (Crookwell Aerodrome)	1 June 2010 Letter to General Manager [Copy at Annexure 5]	7 June 2010 Letter from Director of Environment and Planning - Robert Mowle on behalf of General Manager [Copy at Annexure 5]	Any aviation issues related to wind farms should be directed to Civil Aviation Safety Authority.	Refer to CASA response.
Goulburn Mulwaree Council (Goulburn Airport)	7 June 2010 Letter to Manager Engineering Development – Ian Aldridge [Copy at Annexure 5]	1 July 2010 Letter from Manager Engineering Development – Ian Aldridge [Copy at Annexure 5]	Concur with Strategic Airspace report that there will be no impact by the proposed wind farm on Goulburn Airport.	Nil.
NSW Rural Fire Service	7 June 2010 Telephone conversation with Manager of Aviation and Specialist Equipment - Mary-Anne Carmichael	7 June 2010 When asked whether the RFS would like the opportunity to respond via a letter or whether they were happy with this discussion to be representative of their views. Ms Carmichael was happy with the phone discussion and she stated that once the development application was submitted they would respond if required.	<p>Aerial fire fighting services are conducted from the nearest suitable airfield to the fire zone. Crookwell has been used in the past and it was her understanding it remains an option for the future. Fixed wing fire assets are more likely to use the airfields than helicopters and they had a requirement that the departure and arrival areas from the airfield remained obstacle free.</p> <p>Ms Carmichael did not give details of particular companies or individuals that they used for fire fighting activities other than they referred to a 'call when needed list' of appropriate contractors when required.</p> <p>In terms of the impact of wind farms on their operations she stated that aerial fire fighting near wind farms would not be an option and that ground based activities would be required instead. When I asked how aerial fire fighting may occur in areas around wind farms and how they provided obstacle information to contractors and operators she stated that it was up to the operators to determine hazards in their areas of operation. However, the local fire authorities should have this information as a part of their bush fire management plan.</p>	<p>Crookwell aerodrome is not affected by the proposed wind farm. Refer to the discussion of PANS-OPS and OLS.</p> <p>Publicise location of turbines through proponent communications program.</p> <p>Notify AIS of turbine locations for publication in AIP.</p> <p>Notify NSW RFS of turbine locations when finalised.</p>

Agency/Contact	Activity/Date	Response/Date	Issues Raised During Consultation	Action Proposed
<p>Commonwealth Department of Defence</p>	<p>27 April 2010 Letter to Director, Land Planning and Spatial Information [Copy at Annexure 5]</p>	<p>14 May 2010 Letter from Director Land Planning and Spatial Information [Copy at Annexure 5] 15 April 2010 Letter from Director Land Planning and Spatial Information to Manager – Water and Energy Infrastructure Projects [Copy at Annexure 5]</p>	<p>No additional requirements to DGRs. No objection to the Crookwell 3 Wind Farm. RAAF AIS to be provided as constructed details of wind monitoring masts so that they can be appropriately shown on aviation charts. Defence has assessed the proposal with respect to any impact on the safety of military flying operations and possible interference to Defence communications and radars. Defence can advise that it has no concerns with the Crookwell 3 Wind Farm at this time and therefore does have any additional Environmental Assessment Requirements to recommend.</p>	<p>RAAF AIS provided as constructed details of wind monitoring masts via email on 30 July 2010. Final turbine locations to be provided when known.</p>

Agency/Contact	Activity/Date	Response/Date	Issues Raised During Consultation	Action Proposed
<p>Civil Aviation Safety Authority</p>	<p>27 April 2010 Letter to Executive Manager, Airspace and Aerodrome Regulation - Peter Cromarty [Copy at Annexure 5]</p>	<p>6 May 2010 Letter from Executive Manager, Airspace and Aerodrome Regulation - Peter Cromarty [Copy at Annexure 5]</p>	<p>Identify any aerodrome within 30 km of the boundaries of the aerodrome and consult with the operators to determine any impact on Obstacle Limitation Surfaces at such aerodromes.</p> <p>Consult with Airservices Australia to have them assess any potential impact on instrument approach procedures at aerodromes, navigation aids, communications facilities or surveillance facilities.</p> <p>Contact the Aerial Agricultural Association of Australia to advise of the proposal and gain comment on potential hazards to aerial application operations in the area.</p> <p>Since the maximum height of the turbines is 152 m, they are coincident with the base of navigable airspace and hence are a potential hazard to aircraft operating at legal altitudes, particularly under conditions of low light. As a consequence, it is recommended that you consider your duty of care in deciding whether or not the wind farm should be lit.</p> <p>The location, extent and height of the wind farm is to be advised to RAAF AIS.</p>	<p>Refer to consultation with Upper Lachlan Shire Council and Goulburn Mulwaree Council.</p> <p>Refer to consultation with Airservices Australia.</p> <p>Refer to consultation with Aerial Agricultural Association of Australia.</p> <p>Refer to discussion on marking and lighting.</p> <p>To be advised when finalised.</p>
<p>Airservices Australia</p>	<p>4 June 2010 Letter to Senior Advisor, Airport Relations NSW – Mitchell Sloan [Copy at Annexure 5]</p>	<p>2 July 2010 Email from Senior Advisor Airport Relations/Industry Relations – Steve Tattam [copy at Annexure 5]</p>	<p>This proposed wind farm <u>will not impact</u> the performance of Precision/Non-Precision Nav Aids, HFVHF Comms, A-SMGCS, Radar, PRM or Satellite/Links.</p> <p>At a maximum height of 1085m (3560ft) AHD, the proposed Wind Farm <u>will affect</u> the W10 air route to the north of Goulburn. Lowest Safe Altitude procedures are penetrated by 60ft and will be adjusted accordingly (minor adjustment).</p> <p>At a maximum height of 1085m (3560ft) AHD, the proposed Wind Farm <u>will not affect</u> any sector or circling, nor any approach or departure from Goulburn airport.</p>	<p>Notify as constructed details of turbine locations and heights when finalised.</p>

Agency/Contact	Activity/Date	Response/Date	Issues Raised During Consultation	Action Proposed
Aerial Agricultural Association of Australia Phil Hurst	27 April 2010 Letter to Chief Executive Officer – Phil Hurst [Copy at Annexure 5]	31 May 2010 Telephone conversation with CEO – Phil Hurst 3 July 2010 Telephone message left by CEO – Phil Hurst	<p>Mr Hurst had received the letter inviting a response to the issues raised. Had not yet responded. The AAAA position was as outlined in the AAAA wind farm policy. Indicated he did not believe anybody still operated from the Crookwell area – although provided names of two contacts who did operate in to the area from other locations (Yass and Cowra).</p> <p>Mr Hurst called and left a message that the Association opposed all wind farms unless there was no economic or safety issues for aerial application and referred us to the policy on the website.</p> <p>Mr Hurst acknowledged receipt of the correspondence but referred us to the Windfarms and Powerlines policies. No formal response will be provided.</p> <p>He also mentioned recent introduction of a new risk management program.</p>	Refer to further consultation with Fred Fahey Aerial Services – Cowra and Yass Aerial Services – Yass. Refer to discussion on Aerial Application.
Fred Fahey Aerial Services Fred Fahey	31 May 2010 Telephone conversation with Fred Fahey	31 May 2010 No formal response to be provided	<p>Operates in to the Crookwell area on an irregular basis (depending on the demand of the agricultural industry) and would expect this to remain the same in the future.</p> <p>The wind farm would, in all likelihood, prevent agricultural operations in that particular area.</p> <p>Properties adjacent to the wind farm would have to be assessed on an individual basis.</p> <p>Stated that there were a significant number of agricultural type airstrips on properties throughout the area but was not aware of any other substantial size airfields other than Crookwell. FFAS operated from Crookwell aerodrome in support of Rural Fire Service aerial fire bombing activities.</p> <p>Fire bombing activities potentially more hazardous in the vicinity of the wind farm area due to the reduction in visibility from smoke and the size of the obstacles.</p>	Refer to discussion on Aerial Application. Refer to section 5.2. Refer to discussion on Marking and Lighting.

Agency/Contact	Activity/Date	Response/Date	Issues Raised During Consultation	Action Proposed
<p>Yass Aerial Services Ted McIntosh</p>	<p>31 May 2010 Telephone conversation with Ted McIntosh</p>	<p>31 May 2010 No formal response to be provided.</p>	<p>Conducts activities in to the Crookwell area on an annual basis as required by agricultural industry. 'Dozens of airstrips in the area'. Would expect wind farm to limit aerial agricultural activity in the affected area but would have to assess on an individual basis. Properties adjacent to the wind farms would need to be assessed on an individual basis. This company did not conduct RFS fire bombing activities.</p>	<p>Refer to discussion on Aerial Application.</p>
<p>Landowner 1 - Wayne and Adam Rabjohns</p>	<p>31 May 2010 Telephone conversation with Wayne Rabjohns</p>	<p>31 May 2010 No formal response to be provided.</p>	<p>They had not had aerial agricultural activities across their property in a long time'. Had previously used a helicopter to control tussock grass. Had no plan for aerial agricultural activity in the future. In response to a question about airstrips in the local area, Mr Rabjohns stated that in the 60s/70s there was activity but he did not know of anybody in the area that had had superphosphate spreading done for '20 years'. Mr Rabjohns did state that they were not over-flown at low level by any particular type of aircraft / operator although there was ultralight activity at the rate of about 1 per month. His view was that these were generally locals operating from their own airstrips and had 'knowledge of' the local area.</p>	<p>Refer to discussion on Aerial Application.</p>

Agency/Contact	Activity/Date	Response/Date	Issues Raised During Consultation	Action Proposed
<p>Landowner 2 - Matthew and Leanne Donoghoe</p>	<p>31 May 2010 Telephone conversation with Matthew Donoghoe</p>	<p>31 May 2010 No formal response to be provided.</p>	<p>They had not used aerial agricultural applications on their property although there is a paddock with an airstrip (not maintained). They had no plan to use aerial application in the future. They had no memory of aerial water bombing in the area. The only low flying aircraft in their area was the powerline inspection by helicopter. They were not aware of airstrips on neighbouring properties.</p>	<p>Refer to discussion on Aerial Application.</p>
<p>Landowner 3 - John Blewitt</p>	<p>31 May 2010 Telephone conversation with John Blewitt</p>	<p>31 May 2010 No formal response to be provided.</p>	<p>They had not used aerial agricultural applications in the past on their property and had no reason to use them in the future. They had no airstrip on their property and they were not aware of any neighbours that had private airstrips. Mr Blewitt did mention a property 3-4 km south of theirs (this may be Pine Ridge) that they thought used aerial agricultural applications. They were unsure of where those aircraft may operate from. Apart from periodic helicopter powerline inspections, the only other low flying aircraft within the vicinity were ultralights that they thought originated out of Goulburn aerodrome and flew around the Pejar Dam (directly east of their property).</p>	<p>Refer to discussion on Aerial Application.</p>
<p>Neighbour – Margaret and Norbert Williams 'Normaroo'</p>	<p>20 July 2010 Telephone conversation</p>	<p>20 July 2010 No formal response to be provided.</p>	<p>Ms Williams stated that they do not presently use aerial agricultural spraying or spreading on their property and have not done so during the last 12 years. However, given the nature of the terrain, they considered it to be an option that they might like to use in the future if required. Ms Williams was not aware of any close neighbours that used aerial spraying or spreading. Margaret had noted that there were relatively frequent flyovers of aircraft conducting powerline inspections, and occasional very small (ultralight?) aircraft flying overhead.</p>	<p>Nil</p>

Agency/Contact	Activity/Date	Response/Date	Issues Raised During Consultation	Action Proposed
Neighbour - Richard and Sally Bird 'Cottonwood'	20 July 2010 Telephone conversation	20 July 2010 No formal response to be provided.	Mr Bird stated that their property was only small (1 acre) and as such had not used any agricultural spraying or spreading in the past, nor would they use any in the future. Mr Bird was not aware of any aerial spraying or spreading activities on properties surrounding theirs. Power line inspections by aircraft were the only low flying aircraft that he had observed in the area.	Nil
Neighbour - Chris and Amanda Wool 'Snowgums'	20 July 2010 Telephone conversation	20 July 2010 No formal response to be provided.	Mr Wool stated that although they did not currently use any aerial agricultural spraying or spreading it remained an option for the future due to the nature of the terrain on their property. Mr Wool was not aware of other neighbours that used aerial application techniques. Mr Wool was not aware of any other low flying aircraft activities in the surrounding area. Mr Wool stated that they had serious reservations about the obstacle lighting to be incorporated in to the wind farms. He stated that the Gunning wind farm obstacle lighting was easily visible from their property (stated the distance of this was some 40 km away) and that they had made a submission raising their objection to the proposed wind farms based on the lighting.	Refer to section 6.
Neighbour - Vernon Robertson 'Meadowvale'	20 July 2010 Telephone call	20 July 2010 No formal response to be provided.	Message left with contact details. No return call received.	Nil.
Neighbour - Wayne Flint 'Windalee'	21 July 2010 Telephone call	21 July 2010 No formal response to be provided.	Message left with contact details. No return call received.	Nil.
Neighbour - Guy Dowling 'Walloobie'	23 July 2010 Telephone call	23 July 2010 No formal response to be provided.	Telephone number rang out with no message able to be left. A further attempt on 16 August 2010 yielded the same result.	Nil.

Agency/Contact	Activity/Date	Response/Date	Issues Raised During Consultation	Action Proposed
<p>Neighbour - Nicholas Rowe 'Pejar Park'</p>	<p>23 July 2010 Telephone call</p>	<p>23 July 2010 No formal response to be provided.</p>	<p>Mr Rowe advised that they use aerial application for herbicide once or twice per year. He couldn't recall the name of the operator, but noted that they came from the west. He stated that they used a helicopter and the operation took about 10 – 20 minutes. Pejar Park is approximately 505 Ha situated between Crookwell Rd and Woodhouselee Rd.</p> <p>Mr Rowe stated his objection to night lighting.</p> <p>Mr Rowe also mentioned that they use a microwave receiver for internet access, and the potential impact on reception might be an issue for consideration.</p>	<p>Nil</p> <p>Refer to section 6.</p> <p>Please refer to separate assessment prepared in relation to telecommunications impacts.</p>

5. Aeronautical Impacts

29. Assessments were required of:

- (a) the potential impacts on aviation safety considering nearby aerodromes and aircraft landing areas, defined air traffic routes, aircraft operating heights, radar interference, communication systems, and navigation aids;
- (b) the impact of the turbines on the safe and efficient aerial application of agricultural fertilisers and pesticides in the vicinity of the turbines; and
- (c) the potential hazards and risks associated with electric and magnetic fields and bushfires.

Details of these assessments follow.

5.1. Nature of flying activities conducted within the local area

30. Flying activities conducted within the local area surrounding the proposed wind farm include:

- (a) general aviation—including flying training, private flying and ad-hoc charter, primarily to Goulburn Airport and Crookwell aerodrome, as well as several privately owned airstrips;
- (b) ultralights and other sports aircraft;
- (c) fire bombing and other fire-fighting related aircraft operations;
- (d) aerial agriculture;
- (e) power line survey (rotary wing); and
- (f) military low flying.

5.2. Nearby aerodromes and aircraft landing areas

31. In addition to a number of unprepared airstrips, two significant aerodromes are located within the vicinity of the proposed development, near Crookwell and Goulburn.

Goulburn Airport

32. Goulburn Airport is a registered aerodrome located approximately 27 km to the South South East (143 degrees magnetic) of the proposed wind farm. It has a number of non-precision instrument approach procedures that serve runway 04/22 (1283 m). The airport also has a smaller runway 08/26 (676 m).

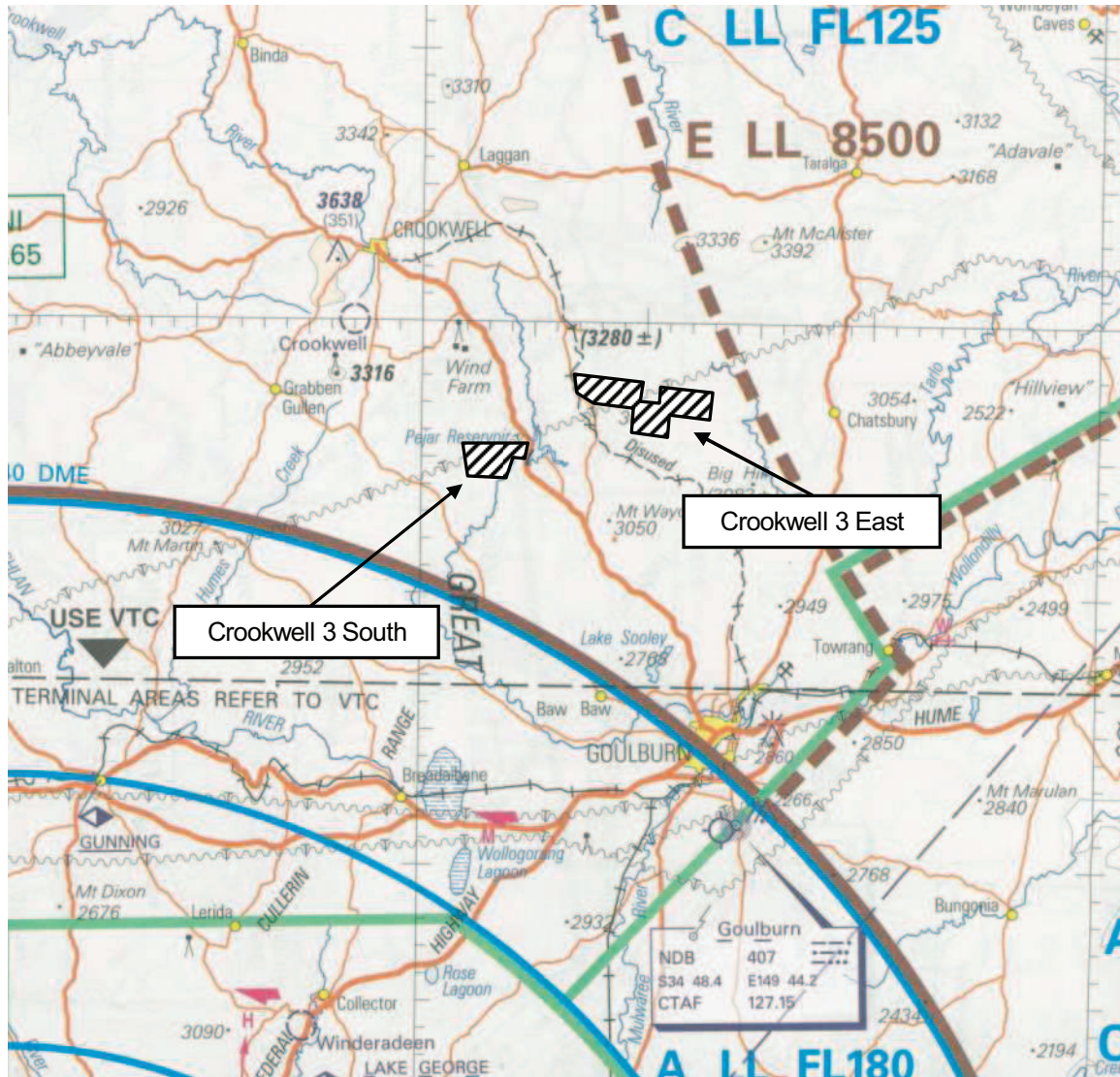
Crookwell Aerodrome

33. Crookwell aerodrome is located approximately 8 km to the West North West (293 degrees magnetic) of the proposed wind farm. It has a single runway approximately 915 m in length oriented East-West.

34. Under the Civil Aviation Safety Regulations, the aerodrome is considered to be an aeroplane landing area and is not regulated by CASA. It supports small general aviation aircraft undertaking mostly training, aerial work and private operations, with some ad-hoc charter flights. The NSW Rural Fire Service identifies the aerodrome as a potential operating base for its aerial fire fighting activities.

Airspace

- 35. Airspace above the proposed wind farm is Class E airspace with a lowest usable level of 8500 ft Above Mean Sea Level (AMSL),
- 36. A copy of Visual Navigation Chart (VNC) 2 Sydney, dated 3 June 2010 showing the location of Goulburn Airport, Crookwell aerodrome and the location of Crookwell 3 Wind Farm is provided in Figure 2 below.



■ Figure 2 Visual Navigation Chart

- 37. It is considered that there will be no adverse impact by the proposed wind farm on nearby aerodromes or aircraft landing areas.

5.3. Obstacle limitation surfaces

- 38. Obstacle limitation surfaces (OLS) are a series of surfaces that define the volume of airspace at and around an aerodrome to be kept free of obstacles in order to permit the intended aeroplane operations to be conducted safely and to prevent the aerodrome from becoming unusable by the growth of obstacles around the aerodrome (source: ICAO Doc 9774 definitions).
- 39. Strategic Airspace was engaged to assess aerodromes within 30 km of the proposed wind farm to determine whether any proposed turbines penetrated any obstacle limitation surfaces. Their report

Aeronautical Impact Assessment (PANS-OPS & OLS): Crookwell 3 Wind Farm provides further detailed analysis. A copy of this report is contained at **Annexure 3**.

40. The report concludes that there will be no adverse impact by the proposed wind farm on obstacle limitation surfaces.
41. It should be noted that since the original aeronautical analysis was conducted, the configuration of the Eastern site of the Crookwell 3 Wind Farm has been modified. Notably, turbines A7, A11 and A14 have been deleted from the proposal, while turbines A6, A9, A10 and A15 have moved slightly. These changes have no adverse effect on the results of the assessment.

Goulburn Airport

42. Goulburn Airport is the only aerodrome within 30 km of the proposed wind farm which has instrument approach procedures and is therefore required to establish and maintain obstacle limitation surfaces (OLS).
43. The entire proposed development is outside the extent of the OLS for Goulburn Airport. The closest of the proposed wind turbines is more than 12.6 km (6.8 nm) from the edge of the OLS Outer Horizontal Surface.
44. As all obstacles proposed are outside the Goulburn OLS surfaces, there is no requirement to consider shielding.
45. Goulburn Mulwaree Council concurs with the conclusions in the Strategic Airspace report that there will be no impact by the proposed wind farm on Goulburn Airport.
46. Airservices Australia advised that at a maximum height of 1085 m (3560 ft) AHD, the proposed wind farm will not affect any sector or circling, nor any approach or departure from Goulburn Airport.

Crookwell Aerodrome

47. Although Crookwell aerodrome is not regulated, aircraft operators can choose to apply Civil Aviation Advisory Publication 92-1(1) *Guidelines for aeroplane landing areas*, which identifies a basic OLS extending to 900 m on the extended centreline of the runway.
48. This basic OLS is not infringed by the proposed wind farm.
49. Upper Lachlan Shire Council advised that any aviation issues related to wind farms should be directed to Civil Aviation Safety Authority, which in turn did not identify any specific impacts with respect to Crookwell aerodrome.

5.4. PANS-OPS surfaces

50. Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) surfaces are a series of surfaces designed to provide an aircraft with safe clearance from obstacles when operating without external visual reference on instrument procedures while departing from or approaching an aerodrome.
51. Crookwell aerodrome does not have any instrument approach procedures and therefore does not have PANS-OPS surfaces. No further assessment is therefore required.
52. Assessment of impact by the proposed development plan was undertaken with respect to instrument procedures for Goulburn Airport (YGLB) — as published in the AIP Departures and Approach Procedures (DAP), Amendment 123, effective 03-Jun-2010.
53. Strategic Airspace's report *Aeronautical Impact Assessment (PANS-OPS & OLS): Crookwell 3 Wind Farm*, provides further detailed analysis. A copy of this report is contained at **Annexure 3**.

54. Goulburn Mulwaree Council concurred with the Strategic Airspace report that there will be no impact by the proposed wind farm on Goulburn Airport.
55. It is considered that there will be no adverse impact by the proposed wind farm on PANS-OPS surfaces.

Minimum Sector Altitudes

56. The proposed development is located wholly within the lateral area of the north-west sector of the MSA. The highest of the proposed turbines is below the minimum obstacle clearance altitude (MOCA) of the relevant MSA sectors, and thus the development has no adverse impact.

Circling Minima

57. All circling for Goulburn is restricted outside of 2 nm north of runway 04/22. The Crookwell 3 development is located well outside the Category C circling area, and so there is no impact on the procedure.

Instrument Approaches, Missed Approaches and Arrivals

58. All instrument approach procedures were considered. The proposed development was assessed as being outside the protection areas for all arrival and approach procedures.

Departures

59. There are no published departure procedures for Goulburn Airport.

Future Developments

60. Given the terrain and built environment around Goulburn Airport, and the existing runway configuration, it is considered highly unlikely that the proposed development would preclude the introduction of new safe and efficient instrument procedures to/from Goulburn Airport.

5.5. Aircraft operations

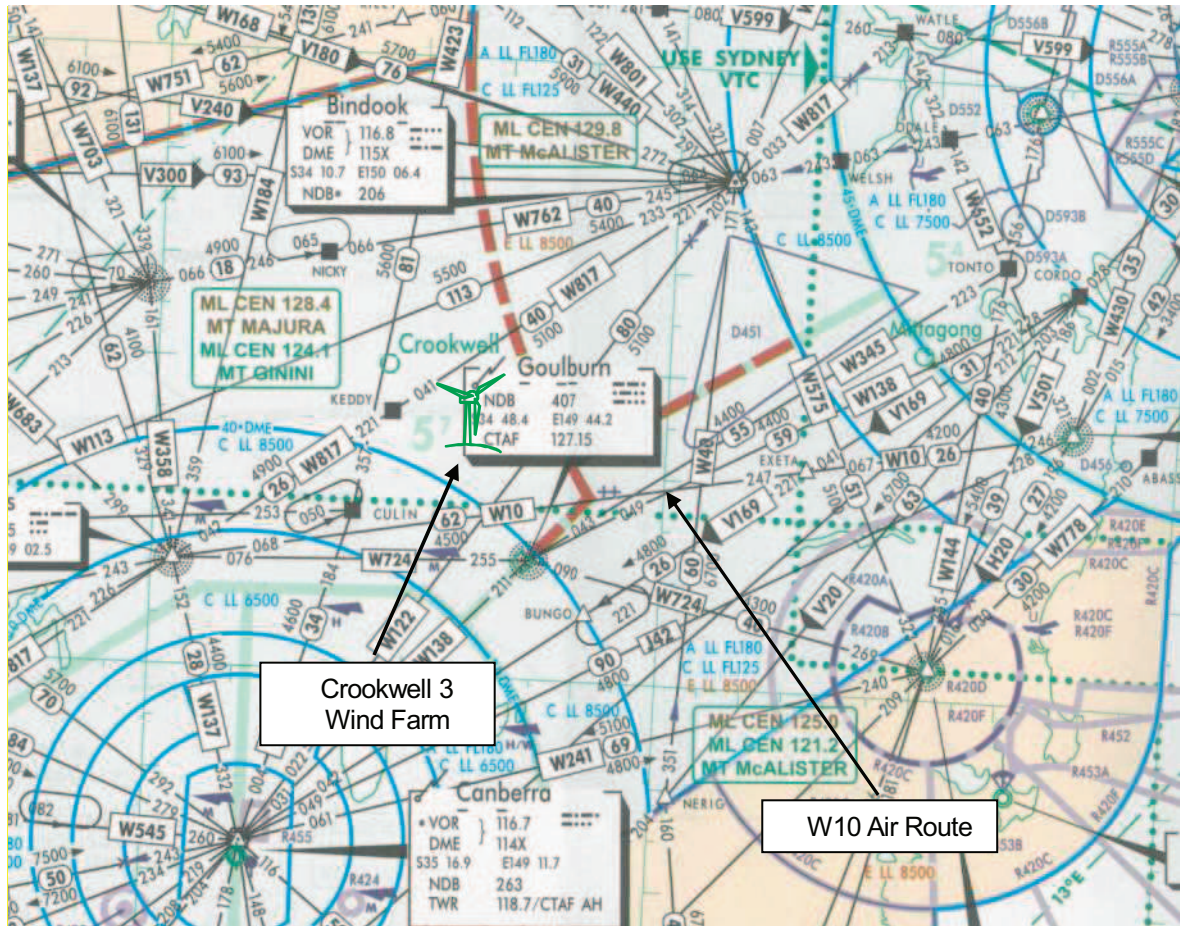
Aircraft operating heights

61. Most aircraft are required under the current regulatory framework to operate above 500 ft (152 m) above ground level (AGL), and avoid obstacles horizontally by 600 m (Civil Aviation Regulation 157 refers). Other aircraft, such as those involved in aerial agriculture and fire fighting activities, are permitted to fly at lower heights subject to strict training, licensing and operational control requirements.
62. When flying with visual reference to the surroundings, there is a regulatory requirement to maintain a specified horizontal visibility and clearance from cloud to ensure sufficient time is available to manoeuvre an aircraft clear of terrain and obstacles.
63. To avoid the turbine obstacles, aircraft will have to fly at a higher altitude or divert around the wind farm.

Air traffic routes

64. When flying in cloud or otherwise under instrument conditions, certain altitude buffers are applied to the highest obstacle within the vicinity of the proposed operation.
65. Airservices Australia found that at a maximum height of 1085 m (3560 ft) AHD, the proposed wind farm will affect the W10 air route to the north of Goulburn. Lowest Safe Altitude procedures are penetrated by 60 ft and will need be adjusted accordingly (minor adjustment).
66. This finding will be subject to any changes made to the proposed turbine layout and blade tip heights.

67. A copy of Australian En Route Chart L2 dated 3 June 2010 showing air route W10 with reference to Goulburn Airport, Crookwell aerodrome and Crookwell 3 wind Farm is shown in Figure 3 below.



■ Figure 3 W10 Air Route

Contingency procedures

68. The development area is outside of the extent normally considered for Engine Out procedures, particularly from Goulburn Airport. Additionally, given that the development lies in and on areas of rising terrain, and there are many other lower escape paths for aircraft within and around the Goulburn region, it is considered that the development poses no impact on such contingency requirements.

Aerial fire fighting

69. The NSW Rural Fire Service (RFS) Manager of Aviation and Specialist Equipment, Ms Carmichael, advised that aerial fire fighting operations are conducted from the nearest suitable airfield to the fire zone. Crookwell aerodrome has been used in the past and it was her understanding it remains an option for the future. Fixed wing fire assets are more likely to use the airfields than helicopters and they had a requirement that the departure and arrival areas from the aerodrome remain obstacle free.
70. Ms Carmichael did not give details of particular companies or individuals used for fire fighting activities. NSW RFS maintains a 'call when needed list' of appropriate contractors.
71. In terms of the impact of wind farms on fire fighting operations, Ms Carmichael stated that aerial fire fighting near wind farms would not be an option and that ground based activities would be required instead.

72. Ms Carmichael also stated that when conducting aerial fire fighting operations it is the responsibility of the operators to determine hazards in their areas of operation. However, the local fire authorities should have this information as a part of their bush fire management plan.

Military flying

73. The Department of Defence assessed the proposal with respect to any impact on the safety of military flying operations and advised that it has no concerns with the Crookwell 3 Wind Farm.
74. There is a requirement to notify RAAF AIS of the as-constructed turbine locations and heights.

5.6. Radar interference

75. Airservices Australia advised that the proposed wind farm will not affect the performance of advanced surface movement guidance and control systems (A-SMGCS) or precision radar monitoring (PRM) systems.
76. The Department of Defence assessed the proposal with respect to possible interference to Defence radars and advised that it has no concerns with the Crookwell 3 Wind Farm.
77. In consideration of the proposed development height, location and distance from radar and associated control zones, it is considered that the development will be approvable by Airservices Australia.

5.7. Communications systems

78. Airservices Australia advised that the proposed wind farm will not affect the performance of high frequency (HF) or very high frequency (VHF) communications, advanced surface movement guidance and control systems (A-SMGCS), precision radar monitoring (PRM) systems or satellite/links.
79. The Department of Defence assessed the proposal with respect to possible interference to Defence communications and advised that it has no concerns with the Crookwell 3 Wind Farm.
80. It is considered that there will be no adverse impact by the proposed wind farm on aviation-related communications systems.

5.8. Navigation aids

81. Airservices Australia advised that the proposed wind farm will not affect the performance of precision/non-precision navigation aids.
82. It is considered that there will be no adverse impact by the proposed wind farm on aviation-related navigation aids.

5.9. Aerial application of agricultural fertilisers and pesticides

83. The impact of the proposed turbines on the safe and efficient aerial application of agricultural fertilisers and pesticides in the vicinity of the turbines was assessed.

Aerial Agricultural Association of Australia

84. Several telephone discussions were conducted with the Aerial Agricultural Association of Australia (AAAA) Chief Executive Officer (CEO) Mr Phil Hurst.
85. AAAA publishes a Windfarm Policy (dated November 2009) which states in part:

AAAA's formal policy position on all windfarm developments and wind monitoring towers is to automatically oppose such developments, unless the developer is able to clearly demonstrate they have:

1. consulted honestly and in detail with local aerial application operators
2. sought and received an independent expert opinion on the safety and economic impacts of the proposed development
3. clearly and fairly identified that there will be no short or long term impact on the aerial application industry from either safety or economic perspectives and
4. if there is an identified impact on local aerial application operators, provided a legally binding agreement for compensation over a fair period of years for loss of income to the aerial operators affected.

86. Mr Hurst provided the names of two aerial application operators who he thought were active in the Crookwell area.
87. Mr Hurst also mentioned that a tailored risk management program based on AS/NZS ISO 31000:2009 *Risk management – Principles and guidelines* had been recently developed and was in the process of being introduced. This program seeks to provide a means by which risks can be identified and treated so that an acceptable level of safety can be maintained during aerial application operations.

Local aerial application operators

88. The AAAA advised that two operators were known to operate in the Crookwell area – Fred Fahey Aerial Services (based in Cowra) and Yass Aerial Services.
89. During telephone conversations with representatives from these operators, both stated that they operate in the Crookwell area on an irregular (notionally annual) basis depending on the demand of the agricultural industry and would expect this to remain the same in the future.
90. They both stated that the wind farm would, in all likelihood, prevent aerial agricultural operations in that particular area, but that properties adjacent to the wind farm would have to be assessed on an individual basis.
91. Neither expressed any specific objection to the proposed wind farm.

Properties on which the wind farm will be located

92. Representatives of each of the owners of the properties on which the proposed wind farm is to be situated advised that aerial application of agricultural fertilisers and/or pesticides had not occurred on their properties for some time, if at all, and was not currently planned to occur in the future.

Neighbouring properties

93. A number of neighbouring property owners were contacted. Most did not currently use aerial application methods, but expressed a desire to retain the option for the future.
94. Mr Nick Rowe of Pejar Park, however, indicated that aerial application was used on his property every year for the application of herbicides. Application was conducted by helicopter, although he couldn't recall the name of the operator.
95. As advised by the two operators contacted, aerial application operations at these properties would need to be assessed on an individual basis. Without specific details of the intended operation, it is not possible to provide an independent expert opinion on the impact of the proposed wind farm on potential aerial application activities at these properties.

96. The risk assessment procedure developed by AAAA would form the basis of any independent assessment. At the time of writing, AAAA would not release the risk assessment procedure.
97. It is reasonable to conclude, however, that safe aerial application operations would be possible on properties neighbouring the proposed wind farm, subject to final turbine locations, and subject to a case by case assessment. The use of helicopters enables aerial application operations to be conducted in closer proximity to obstacles than would be possible with fixed wing aircraft due to their greater manoeuvrability.

5.10. Electric and magnetic fields

98. Airservices Australia advised that the proposed wind farm will not affect the performance of precision/non-precision navigation aids, HF/VHF communications, A-SMGCS, radar, PRM systems or satellite/links.
99. The Department of Defence assessed the proposal with respect to possible interference to Defence communications and radars and advised that it has no concerns with the Crookwell 3 Wind Farm.
100. No other aviation-related electric or magnetic fields were identified or notified during the prescribed consultation activities.

5.11. Bushfires

101. NSW RFS Manager of Aviation and Specialist Equipment advised that aerial fire fighting near wind farms would not be an option and that ground based activities would be required instead.
102. Notwithstanding that aerial fire fighting operations will potentially be restricted in the vicinity of the proposed wind farm, there is still a valid (ground-based) means of fighting bushfires on and near the properties on which the wind farm is proposed to be located.

6. Obstacle Marking and Lighting

- 103. Because wind turbines project into navigable airspace, they need to be visible to pilots so that they can be avoided. As aircraft can be flown during the day and at night, consideration should be given to the question of whether the turbines need to be marked and lit so that they are visible under all lighting conditions.
- 104. A marking and lighting design has been prepared in accordance with applicable regulations and guidance.
- 105. The visual impact of night lighting has also been considered.

6.1. Regulatory context

6.1.1. Civil Aviation Safety Authority

Civil Aviation Safety Regulations 1998, Part 139—Aerodromes

- 106. In areas remote from an aerodrome, Civil Aviation Safety Regulation (CASR) 139.365 requires the owner of a structure (or proponents of a structure) that will be 110m or more above ground level to inform CASA. This is to allow CASA to assess the effect of the structure on aircraft operations and determine whether or not the structure will be hazardous to aircraft operations.
- 107. CASA provided notification in its letter dated 6 May 2010 that the turbines pose a potential hazard (due to their height of 152 m AGL) as they will be coincident with the base of navigable airspace, particularly under conditions of low light.

Manual of Standards Part 139—Aerodromes

- 108. Chapter 7 of MOS 139 sets out the standards applicable to Obstacle Restriction and Limitation. Section 7.1.5 deals with Objects Outside the OLS:

7.1.5 Objects Outside the OLS

7.1.5.1 Under CASR Part 139 any object which extends to a height of 110 m or more above local ground level must be notified to CASA.

Note: For instrument runways, obstacle monitoring includes the PANS-OPS surface which extends beyond the OLS of the aerodrome. See paragraph 7.1.1.

7.1.5.2 Any object that extends to a height of 150 m or more above local ground level must be regarded as an obstacle unless it is assessed by CASA to be otherwise.

- 109. Chapter 9 sets out the standards applicable to Visual Aids Provided by Aerodrome Lighting.
- 110. Section 9.4.1 provides some general guidance on obstacle lighting:
 - 9.4.1.2 In general, an object in the following situations would require to be provided with obstacle lighting unless CASA, in an aeronautical study, assesses it as being shielded by another lit object or that it is of no operational significance:*
 - ...
 - (b) outside the obstacle limitation surfaces of an aerodrome, if the object is or will be more than 110 m above ground level.*

- 111. Section 9.4.2 provides guidance on Types of Obstacle Lighting and Their Use:

9.4.2.3 *Medium intensity obstacle lights are to be used either alone or in combination with low intensity lights, where:*

- (a) *the object is an extensive one;*
- (b) *the top of the object is 45 m or more above the surrounding ground; or*
- (c) *CASA determines that early warning to pilots of the presence of the object is desirable.*

...

9.4.2.5 *High intensity obstacle lights are flashing white lights used on obstacles that are in excess of 150 m in height.*

AC 139-18(0)—Obstacle Marking and Lighting of Wind Farms

- 112. CASA has previously provided guidance on the marking and lighting of wind farms in Advisory Circular (AC) 139-18(0) *Obstacle Marking and Lighting of Wind Farms*, dated December 2005. This document was withdrawn from publication in 2008, and to date has not been replaced. It therefore has no regulatory or legal effect, although the DGRs list it in the Relevant Guidelines – For Reference section.
- 113. There is no other current guidance from CASA on the subject of marking and lighting of wind farms. Accordingly, AC 139-08(0) has been considered in this assessment.

AC 139-08(0)—Reporting of Tall Structures

- 114. In AC 139-08(0)—*Reporting of Tall Structures*, CASA provides guidance to those authorities and persons involved in the planning, approval, erection, extension or dismantling of tall structures so that they may understand the vital nature of the information they provide.
- 115. The RAAF Aeronautical Information Service (AIS) has been assigned the task of maintaining a database of tall structures, the top measurement of which is:
 - (a) 30 metres or more above ground level—within 30 kilometres of an aerodrome; or
 - (b) 45 metres or more above ground level elsewhere.
- 116. The purpose of notifying RAAF AIS of these structures is to enable their details to be provided in aeronautical information databases and maps/charts etc used by pilots, so that the obstacles can be avoided.
- 117. As the proposed turbines, located within 30 km of an aerodrome, will be greater than 30 m AGL, they must be reported to RAAF AIS. This requirement was also mentioned in the letter from CASA dated 6 May 2010. This action should occur once the final layout is confirmed at the completion of the Environmental Assessment process.

6.1.2. International Civil Aviation Organization

- 118. As a contracting state to the International Civil Aviation Organization (ICAO) and signatory to the Chicago Convention on International Civil Aviation, Australia has an obligation to implement ICAO's standards and recommended practices (SARPs) as published in the various annexes to the Convention. Where these SARPs are not met, a difference must be filed.
- 119. Annex 14 to the Convention — *Aerodromes*, Volume 1 documents SARPs applicable to wind turbines. Section 6.4 of Annex 14 provides:

6.4 Wind turbines

6.4.1 A wind turbine shall be marked and/or lighted if it is determined to be an obstacle.

Note.— See 4.3.1 and 4.3.2.

Markings

6.4.2 **Recommendation.**— *The rotor blades, nacelle and upper 2/3 of the supporting mast of wind turbines should be painted white, unless otherwise indicated by an aeronautical study.*

Lighting

6.4.3 **Recommendation.**— *When lighting is deemed necessary, medium-intensity obstacle lights should be used. In the case of a wind farm, i.e. a group of two or more wind turbines, it should be regarded as an extensive object and the lights should be installed:*

- a) to identify the perimeter of the wind farm;*
- b) respecting the maximum spacing, in accordance with 6.3.14 [900 m], between the lights along the perimeter, unless a dedicated assessment shows that a greater spacing can be used;*
- c) so that, where flashing lights are used, they flash simultaneously; and*
- d) so that, within a wind farm, any wind turbines of significantly higher elevation are also identified wherever they are located.*

6.4.4 **Recommendation.**— *The obstacle lights should be installed on the nacelle in such a manner as to provide an unobstructed view for aircraft approaching from any direction.*

120. Sections 4.3.1 and 4.3.2 of Annex 14 state as follows:

4.3 Objects outside the obstacle limitation surfaces

4.3.1 **Recommendation.**— *Arrangements should be made to enable the appropriate authority to be consulted concerning proposed construction beyond the limits of the obstacle limitation surfaces that extend above a height established by that authority, in order to permit an aeronautical study of the effect of such construction on the operation of aeroplanes.*

4.3.2 **Recommendation.**— *In areas beyond the limits of the obstacle limitation surfaces, at least those objects which extend to a height of 150 m or more above ground elevation should be regarded as obstacles, unless a special aeronautical study indicates that they do not constitute a hazard to aeroplanes.*

Note.— This study may have regard to the nature of operations concerned and may distinguish between day and night operations.

121. Section 6.3.1.4 of Annex 14 states as follows:

6.3.14 *In the case of an extensive object or of a group of closely spaced objects, top lights shall be displayed at least on the points or edges of the objects highest in relation to the obstacle limitation surface, so as to indicate the general definition and the extent of the objects. ..Where medium-intensity lights are used, they shall be spaced at longitudinal intervals not exceeding 900 m.*

6.2. Marking

122. In accordance with ICAO Annex 14 Vol 1 section 6.4.2, it is proposed that the rotor blades, nacelle and the supporting mast of the wind turbines should be painted white or off-white.

6.3. Lighting

6.3.1. Turbines 150 m or more above ground level

123. Since:

- (a) the proposed turbines are anticipated to reach a height of 152 m;
- (b) the Manual of Standards 139—Aerodromes (MOS 139) 7.1.5.2 states that any object extending to a height of 150 m or more AGL must be regarded as an obstacle; and
- (c) CASA has indicated that the turbines are a potential hazard (refer to letter dated 6 May 2010),

then the turbines will be regarded as obstacles.

124. Under the requirements of MOS 139, section 9.4.1.2, obstacles more than 110 m AGL are required to be provided with obstacle lighting. The requirements of Annex 14 sections 6.4.1 and 4.3.2 direct that any such obstacles be marked and lighted.

6.3.2. Turbines >110m, <150 m above ground level

125. MOS 139 section 9.4.1.2 directs that obstacles more than 110 m AGL would be required to be provided with obstacle lighting.

6.3.3. Lighting design

126. In light of the foregoing discussion and since the turbines under consideration for the project range in height from 125 m to 152 m, the wind farm will need obstacle lighting regardless of which turbine is selected.

127. A lighting design has therefore been prepared on the basis of the requirements set out in ICAO Annex 14 Vol 1 Chapter 6 and MOS 139.

128. Key turbines are proposed to be lit, and wherever possible these are on the perimeter at appropriate spacing and/or are significantly higher than surrounding turbines.

129. In addition, the lighting proposal has been based on:

- (a) the specific configuration of each wind farm site (East and South) and its location in relation to surrounding facilities (including Crookwell 2 Wind Farm and Goulburn Airport to the south) and features (including terrain);
- (b) the relative elevation and proximity of each turbine in relation to others; and
- (c) the position of turbines in relation to falling and rising terrain.

130. Due to the configuration of each wind farm (East and South) however, not all lit turbines are within 900 m of each other—although the apparent intermediate distance (approaching from any direction is minimised (and retained under approximately 1 nm) due to the location of intermediate lights set further back from turbines on the perimeter.

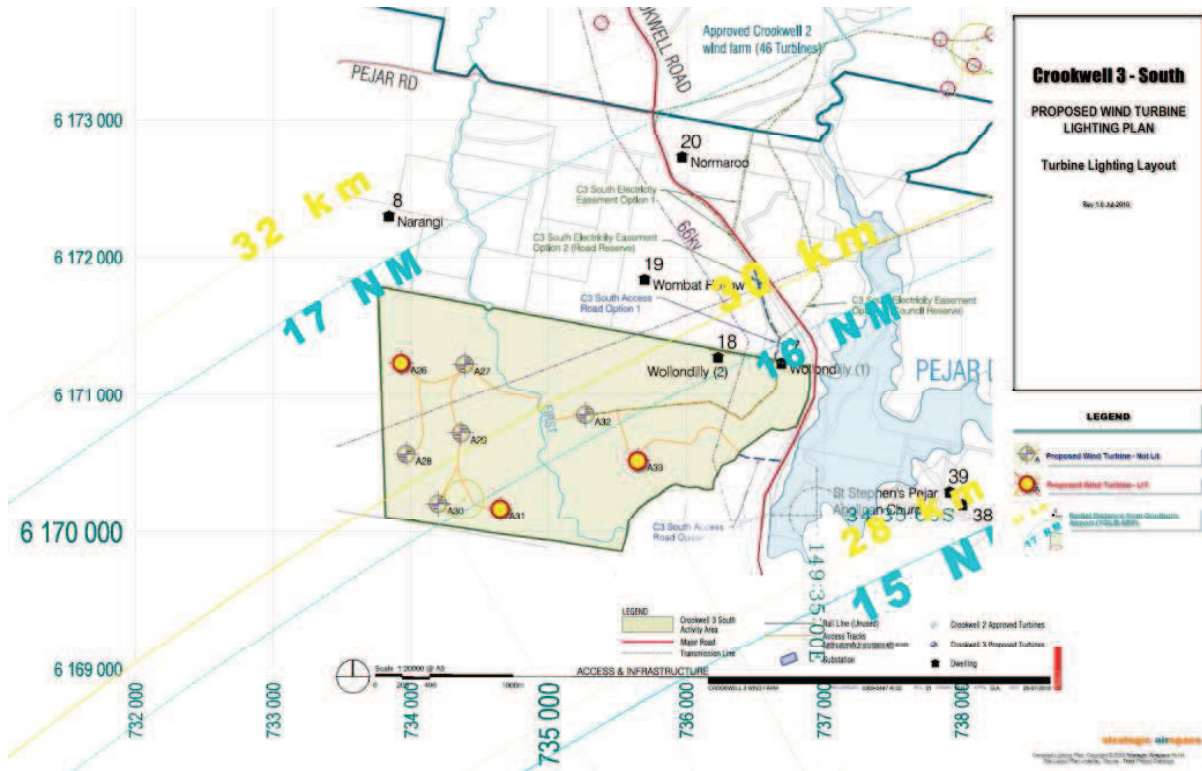
131. Given the minimum requirement for 5000 m visibility for flight under the visual flight rules, the lighting design should provide sufficient warning to pilots that they will be able to manoeuvre their aircraft to avoid the turbines.

132. The following turbines are proposed be lit:

Crookwell South—A26, A31 and A33; and

Crookwell East—A1, A3, A5, A10, A12, A15, A19, A23 and A25.

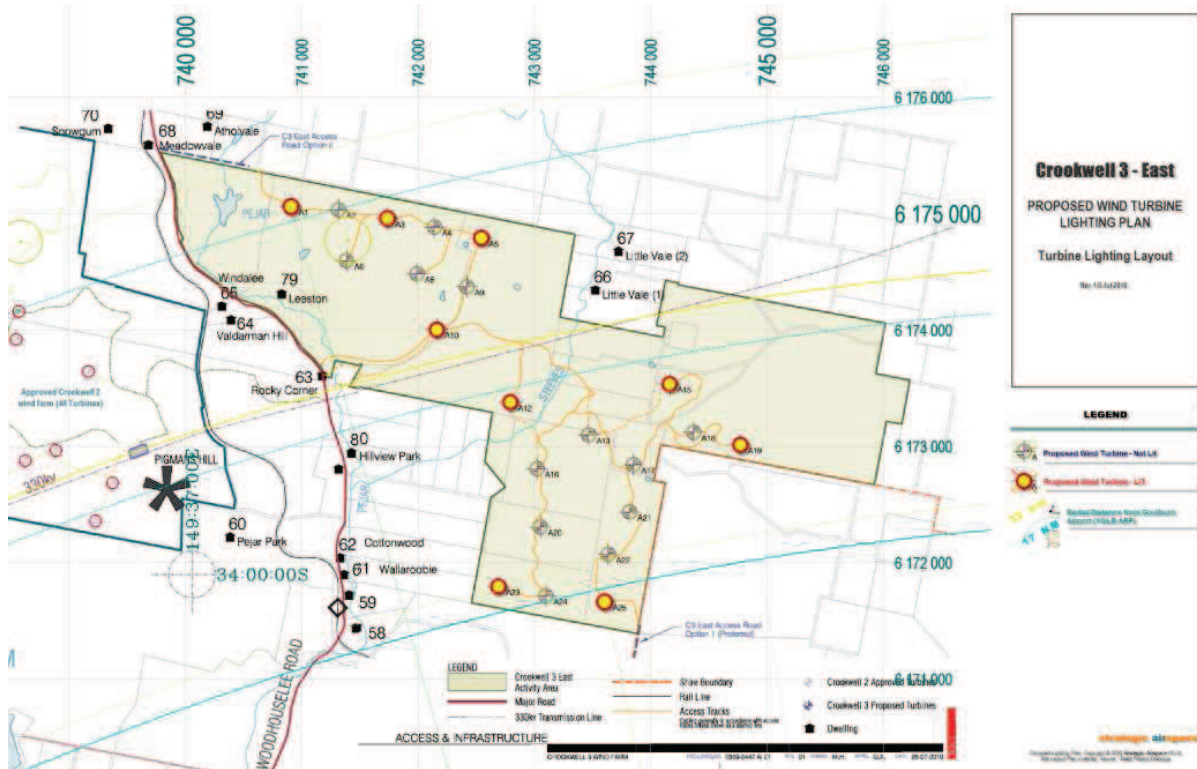
133. See figures 4 and 5 below for a graphic representation of those turbines proposed to be lit, in the context of the overall wind farm.



■ Figure 4 Crookwell 3 South Turbine Lighting Layout

134. It is proposed to not light turbines A28 and A30 because:

- (a) the offset distances are small within the aviation context (159 m to 351 m);
- (b) each of those turbines are within the 900m radius from an existing lit turbine;
- (c) the apparent distance between lit turbines (from any approach angle) is no more than approximately 1400 m (0.75 nm); and
- (d) each of these turbines is lower than the lit turbines.



■ Figure 5 Crookwell 3 East Turbine Lighting Layout

- 135. Under the Annex 14 guidelines one could potentially construe that turbine A21 should be lit. However, because this turbine is set back from the line (along the south-east side of the site) between the two tallest turbines (on the site), A18 and A25 — and because it 34-27m (100+ feet) lower — it is proposed that this turbine NOT be lit.
- 136. A larger scale graphic representation of the wind farm showing those turbines proposed to be lit is provided at **Annexure 4**. Also provided is a graphic representation of the technical aspects of the design including 900 m range rings and highest elevation data.

Light characteristics

- 137. Installed lights should be designed according to the criteria set out in the applicable regulations and guidance material. In addition to the guidance already outlined, the withdrawn AC 139-18(0) provided relevant guidance as follows:
 - (a) two flashing red medium intensity obstacle lights should be provided;
 - (b) the light fixtures should be mounted sufficiently above the surface of the nacelle so that the lights are not obscured by the rotor hub, and at a horizontal separation to ensure an unobstructed view of at least one of the lights by a pilot approaching from any direction;
 - (c) both lights should flash simultaneously; and
 - (d) the characteristics of the obstacle lights should be in accordance with the applicable standards in MOS 139.

138. The characteristics of medium intensity obstacle lights specified in MOS 139, Chapter 9, are provided below:

9.4.7 Characteristics of Medium Intensity Obstacle Lights

9.4.7.1 Medium intensity obstacle lights are to be flashing or steady red lights or flashing white lights, visible in all directions in azimuth.

9.4.7.2 The frequency of flashes is to be between 20 and 60 flashes per minute.

9.4.7.3 The peak effective intensity is to be 2,000 +-25% cd with a vertical distribution as follows:

(a) vertical beam spread is to be 3° minimum (beam spread is defined as the angle between two directions in a plane for which the intensity is equal to 50% of the lower tolerance value of the peak intensity);

(b) at -1° elevation, the intensity is to be 50% minimum and 75% maximum of lower tolerance value of the peak intensity; and

(c) at 0° elevation, the intensity is to be 100% minimum of the lower tolerance value of the peak intensity.

Ongoing availability of obstacle lights

139. MOS 139 section 9.4.10 sets out the requirements for ongoing availability of obstacle lights:

9.4.10.4 For obstacles located outside the obstacle limitation surface area of an aerodrome, the owners of the lights need to establish a program to monitor the lights and report light failures. The reporting point for obstacle light failure is normally the nearest CASA office. When an obstacle light is unserviceable, the matter needs to be reported immediately to the relevant CASA

140. To ensure the ongoing availability of obstacle lights, it is proposed that a monitoring, reporting and maintenance program will be established in accordance with this guidance.

Confirmation of final design subject to final turbine layout

141. This lighting design is subject to confirmation of the final turbine layout as any changes proposed could potentially affect which turbines should be lit in accordance with the 900 m interval consideration.

6.3.4. Visual impact of night lighting

142. Although MOS 139 specifies a requirement for high intensity lighting for obstacles in excess of 150m in height, the Annex 14 requirement, specifically intended for wind farms, is for medium intensity lighting. In the interest of minimising visual impact, it is therefore proposed that medium intensity lighting will be used regardless of the final turbine height (provided it is greater than 110m AGL).

143. The withdrawn AC 139-18(0) provided relevant guidance on the minimisation of visual impact. This guidance should be adopted in the lighting design for this wind farm:

10.4 To minimise the visual impact on the environment, some shielding of the obstacle lights is permitted, provided it does not compromise their operational effectiveness.

(a) Shielding may be provided to restrict the downward component of light to either, or both, of the following:

(i) Such that no more than 5% of the nominal intensity is emitted at or below 5 degrees below horizontal; and

(ii) Such that no light is emitted at or below 10 degrees below horizontal.

(b) Where two lights are mounted on a nacelle, dynamic shielding or light extinction of one light at a time, for the period that a blade is passing in front of the light, is permissible, providing that at all times at least one light can be seen, without interruption, from every angle of azimuth.

10.5 All obstacle lights on a wind farm are to be synchronised so that they flash simultaneously.

144. AC 139-18(0) also mentioned that a relatively small area on the back of each blade near the rotor hub may be treated with a different colour or surface treatment, to reduce reflection from the rotor blades of light from the obstacle lights, without compromising the daytime conspicuity of the overall turbine.

6.4. Power lines

145. Crookwell Development Pty Ltd has advised that there may be a need to construct distribution powerlines from either one or both of the Crookwell 3 sites to the Crookwell 2 site; the circumstances for the use of power lines would be to bypass terrain that is not suitable for trenching due to excessive hills and gullies.
146. These poles would be constructed of concrete and be between approximately 15-20 m high, and would most probably use ABC cable(s); three from Crookwell 3 East and one from Crookwell 3 South (if required).
147. There is no regulatory requirement to mark or light these power poles and nor is it intended to do so; however, a case by case assessment as to whether marking or lighting would be required to maintain an acceptable level of safety would be made, in consultation with applicable stakeholders, prior to construction.

6.5. Future regulatory requirements and guidance

148. It is understood that CASA is reviewing the regulatory framework applicable to the lighting of wind farms and other obstacles not in the vicinity of aerodromes, and that there is some prospect that only turbines (and other obstacles) in excess of 150 m in height above ground level would be required to be lit (as per ICAO Standards and Recommended Practices).
149. This or any other future development or amendment of regulations or guidance by CASA could potentially affect the requirement for lighting and/or applicable design specifications. This proposed lighting design is therefore subject to final confirmation of applicable regulatory requirements prior to installation of the lights during construction.

7. Conclusions

150. This assessment, consistent with the DGRs, considered aviation aspects associated with cumulative impact, visual amenity, hazard/risk and consultation.
151. A summary of the conclusions drawn in this report are provided for each area of consideration below.

7.1. Cumulative impacts

152. There will be an increased area that will 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 will 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.
153. As obstacle lighting has been identified as a requirement for this wind farm, and there are other wind farms close by that will also potentially require obstacle lighting, 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.
154. The turbines of the 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 therefore establish the vertical limit for impact on airspace-related aspects of aviation activities.

7.2. Night lighting

155. Under the relevant regulatory framework and in accordance with CASA's determination, the wind turbines are considered obstacles and the wind farm should be regarded as an extensive object. Accordingly, medium intensity obstacle lighting should be installed:
- (a) to identify the perimeter of the wind farm;
 - (b) at longitudinal intervals not exceeding 900 m;
 - (c) so that they are synchronised to flash simultaneously; and
 - (d) so that any wind turbines of significantly higher elevation are also identified.
156. The medium intensity obstacle lights should have the characteristics specified in MOS 139, Chapter 9.
157. To minimise visual impact, the guidance provided in the withdrawn AC 139-18(0) on the minimisation of visual impact should be adopted in the lighting design.

7.3. Aeronautical impacts

158. The proposed development does not impose any significant risk to normal flying operations provided aircraft are operated in compliance with applicable regulatory and operational control requirements and with the application of good airmanship.

7.3.1. Nearby aerodromes and aircraft landing areas

159. There will be no adverse impact by the proposed wind farm on nearby aerodromes or aircraft landing areas.

7.3.2. Obstacle Limitation Surfaces

160. There will be no adverse impact by the proposed wind farm on obstacle limitation surfaces.

7.3.3. PANS-OPS surfaces

161. There will be no adverse impact by the proposed wind farm on PANS-OPS surfaces.

7.3.4. Aircraft operations

162. To avoid the turbine obstacles, aircraft will potentially have to fly at a higher altitude or divert around the wind farm.

7.3.5. Defined air traffic routes

163. Airservices Australia found that at a maximum height of 1085 m (3560 ft) AHD, the proposed wind farm will affect the W10 air route to the north of Goulburn. Lowest Safe Altitude procedures are penetrated by 60 ft and will need be adjusted accordingly (minor adjustment).

164. There is a requirement to notify RAAF AIS of the as-constructed turbine locations and heights.

7.3.6. Radar interference

165. In consideration of the proposed development height, location and distance from radar and associated control zones, it is considered that the development will be approvable by Airservices Australia.

7.3.7. Communications systems

166. There will be no adverse impact by the proposed wind farm on aviation-related communications systems.

7.3.8. Navigation aids

167. There will be no adverse impact by the proposed wind farm on aviation-related navigation aids.

7.3.9. Aerial application of agricultural fertilisers and pesticides

168. Representatives of each of the owners of the properties on which the proposed wind farm is to be situated advised that aerial application of agricultural fertilisers and/or pesticides had not occurred on their properties for some time, if at all, and was not currently planned to occur in the future.

169. Safe aerial application operations would be possible on properties neighbouring the proposed wind farm, subject to final turbine locations, and subject to a case by case assessment. The use of helicopters enables aerial application operations to be conducted in closer proximity to obstacles than would be possible with fixed wing aircraft due to their greater manoeuvrability.

7.3.10. Electric and magnetic fields

170. No aviation-related electric or magnetic fields were identified or notified during the prescribed consultation activities and so no adverse effect is anticipated in this regard.

7.3.11. Bushfires

171. Notwithstanding that aerial fire fighting operations will potentially be restricted in the vicinity of the proposed wind farm, ground-based means of fighting bushfires on and near the properties on which the wind farm is proposed to be located remain available and present a valid alternative.

7.4. Consultation

172. An appropriate and justified level of consultation was undertaken with the following parties:

- (a) Upper Lachlan Shire Council;
- (b) Goulburn Mulwaree Council;
- (c) NSW Rural Fire Service;
- (d) Commonwealth Department of Defence;
- (e) Civil Aviation Safety Authority;
- (f) Airservices Australia;
- (g) Aerial Agricultural [Association] of Australia; and
- (h) the local community and landowners.

8. Mitigation Actions Required

173. Recommended actions resulting from the conduct of this assessment are provided below.

8.1. Notification of tall structures

174. Final (approved) turbine coordinates and elevations should be provided to RAAF AIS at the following address:

Aeronautical Data Officer
RAAF AIS (VBM-M2)
Victoria Barracks
St Kilda Rd
Southbank VIC 3006
Tel: (03) 9282 6400
Fax: (03) 9282 6695
Email: ais.charting@defence.gov.au

8.2. Marking of turbines

175. The rotor blades, nacelle and the supporting mast of the wind turbines should be painted white or off-white.

176. There is no regulatory requirement to mark or light power poles potentially required to support distribution powerlines and nor is it intended to do so; however, a case by case assessment as to whether marking or lighting would be required to maintain an acceptable level of safety should be made, in consultation with applicable stakeholders, prior to construction.

8.3. Lighting of turbines

177. Medium intensity obstacle lighting should be installed:

- (a) to identify the perimeter of the wind farm;
- (b) at longitudinal intervals not exceeding 900 m;
- (c) so that they are synchronised to flash simultaneously (both within the windfarm and with other windfarms in the vicinity); and
- (d) so that any wind turbines of significantly higher elevation are also identified.

178. The following turbines are proposed be lit:

Crookwell South—A26, A31 and A33; and

Crookwell East—A1, A3, A5, A10, A12, A15, A19, A23 and A25.

179. The medium intensity obstacle lights should have the characteristics specified in MOS 139, Chapter 9.

180. To minimise visual impact, the guidance provided in withdrawn AC 139-18(0) on the minimisation of visual impact should be adopted in the lighting design.

181. Any other future development or amendment of regulations or guidance by CASA could potentially affect the requirement for lighting and/or applicable design specifications. The lighting design is

therefore subject to final confirmation of applicable regulatory requirements prior to installation of the lights during construction.

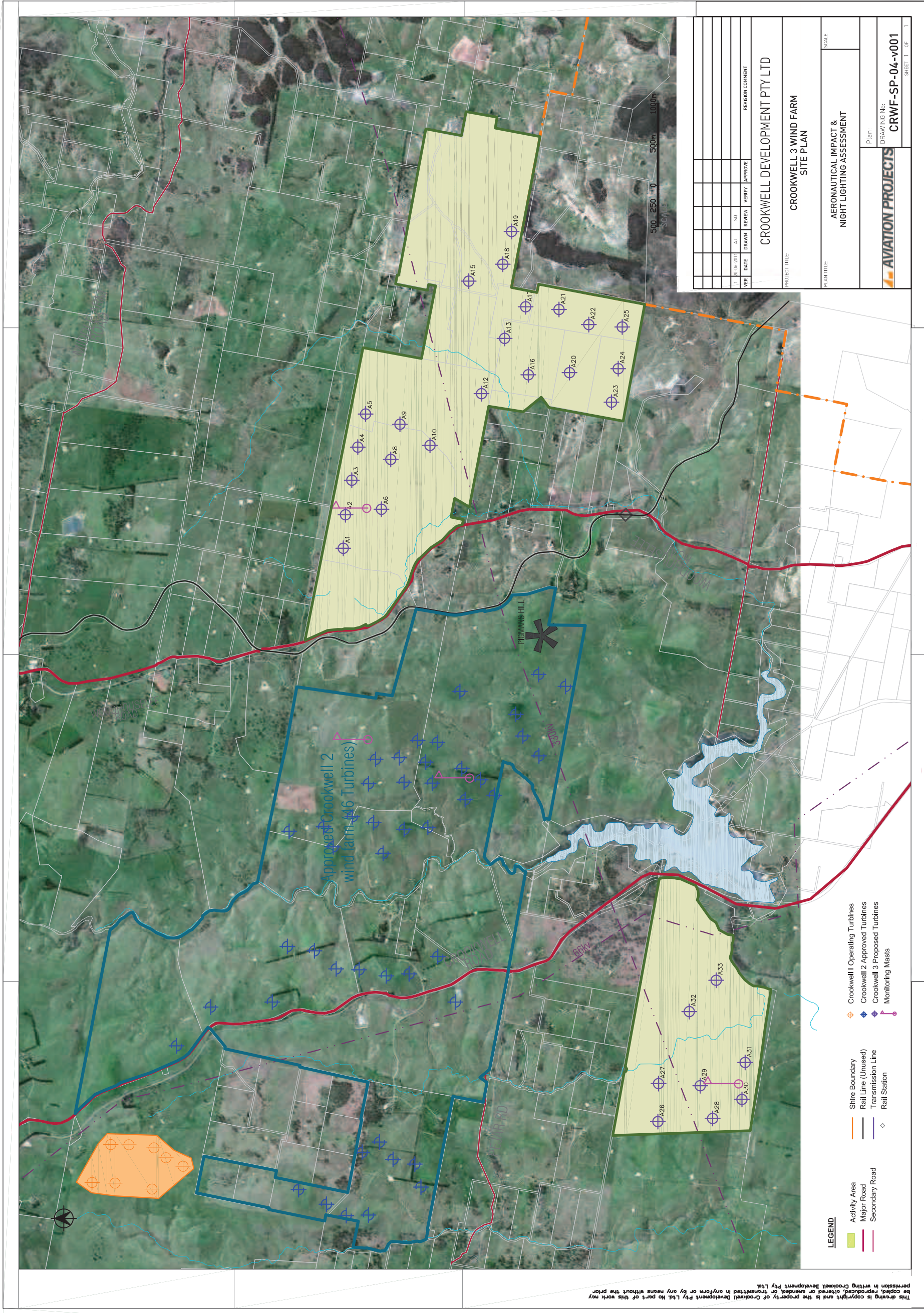
182. To ensure the ongoing availability of obstacle lights, a monitoring, reporting and maintenance program should be established in accordance with the requirements set out in MOS 139, Chapter 9.

Annexures

1. Site Plans
2. Turbine and Wind Monitoring Masts Coordinates
3. PANS-OPS and OLS Report
4. Obstacle Lighting Design
5. Correspondence
6. Curriculum Vitaes

Annexure 1 – Site Plans

1. Crookwell 3 Wind Farm Aviation Plan, 309447-PD AC 01 Rev 00 dated 27 July 2010, replaced with CRWF-SP-04-v001 Crookwell 3 Wind Farm Site Plan to provide additional clarity
2. Crookwell 3 Wind Farm Site Plan, 0309-0447 SP-03 Rev 04 dated 26 July 2010, replaced with CRWF-SP-03-v001 Crookwell 3 Wind Farm Site Plan to provide additional clarity



LEGEND

- Activity Area
- Major Road
- Secondary Road
- Shire Boundary
- Rail Line (Unused)
- Transmission Line
- Rail Station
- Crookwell 1 Operating Turbines
- Crookwell 2 Approved Turbines
- Crookwell 3 Proposed Turbines
- Monitoring Masts

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NO.	DATE	DRAWN	REVIEW	VERIFY	APPROVE	REVISION COMMENT
1	04/02/20	AJ	SA			

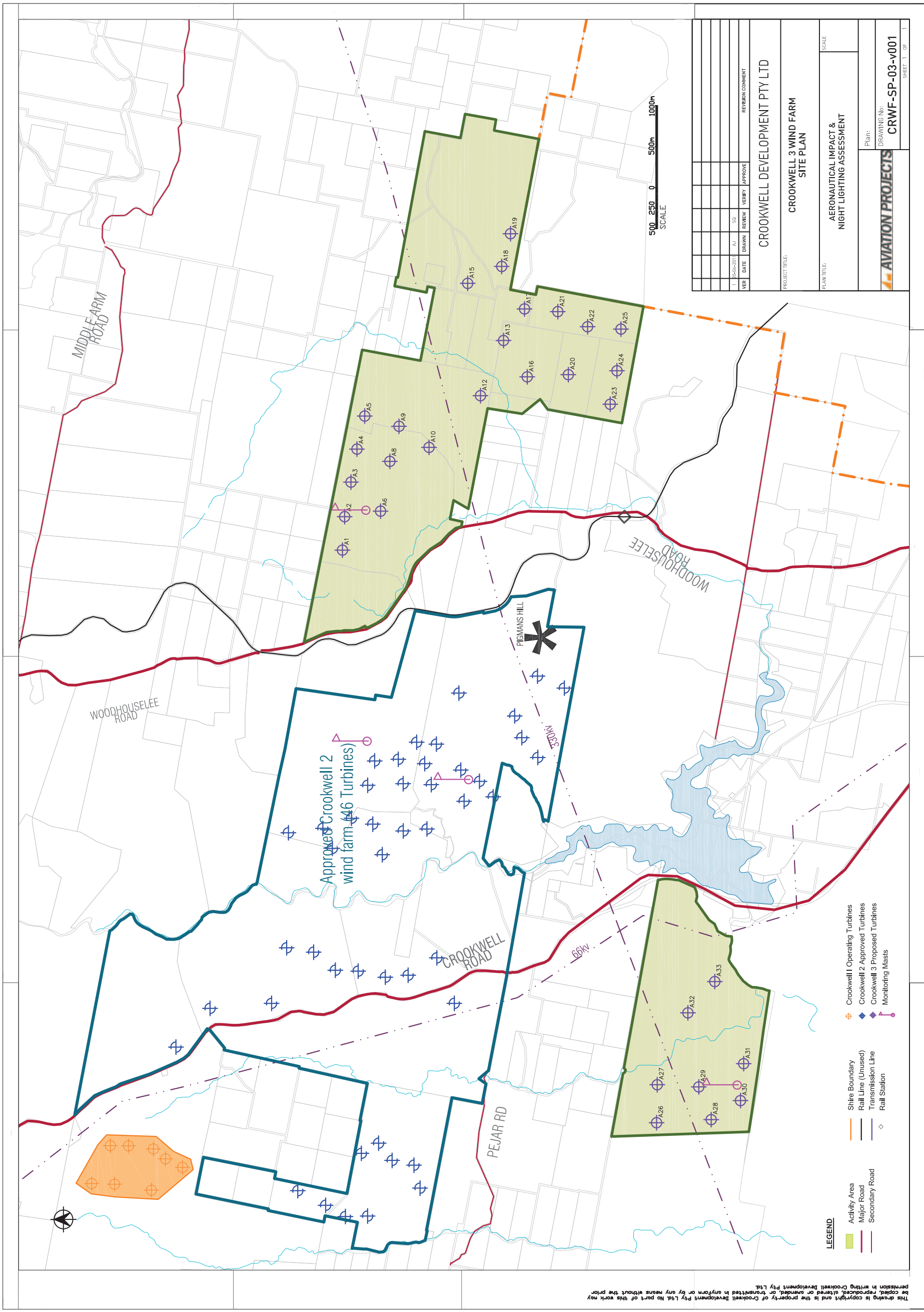
PROJECT TITLE: CROOKWELL DEVELOPMENT PTY LTD
CROOKWELL 3 WIND FARM
SITE PLAN

PLAN TITLE: AERONAUTICAL IMPACT & NIGHT LIGHTING ASSESSMENT

SCALE: 1:1000

Plan: AVIATION PROJECTS
DRAWING No: CRWF-SP-04-v001
SHEET 1 OF 1

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Annexure 2 – Turbine and Wind Monitoring Mast Coordinates

1. Spreadsheet Crookwell3-Turbines+Masts_WGSLatLong_FINAL-20100729__DISTRIB.xls

10.003 Crookwell 3 Wind Farm
TURBINE and WIND MONITORING MAST DATA
WGS84

Updated 29-Jul-2010
CW3 Total Turbines: 30

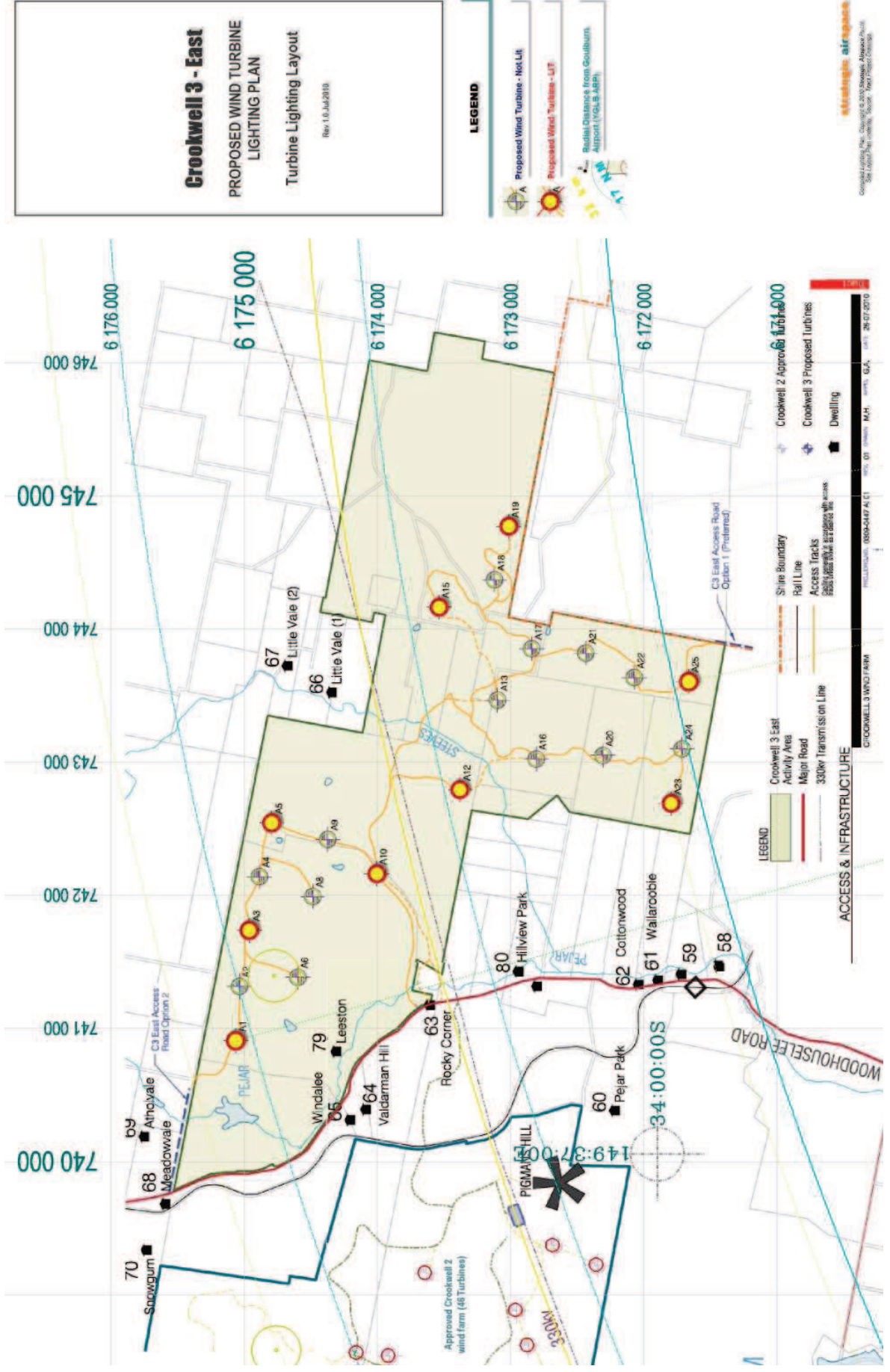
TurbineID	Status	Type	Description	Lighting	WGS84 Lat/Long		Top Elev m AMSL	Ground Elev.m AMSL	Mast Hgt AGL	MGA94 Coordinates		Data Provenance		
					Latitude (text)	Longitude (text)				UTM-X Easting (m)	UTM-Y Northing (m)	Data Provider	Date Source	Date
CW2-Monitor	Installed	WindTurbine	Tubular (with guy wires and anchors on 4 sides)	N	S343228.48	E1493559.36	953	913	40	736584	6174759	Union Fenosa	20100519 - Crookwell3, Mast Coordinates for Assessment by Aircservices Australia.xls	19/05/2010
CW2-Monitor	Installed	WindTurbine	Lattice (with guy wires and anchors on 3 sides)	N	S343309.25	E1493542.19	953	873	80	736114	6175514	Union Fenosa	20100519 - Crookwell3, Mast Coordinates for Assessment by Aircservices Australia.xls	19/05/2010
CW3-Monitor Nth	Installed	WindTurbine	Tubular (with guy wires and anchors on 4 sides)	N	S343225.60	E1493749.55	975	915	60	741396	6174775	Union Fenosa	20100519 - Crookwell3, Mast Coordinates for Assessment by Aircservices Australia.xls	19/05/2010
CW3-Monitor Sth	Installed	WindTurbine	Tubular (with guy wires and anchors on 4 sides)	N	S343458.38	E1493319.30	884	824	60	734386	6170244	Union Fenosa	20100519 - Crookwell3, Mast Coordinates for Assessment by Aircservices Australia.xls	19/05/2010
Crookwell3 Development Proposal														
A1	Proposed	WindTurbine	CW3 - East - Proposed to be lit	LIT	S343216.60	E1493730.21	1063	911	152	740910	6175065	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A2	Proposed	WindTurbine	CW3 - East	N	S343217.13	E1493746.23	1063	911	152	741318	6175038	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A3	Proposed	WindTurbine	CW3 - East - Proposed to be lit	LIT	S343219.27	E1493802.81	1071	919	152	741739	6174961	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A4	Proposed	WindTurbine	CW3 - East	N	S343221.30	E1493818.67	1075	923	152	742142	6174888	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A5	Proposed	WindTurbine	CW3 - East - Proposed to be lit	LIT	S343224.04	E1493834.57	1068	916	152	742545	6174793	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A6	Proposed-Relocated	WindTurbine	CW3 - East - Loc.v2 as at 20/10/2016	N	S343229.89	E1493741.41	1057	905	152	741385	6174600	Union Fenosa	20100716 - Crookwell3, Turbine Coordinates v2.xls	27/07/2010
A7	CANCELLED	WindTurbine	CW3 - East - removed from proposal 20/10/2016	N/A	S343232.08	E1493757.29	1042	890	152	741488	6174520	Union Fenosa	20100716 - Crookwell3, Turbine Coordinates v2.xls	27/07/2010
A8	Proposed	WindTurbine	CW3 - East	N	S343234.43	E1493813.21	1063	911	152	741992	6174487	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A9	Proposed-Relocated	WindTurbine	CW3 - East - Loc.v2 as at 20/10/2016	N	S343236.76	E1493829.99	1065	913	152	742420	6174375	Union Fenosa	20100716 - Crookwell3, Turbine Coordinates v2.xls	27/07/2010
A10	Proposed-Relocated	WindTurbine	CW3 - East - Loc.v2 as at 20/10/2016 - Proposed to be lit	LIT	S343248.78	E1493819.15	1052	900	152	742163	6174009	Union Fenosa	20100716 - Crookwell3, Turbine Coordinates v2.xls	27/07/2010
A11	CANCELLED	WindTurbine	CW3 - East - removed from proposal 20/10/2016	N/A	S343249.10	E1493845.29	1050	898	152	742556	6174020	Union Fenosa	20100716 - Crookwell3, Turbine Coordinates v2.xls	27/07/2010
A12	Proposed	WindTurbine	CW3 - East - Proposed to be lit	LIT	S343309.59	E1493845.73	1038	886	152	742793	6175382	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A13	Proposed	WindTurbine	CW3 - East	N	S343318.13	E1493912.40	1020	868	152	743466	6175101	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A14	CANCELLED	WindTurbine	CW3 - East - removed from proposal 20/10/2016	N/A	S343307.93	E1493927.65	1027	875	152	743863	6174445	Union Fenosa	20100716 - Crookwell3, Turbine Coordinates v2.xls	27/07/2010
A15	Proposed-Relocated	WindTurbine	CW3 - East - Loc.v2 as at 20/10/2016 - Proposed to be lit	LIT	S343301.36	E1493941.80	1041	889	152	744163	6173538	Union Fenosa	20100716 - Crookwell3, Turbine Coordinates v2.xls	27/07/2010
A16	Proposed	WindTurbine	CW3 - East	N	S343327.88	E1493955.34	1023	871	152	743023	6172812	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A17	Proposed	WindTurbine	CW3 - East	N	S343326.10	E1493927.76	1032	880	152	743851	6172845	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A18	Proposed	WindTurbine	CW3 - East	N	S343316.64	E1493947.78	1055	903	152	744369	6173123	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A19	Proposed	WindTurbine	CW3 - East - Proposed to be lit	LIT	S343319.77	E1494003.53	1082	930	152	744768	6173016	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A20	Proposed	WindTurbine	CW3 - East	N	S343344.10	E1493856.87	1032	880	152	743049	6172311	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A21	Proposed	WindTurbine	CW3 - East	N	S343339.30	E1493926.88	1048	896	152	743818	6172439	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A22	Proposed	WindTurbine	CW3 - East	N	S343351.23	E1493920.05	1056	904	152	743634	6172076	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A23	Proposed	WindTurbine	CW3 - East - Proposed to be lit	LIT	S343400.98	E1493843.28	1013	861	152	742689	6171800	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A24	Proposed	WindTurbine	CW3 - East	N	S343403.29	E1493859.36	1024	872	152	743091	6171718	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A25	Proposed	WindTurbine	CW3 - East - Proposed to be lit	LIT	S343404.45	E1493919.33	1085	933	152	743605	6171669	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A26	Proposed	WindTurbine	CW3 - South - Proposed to be lit	LIT	S343426.62	E1493300.36	977	825	152	733928	6171235	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A27	Proposed	WindTurbine	CW3 - South	N	S343426.50	E1493318.52	943	791	152	734391	6171227	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A28	Proposed	WindTurbine	CW3 - South	N	S343448.19	E1493302.51	951	799	152	733966	6170569	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A29	Proposed	WindTurbine	CW3 - South	N	S343442.96	E1493318.01	971	819	152	734365	6170720	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A30	Proposed	WindTurbine	CW3 - South	N	S343459.58	E1493311.96	962	810	152	734198	6170212	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A31	Proposed	WindTurbine	CW3 - South - Proposed to be lit	LIT	S343500.47	E1493329.65	976	824	152	734648	6170173	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A32	Proposed	WindTurbine	CW3 - South	N	S343437.91	E1493353.28	955	803	152	735268	6170853	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010
A33	Proposed	WindTurbine	CW3 - South - Proposed to be lit	LIT	S343448.23	E1493408.55	951	799	152	735649	6170525	Union Fenosa	20100312 - Crookwell3, Turbine Coordinates v1.xls	12/03/2010

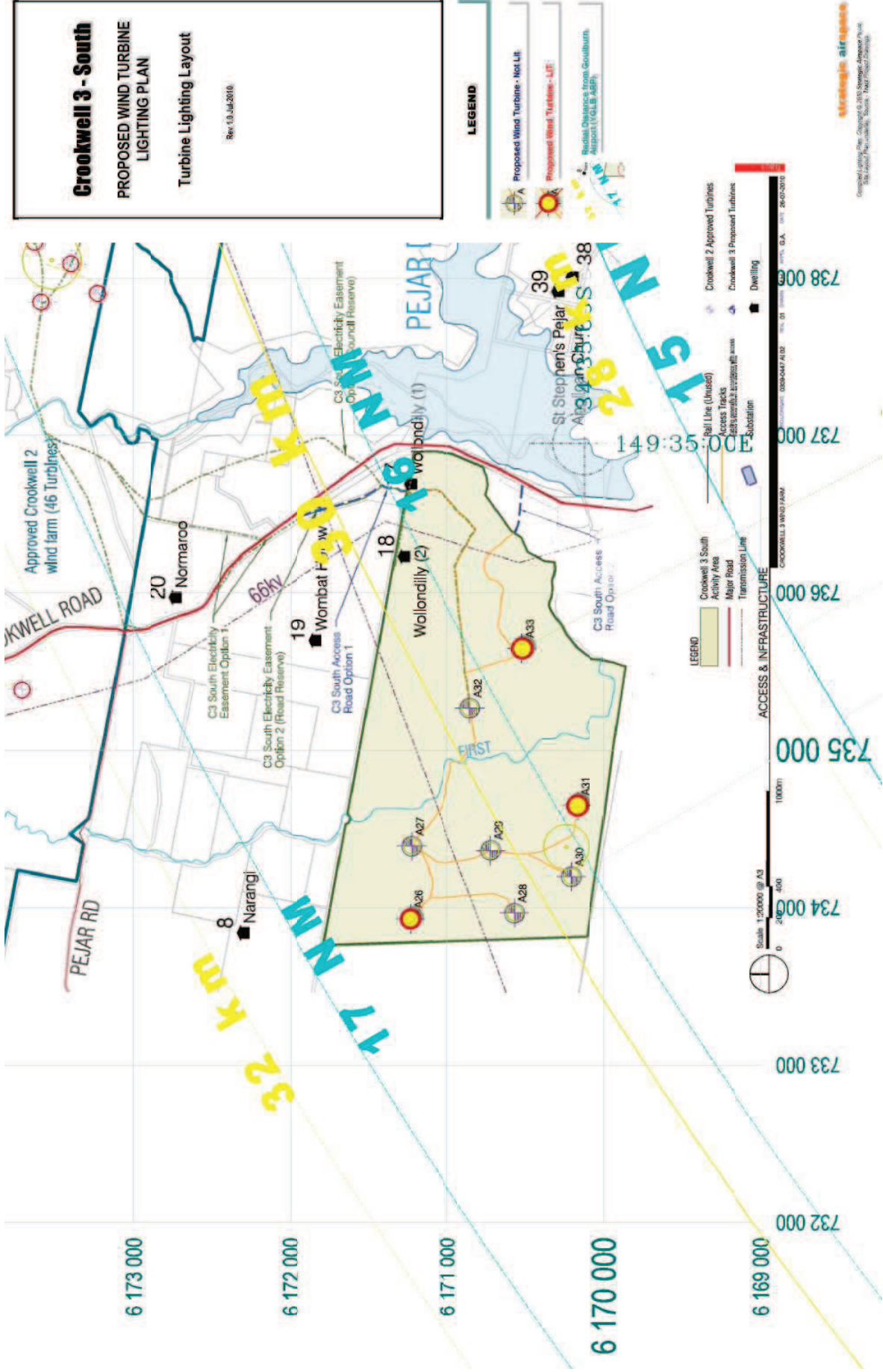
Annexure 3 – PANS-OPS and OLS Report

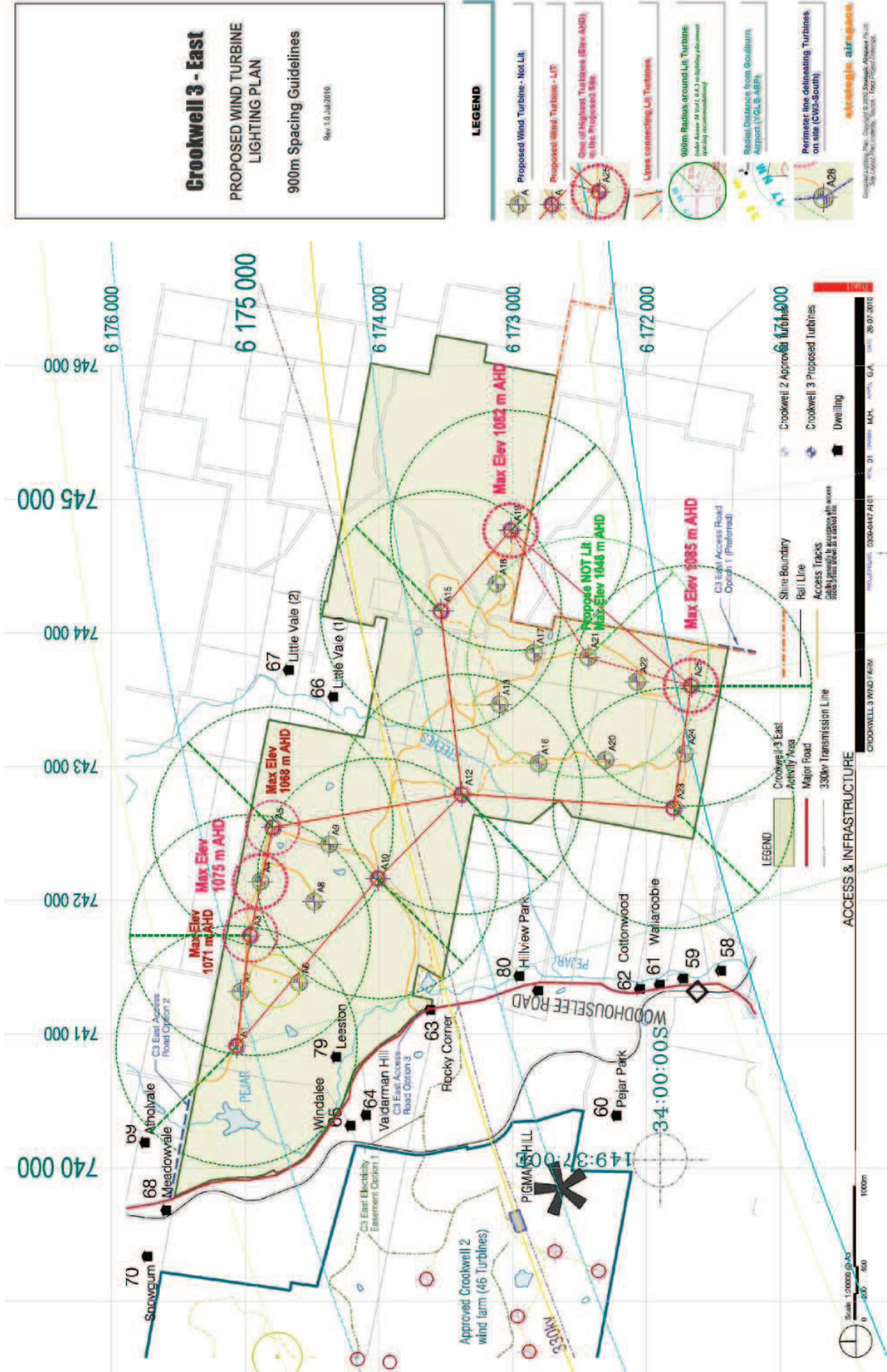
1. Aeronautical Impact Assessment (PANS-OPS & OLS): Crookwell 3 Wind Farm, Doc v1.0 Final Report dated 3 June 2010.

Annexure 4 – Obstacle Lighting Design

1. Crookwell East Turbine Lighting Layout Rev 1.0 Jul 2010
2. Crookwell South Turbine Lighting Layout Rev 1.0 Jul 2010
3. Crookwell East 900m Spacing Guidelines Rev 1.0 Jul 2010
4. Crookwell South 900m Spacing Guidelines Rev 1.0 Jul 2010







Crookwell 3 - East

**PROPOSED WIND TURBINE
LIGHTING PLAN**

900m Spacing Guidelines

Rev. 1.0 July 2010

LEGEND

- Proposed Wind Turbine - Not Lit
- Proposed Wind Turbine - Lit
- Circle of Highest Turbines (Elev AHD) in this Proposed Site
- Lines connecting Lit Turbines
- Buffer Radius around Lit Turbine
Note: Above 40 feet, 4.2 m - lighting placement
workily recommended
- Radius Distance from Goulburn Airport (VGLS AHP)
- Perimeter line delineating Turbines on site (CWA-South)
- strategic airspaces

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Annexure 5 – Correspondence

1. From Aviation Projects Pty Ltd (APPL) to Upper Lachlan Shire Council dated 1 June 2010
2. From Upper Lachlan Shire Council to APPL dated 7 June 2010
3. From APPL to Goulburn Mulwaree Council dated 7 June 2010
4. From Goulburn Mulwaree Council to APPL dated 1 July 2010
5. From Commonwealth Department of Defence to Manager – Water and Energy Infrastructure Projects dated 15 April 2010
6. From APPL to Commonwealth Department of Defence dated 27 April 2010
7. From Commonwealth Department of Defence to APPL dated 14 May 2010
8. From APPL to Civil Aviation Safety Authority dated 27 April 2010
9. From Civil Aviation Safety Authority to APPL dated 6 May 2010
10. From APPL to Airservices Australia dated 4 June 2010
11. From Airservices Australia to APPL dated 2 July 2010
12. From APPL to Aerial Agricultural Association of Australia dated 27 April 2010

 **AVIATION PROJECTS**

1 Jun 2010

General Manager
Upper Lachlan Shire Council
PO Box 10
CROOKWELL NSW 2583

Dear Sir or Madam,

Proposed Crookwell 3 Wind Farm – Aviation issues

Crookwell Development Pty Ltd (CDPL) is part of an international energy group proposing to develop a new wind farm in the Crookwell region of NSW, and seeks to inform the Upper Lachlan Shire Council of the proposal for the purpose of seeking feedback on a number of important issues.

The project area consists of approximately 1500 hectares in two separate parcels, east and south of the approved Crookwell 2 Wind Farm. These two parcels are referred to as Crookwell 3 East and Crookwell 3 South. The enclosed Location Plan shows the proposed Crookwell 3 Wind Farm in two separate tan coloured parcels.

CDPL is currently applying to the NSW Department of Planning for approval of the project. Having recently received the Director General's Requirements following consideration of a Preliminary Environmental Assessment, CDPL is undertaking stakeholder engagement and consultation activities in order to understand and address concerns to inform a final design which will be included in the final Environmental Assessment (EA). Once lodged, the EA will be assessed by the Department of Planning. This assessment will include a period of public exhibition where interested stakeholders will be invited to make a submission to the Department about the project.

The wind farm is proposed to comprise between 25 – 35 individual wind turbines standing up to 152 m at the the top of the blade tip.

A final layout and individual turbine coordinates will be provided when finalised during the current investigation phase of the approvals process.

On behalf of CDPL, Aviation Projects seeks the Upper Lachlan Shire Council's position in relation to the proposed development, with specific reference to the following aviation-related issues:

1. Potential impacts on aviation safety considering:
 - a. nearby aerodromes and aircraft landing areas;
 - b. defined air traffic routes;
 - c. aircraft operating heights;
 - d. radar interference;
 - e. communication systems; and

AVIATION PROJECTS Pty Ltd / ABN 88 127 760 267

Mobile 0417 631 681 / Phone 07 3117 9608 / Fax 07 3374 3562

Street 2/43 Upper Brookfield Road, Brookfield Qld 4069

Web www.aviationprojects.com.au

- f. navigation aids;
- 2. Potential hazards and risks associated with electric and magnetic fields; and
- 3. Marking and lighting of wind farms.

Further information on the proposal is available on the project website:

http://www.unionfenosa.com.au/project_cw3.htm

If you require clarification on the contents of this correspondence, please contact the undersigned direct on on 0417 631 681 or via email ktonkin@aviationprojects.com.au.

Yours sincerely,



Keith Tonkin
Managing Director

Enclosure: Location Plan Crookwell 3 Wind Farm



Fig 1

PROJ: 390447.PDS(A3) REV: 00 SHEET: 04 OF 11 DATE: 21/12/2005

LOCATION PLAN

0 1000 2000 5000

23
SCALE 1:10000

330kV Transmission Line

CROOKWELL 3 WIND FARM



ABN 81 011 241 552

Upper Lachlan Shire Council

All correspondence addressed to the General Manager, PO Box 42, Gunning NSW 2581

Crookwell Office: 44 Spring Street, Crookwell NSW 2583

p: 02 4830 1000 | f: 02 4832 2066 | e: council@upperlachlan.nsw.gov.au | www.upperlachlan.local-e.nsw.gov.au

Gunning Office: 123 Yass Street, Gunning NSW 2581

p: 02 4845 4100 | f: 02 4845 1426 | e: council@upperlachlan.nsw.gov.au

Taralga Office: Taralga Community Service Centre, Orchard Street, Taralga NSW 2580

p: 02 4840 2099 | f: 4840 2296 | e: taralgacsc@ceinternet.com.au

Please quote when responding: 6.1.6

7 June 2010

Mr Keith Tonkin
Managing Director
Aviation Projects Pty Ltd
2/43 Upper Brookfield Road
BROOKFIELD QLD 4069

Dear Mr Tonkin

**Re: Proposed Crookwell 3 Wind Farm
Aviation Issues**

I refer to your letter dated 1 June 2010 regarding the above matter and advise that any aviation issues related to wind farms should be directed to the Civil Aviation and Safety Authority.

Please contact me on 48301000 if you require any additional information or clarification.

Yours faithfully

Robert Mowle
Director of Environment and Planning
For
General Manager
Upper Lachlan Shire Council

Keith Tonkin

From: Keith Tonkin [ktonkin@aviationprojects.com.au]
Sent: Monday, 7 June 2010 11:13 AM
To: 'ian.aldridge@goulburn.nsw.gov.au'
Cc: 'Shaq Mohajerani'; 'Cathy Pak-Poy'; 'John McCarthy'; 'Mike Gahan'; 'Michael Sullivan'
Subject: Crookwell 3 Wind Farm - request for consideration of potential aviation impacts - Goulburn Airport
Attachments: 20091222 - Crookwell 3, Location Plan.pdf; 1005-Crookwell3WFNSW-AeroImpactAnalysis-Report_v1.0-FINAL.PDF; Crookwell3-Turbines+Masts_WGSLatLong_FINAL-20100603__DISTRIB.XLS; Crookwell 3 Letter to Goulburn Mulwaree Council 100607.pdf

Dear Ian,

Find attached a request for consideration of the potential impacts of the proposed Crookwell 3 Wind Farm.

Attachments:

1. Letter to Goulburn Mulwaree Council
2. Location Plan Crookwell 3 Wind Farm
3. Aeronautical Impact Assessment (PANS-OPS and OLS): Crookwell 3 Wind Farm
4. Turbine locations and AHD data

Best regards,
Keith Tonkin MBA (Aviation Management), CPRM
Managing Director



AVIATION PROJECTS Pty Ltd / ABN 88 127 760 267

Mobile 0417 631 681 / Phone 07 3117 9608 / Fax 07 3374 3562

Street 2/43 Upper Brookfield Road, Brookfield Qld 4069

Web www.aviationprojects.com.au

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 **AVIATION PROJECTS**

7 June 2010

Ian Aldridge
Manager Engineering Development
Goulburn Mulwaree Council
Locked Bag 22
GOULBURN NSW 2580

By email: ian.aldridge@goulburn.nsw.gov.au

Dear Ian,

Proposed Crookwell 3 Wind Farm – Aviation issues

Crookwell Development Pty Ltd (CDPL) is part of an international energy group proposing to develop a new wind farm in the Crookwell region of NSW, and seeks to inform Goulburn Mulwaree Council as owner of Goulburn Airport of the proposal for the purpose of seeking feedback on a number of important issues.

The project area consists of approximately 1500 hectares in two separate parcels, east and south of the approved Crookwell 2 Wind Farm. These two parcels are referred to as Crookwell 3 East and Crookwell 3 South. The **attached** Location Plan shows the proposed Crookwell 3 Wind Farm in two separate tan coloured parcels.

CDPL is currently applying to the NSW Department of Planning for approval of the project. Having recently received the Director General's Requirements following consideration of a Preliminary Environmental Assessment, CDPL is undertaking stakeholder engagement and consultation activities in order to understand and address concerns to inform a final design which will be included in the final Environmental Assessment (EA). Once lodged, the EA will be assessed by the Department of Planning. This assessment will include a period of public exhibition where interested stakeholders will be invited to make a submission to the Department about the project.

The wind farm is proposed to comprise between 25 – 35 individual wind turbines standing up to 152 m at the the top of the blade tip.

Current turbine locations and AHD data are provided in the **attached** spreadsheet.

The locations of turbines in Crookwell 2 Wind Farm, which has been approved by the Minister for Planning, and the locations of four wind monitoring masts (located in Crookwell 2 and 3 Wind Farms as indicated) are also provided in the enclosed spreadsheet for information. The location of Crookwell 2 Wind Farm is shown in green outline on the enclosed Location Plan.

AVIATION PROJECTS Pty Ltd / ABN 88 127 760 267

Mobile 0417 631 681 / **Phone** 07 3117 9608 / **Fax** 07 3374 3562

Street 2/43 Upper Brookfield Road, Brookfield Qld 4069

Web www.aviationprojects.com.au

On behalf of CDPL, Aviation Projects seeks Airservices Australia's position in relation to the proposed development, with specific reference to the following issues as required by the Director General of Planning's Requirements:

1. Potential impacts on aviation safety considering:
 - a. nearby aerodromes and aircraft landing areas;
 - b. defined air traffic routes;
 - c. aircraft operating heights;
 - d. radar interference;
 - e. communication systems; and
 - f. navigation aids;
2. Potential hazards and risks associated with electric and magnetic fields; and
3. Marking and lighting of wind farms.

To assist with Airservices Australia's deliberations, a preliminary assessment of the PANS-OPS and obstacle limitation surfaces potentially affected by the proposed wind farm has been prepared. Find **attached** a report prepared by Strategic Airspace which concludes that there will be no impediment to the height approval of the development of the site as proposed, and the proposed wind farm is not likely to impact air traffic radar effectiveness, minimum enroute and minimum vector altitudes or future aeronautical developments at Goulburn Airport.

Further information on the proposal is available on the project website:

http://www.unionfenosa.com.au/project_cw3.htm

If you require clarification on the contents of this correspondence, please contact the undersigned direct on on 0417 631 681 or via email ktonkin@aviationprojects.com.au.

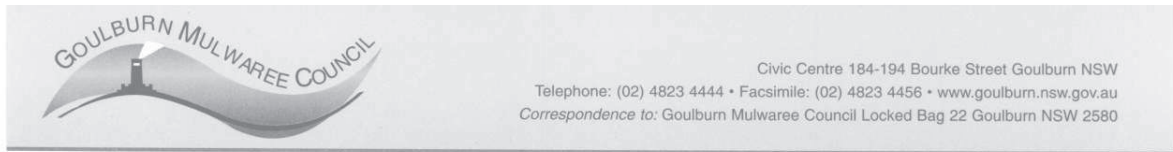
Yours sincerely,



Keith Tonkin
Managing Director

Attachments:

1. Location Plan Crookwell 3 Wind Farm
2. Aeronautical Impact Assessment (PANS-OPS and OLS): Crookwell 3 Wind Farm
3. Turbine locations and AHD data



Contact: Ian Aldridge

Reference: IA:WAN 642584

1 July 2010

Mr Keith Tonkin
Managing Director
Aviation Projects
2/43 Upper Brookfield Road
BROOKFIELD QLD 4069

Dear Sir

Subject: Proposed Crookwell 3 Wind Farm – Aviation Issues

Thank you for your letter dated 7 June 2010 regarding a new wind farm in the Crookwell area.

Goulburn Mulwaree Council concurs with the report by Strategic Airspace that there will be no impact by the proposed windfarm on Goulburn Airport.

If you require any further information regarding the above please contact me during office hours on 4823 4538.

Yours faithfully



Ian Aldridge
Manager Engineering Development

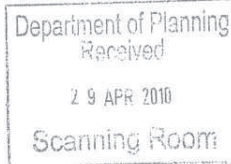


Australian Government
Department of Defence
Defence Support Group



2004/1044160/4
LPSI/OUT/2010/44

Mr Neville Osborne
Manager - Water and Energy
Infrastructure Projects
GPO Box 39
SYDNEY, NSW, 2001



Dear Sir

**RE: REQUEST FOR ENVIRONMENTAL ASSESSMENT REQUIREMENTS -
CROOKWELL 3 WIND FARM (Your ref: 10/01492-1)**

Thank you for referring the abovementioned wind energy project to the Department of Defence (Defence) for comment. Defence understands that this project will be located near the existing Crookwell 1 and the approved Crookwell 2 wind farms. Defence further understands that the wind farm application will consist of a total of 24 wind turbines (of up to 152 m in height above ground level to blade tip zenith). Wind monitoring masts and electrical works typically associated with a wind farm (such as power lines, an electrical substation) will also be constructed.

Defence has assessed the proposal with respect to any impact on the safety of military flying operations and possible interference to Defence communications and radars. Defence can advise that it has no concerns with the Crookwell 3 Wind Farm at this time and therefore does not have any additional Environmental Assessment Requirements to recommend.

Should you wish to discuss the content of this advice further, please contact Brenin Presswell, Executive Officer, Land Planning on (02) 6266 8138 or by email at brenin.presswell@defence.gov.au.

Yours sincerely

John Kerwan
Director Land Planning & Spatial Information
Department of Defence
BP3-1-A052
Brindabella Park
Canberra ACT 2600

15 April 2010

Cc. RD DSO - SNSW
CASA
RAAF AIS



27 April 2010

Director
Land Planning and Spatial Information
Estate Planning Branch
Brindabella Business Park BP3-1-B110
Department of Defence
CANBERRA ACT 2600

Dear Sir,

Proposed Crookwell 3 Wind Farm – Aviation issues

Crookwell Development Pty Ltd (CDPL) is part of an international energy group proposing to develop a new wind farm in the Crookwell region of NSW, and seeks to inform the Civil Aviation Safety Authority of the proposal for the purpose of seeking feedback on a number of important issues.

The project area consists of approximately 1500 hectares in two separate parcels, east and south of the approved Crookwell 2 Wind Farm. These two parcels are referred to as Crookwell 3 East and Crookwell 3 South. The enclosed Location Plan shows the proposed Crookwell 3 Wind Farm in two separate tan coloured parcels.

CDPL is currently applying to the NSW Department of Planning for approval of the project. Having recently received the Director General's Requirements following consideration of a Preliminary Environmental Assessment, CDPL is undertaking stakeholder engagement and consultation activities in order to understand and address concerns to inform a final design which will be included in the final Environmental Assessment (EA). Once lodged, the EA will be assessed by the Department of Planning. This assessment will include a period of public exhibition where interested stakeholders will be invited to make a submission to the Department about the project.

The wind farm is proposed to comprise between 25 – 35 individual wind turbines standing up to 152 m at the the top of the blade tip.

A final layout and individual turbine coordinates will be provided when finalised during the current investigation phase of the approvals process.

On behalf of CDPL, Aviation Projects seeks the Department of Defence's position in relation to the proposed development, with specific reference to the following issues:

1. Potential impacts on aviation safety considering:
 - a. nearby aerodromes and aircraft landing areas;
 - b. defined air traffic routes;
 - c. aircraft operating heights;
 - d. radar interference;

AVIATION PROJECTS Pty Ltd / ABN 88 127 760 267

Mobile 0417 631 681 / Phone 07 3117 9608 / Fax 07 3374 3562

Street 2/43 Upper Brookfield Road, Brookfield Qld 4069

Web www.aviationprojects.com.au

- e. communication systems; and
 - f. navigation aids;
2. Potential hazards and risks associated with electric and magnetic fields; and
 3. Marking and lighting of wind farms.

Further information on the proposal is available on the project website:

http://www.unionfenosa.com.au/project_cw3.htm

If you require clarification on the contents of this correspondence, please contact the undersigned direct on on 0417 631 681 or via email ktonkin@aviationprojects.com.au.

Yours sincerely,



Keith Tonkin
Managing Director

Enclosure: Location Plan Crookwell 3 Wind Farm



Australian Government
Department of Defence
Defence Support Group

2004/1044160/4
LPSI/OUT/2010/59

Mr Keith Tonkin
Managing Director
Aviation Projects Pty Ltd
2/43 Upper Brookfield Road
BROOKFIELD, QLD, 4069

Dear Sir

RE: PROPOSED CROOKWELL 3 WIND FARM - AVIATION ISSUES

Thank you for referring the abovementioned wind energy project to the Department of Defence (Defence) for comment. Defence understands that you are seeking information about potential aviation issues.

Defence has recently reviewed this wind farm project and provided the NSW Department of Planning with a letter advising that Defence has no additional requirements for the Director General to consider. This letter was based on information advising Defence that up to 35 turbines would be constructed.

In relation to your specific queries, Defence has assessed the potential risks and hazards posed and is pleased to advise that it has no objection to the Crookwell 3 wind farm. However, Defence has the following comment and request:

Tall structures such as wind monitoring masts present a potential danger to low-flying aircraft. As such, there is an ongoing need to obtain and maintain accurate information about tall structures so that risks associated with inadvertent collision by low flying aircraft can be reduced. The RAAF Aeronautical Information Service (RAAF AIS) in Melbourne is responsible for recording the location and height of tall structures. The information is held in a central database managed by RAAF AIS and relates to the erection, extension or dismantling of tall structures the top measurement of which is:

- a. 30 metres or more above ground level - within 30 kilometres of an aerodrome,
- or
- b. 45 metres or more above ground level elsewhere.

The proposed wind monitoring mast will meet the above definition of tall structure. The Department of Defence requests that you advise the proponent that they should provide RAAF AIS with "as constructed" details so that the mast can be appropriately shown on aviation charts. RAAF AIS has a web site with a Vertical Obstruction Report

Defending Australia and its National Interests

Form at www.raafais.gov.au/obstr_form.htm which can be used to enter the location and height details of tall structures.

Should you wish to discuss the content of this advice further, please contact Brenin Presswell, Executive Officer, Land Planning on (02) 6266 8138 or by email at brenin.presswell@defence.gov.au.

Yours sincerely



John Kerwan
Director Land Planning & Spatial Information
Department of Defence
BP3-1-A052
Brindabella Park
Canberra ACT 2600

4 May 2010

Cc. RD DSO - SNSW
CASA
RAAF AIS



27 April 2010

Mr Peter Cromarty
Executive Manager
Airspace and Aerodrome Regulation
Civil Aviation Safety Authority
PO Box 2005
CANBERRA ACT 2601

Dear Mr Cromarty,

Proposed Crookwell 3 Wind Farm – Aviation issues

Crookwell Development Pty Ltd (CDPL) is part of an international energy group proposing to develop a new wind farm in the Crookwell region of NSW, and seeks to inform the Civil Aviation Safety Authority of the proposal for the purpose of seeking feedback on a number of important issues.

The project area consists of approximately 1500 hectares in two separate parcels, south and east of the approved Crookwell 2 Wind Farm. These two parcels are referred to as Crookwell 3 East and Crookwell 3 South. The **enclosed** Location Plan shows the proposed Crookwell 3 Wind Farm in two separate tan coloured parcels.

CDPL is currently applying to the NSW Department of Planning for approval of the project. Having recently received the Director General's Requirements following consideration of a Preliminary Environmental Assessment, CDPL is undertaking stakeholder engagement and consultation activities in order to understand and address concerns to inform a final design which will be included in the final Environmental Assessment (EA). Once lodged, the EA will be assessed by the Department of Planning. This assessment will include a period of public exhibition where interested stakeholders will be invited to make a submission to the Department about the project.

The wind farm is proposed to comprise between 25 – 35 individual wind turbines standing up to 152 m at the the top of the blade tip.

A final layout and individual turbine coordinates will be provided when finalised during the current investigation phase of the approvals process.

On behalf of CDPL, Aviation Projects seeks CASA's position in relation to the following issues:

1. Potential impacts on aviation safety considering:
 - a. nearby aerodromes and aircraft landing areas;
 - b. defined air traffic routes;
 - c. aircraft operating heights;
 - d. radar interference;

AVIATION PROJECTS Pty Ltd / ABN 88 127 760 267

Mobile 0417 631 681 / Phone 07 3117 9608 / Fax 07 3374 3562

Street 2/43 Upper Brookfield Road, Brookfield Qld 4069

Web www.aviationprojects.com.au

- e. communication systems; and
 - f. navigation aids;
2. The impact of the turbines on the safe and efficient aerial application of agricultural fertilisers and pesticides in the vicinity of the turbines;
 3. Potential hazards and risks associated with electric and magnetic fields; and
 4. Marking and lighting of wind farms.

Further information on the proposal is available on the project website:

http://unionfenosa.com.au/project_cw3.htm

If you require clarification on the contents of this correspondence, please contact the undersigned direct on on 0417 631 681 or via email ktonkin@aviationprojects.com.au.

Yours sincerely,



Keith Tonkin
Managing Director

Enclosure: Location Plan Crookwell 3 Wind Farm



Australian Government
Civil Aviation Safety Authority

AIRSPACE AND AERODROME REGULATION

TRIM Ref: ED10/97053, File 06/7359

6 May 2010

Mr Keith Tonkin
Managing Director
Aviation Projects Pty Ltd
2/43 Upper Brookfield Rd
BROOKFIELD QLD 4069

Dear Mr Tonkin

Windfarm development proposal at Crookwell

I refer to your letter dated 27 April 2010 in which you sought CASA comment on this proposal. While CASA has no specific authority to direct action relating to structures away from aerodromes, I suggest you should undertake the following consultation to assess the potential hazard posed to aviation by the proposed development.

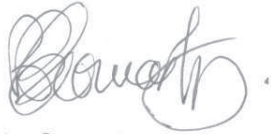
1. Identify any aerodrome within 30km of the boundaries of the aerodrome and consult with the operators to determine any impact on Obstacle Limitation Surfaces at such aerodromes. Penetration of these surfaces is likely to pose a hazard to normal aviation operations at the aerodrome.
2. Consult with Airservices Australia (02 6268 4111 Mr Richard Dudley) to have them assess any potential impact on instrument approach procedures at aerodromes, navigation aids, communications facilities or surveillance facilities.
3. Contact the Aerial Agriculture Association of Australia (02 6241 2100 – Mr Phil Hurst) to advise him of the proposal and gain comment on potential hazards to aerial application operations in the area.
4. Since the maximum height of the turbines is 152m, they are coincident with the base of navigable airspace and hence are a potential hazard to aircraft operating at legal altitudes, particularly under conditions of low light. As a consequence it is recommended that you consider your duty of care in deciding whether or not the windfarm should be lit.

GPO Box 2005 Canberra ACT 2601 Telephone 131 757
Canberra, Brisbane, Darwin, Cairns, Townsville, Tamworth, Bankstown, Mascot, Moorabbin, Melbourne, Adelaide, Perth

5. The location, extent and height of the windfarm is to be advised to:

Aeronautical Data Officer
RAAF AIS (VBM-M2)
Victoria Barracks
St Kilda Road Southbank Vic 3006
Tel: (03) 9282-6400
Fax: (03) 9282-6695
Email: ais.charting@defence.gov.au

Yours sincerely



Peter Cromarty
Executive Manager
Airspace and Aerodrome Regulation

Keith Tonkin

From: Keith Tonkin [ktonkin@aviationprojects.com.au]
Sent: Friday, 4 June 2010 1:06 PM
To: 'mitchell.sloan@airservicesaustralia.com'
Subject: Crookwell 3 Wind Farm - request for assessment of aviation impacts Part 1 of 2
Attachments: 1005-Crookwell3WFNSW-AeroImpactAnalysis-Report_v1.0-FINAL.PDF; Crookwell3-Turbines+Masts_WGSLatLong_FINAL-20100603__DISTRIB.XLS; Crookwell 3 Letter to AsA 100604.pdf

Dear Mitchell,

Find attached a request for an assessment of the proposed Crookwell 3 Wind Farm.

Attachments:

1. Location Plan Crookwell 3 Wind Farm (in Part 2 of 2)
2. Aeronautical Impact Assessment (PANS-OPS and OLS): Crookwell 3 Wind Farm
3. Turbine locations and AHD data

Best regards,
Keith Tonkin MBA (Aviation Management), CPRM
Managing Director



AVIATION PROJECTS Pty Ltd / ABN 88 127 760 267

Mobile 0417 631 681 / Phone 07 3117 9608 / Fax 07 3374 3562

Street 2/43 Upper Brookfield Road, Brookfield Qld 4069

Web www.aviationprojects.com.au

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We cannot accept liability for any loss or damage caused by software viruses.

Keith Tonkin

From: Keith Tonkin [ktonkin@aviationprojects.com.au]
Sent: Friday, 4 June 2010 1:52 PM
To: 'mitchell.sloan@airservicesaustralia.com'
Subject: Crookwell 3 Wind Farm - request for assessment of aviation impacts Part 2 of 2
Attachments: 20091222 - Crookwell 3, Location Plan.pdf

Dear Mitchell,

Find attached a request for an assessment of the proposed Crookwell 3 Wind Farm.

Attachments:

1. Location Plan Crookwell 3 Wind Farm (in Part 2 of 2)
2. Aeronautical Impact Assessment (PANS-OPS and OLS): Crookwell 3 Wind Farm
3. Turbine locations and AHD data

Best regards,
Keith Tonkin MBA (Aviation Management), CPRM
Managing Director



AVIATION PROJECTS Pty Ltd / ABN 88 127 760 267

Mobile 0417 631 681 / Phone 07 3117 9608 / Fax 07 3374 3562

Street 2/43 Upper Brookfield Road, Brookfield Qld 4069

Web www.aviationprojects.com.au

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 **AVIATION PROJECTS**

4 June 2010

Mitchell Sloan
Senior Adviser
Airport Relations NSW
Airservices Australia
GPO Box 367
CANBERRA ACT 2600

By email: mitchell.sloan@airservicesaustralia.com

Dear Mitchell,

Proposed Crookwell 3 Wind Farm – Aviation issues

Crookwell Development Pty Ltd (CDPL) is part of an international energy group proposing to develop a new wind farm in the Crookwell region of NSW, and seeks to inform Airservices Australia of the proposal for the purpose of seeking feedback on a number of important issues.

The project area consists of approximately 1500 hectares in two separate parcels, east and south of the approved Crookwell 2 Wind Farm. These two parcels are referred to as Crookwell 3 East and Crookwell 3 South. The **attached** Location Plan shows the proposed Crookwell 3 Wind Farm in two separate tan coloured parcels.

CDPL is currently applying to the NSW Department of Planning for approval of the project. Having recently received the Director General's Requirements following consideration of a Preliminary Environmental Assessment, CDPL is undertaking stakeholder engagement and consultation activities in order to understand and address concerns to inform a final design which will be included in the final Environmental Assessment (EA). Once lodged, the EA will be assessed by the Department of Planning. This assessment will include a period of public exhibition where interested stakeholders will be invited to make a submission to the Department about the project.

The wind farm is proposed to comprise between 25 – 35 individual wind turbines standing up to 152 m at the the top of the blade tip.

Current turbine locations and AHD data are provided in the **attached** spreadsheet.

The locations of turbines in Crookwell 2 Wind Farm, which has been approved by the Minister for Planning, and the locations of four wind monitoring masts (located in Crookwell 2 and 3 Wind Farms as indicated) are also provided in the enclosed spreadsheet for consideration of cumulative impacts. The location of Crookwell 2 Wind Farm is shown in green outline on the enclosed Location Plan.

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On behalf of CDPL, Aviation Projects seeks Goulburn Mulwaree Council's position in relation to the proposed development, with specific reference to the following issues as required by the Director General of Planning's Requirements:

1. Potential impacts on aviation safety considering:
 - a. nearby aerodromes and aircraft landing areas;
 - b. defined air traffic routes;
 - c. aircraft operating heights;
 - d. radar interference;
 - e. communication systems; and
 - f. navigation aids;
2. Potential hazards and risks associated with electric and magnetic fields; and
3. Marking and lighting of wind farms.

To assist with Airservices Australia's deliberations, a preliminary assessment of the PANS-OPS and obstacle limitation surfaces potentially affected by the proposed wind farm has been prepared. Find **attached** a report prepared by Strategic Airspace which concludes that there will be no impediment to the height approval of the development of the site as proposed, and the proposed wind farm is not likely to impact air traffic radar effectiveness, minimum enroute and minimum vector altitudes or future aeronautical developments at Goulburn Airport.

Further information on the proposal is available on the project website:

http://www.unionfenosa.com.au/project_cw3.htm

If you require clarification on the contents of this correspondence, please contact the undersigned direct on on 0417 631 681 or via email ktonkin@aviationprojects.com.au.

Yours sincerely,



Keith Tonkin
Managing Director

Attachments:

1. Location Plan Crookwell 3 Wind Farm
2. Aeronautical Impact Assessment (PANS-OPS and OLS): Crookwell 3 Wind Farm
3. Turbine locations and AHD data

Keith Tonkin

From: Tattam, Steve [steve.tattam@AirservicesAustralia.com]
Sent: Friday, 2 July 2010 3:15 PM
To: Keith Tonkin
Cc: Sloan, Mitchell
Subject: RE: Crookwell 3 Wind Farm - request for assessment of aviation impacts Part 2 of 2

Dear Keith,

This proposed wind farm will not impact the performance of Precision/Non-Precision Nav Aids, HF/VHF Comms, A-SMGCS, Radar, PRM or Satellite/Links.

At a maximum height of 1085m (3560ft) AHD, the proposed Wind Farm will affect the W10 air route to the north of Goulburn. Lowest Safe Altitude procedures are penetrated by 60ft and will be adjusted accordingly (minor adjustment).

At a maximum height of 1085m (3560ft) AHD, the proposed Wind Farm will not affect any sector or circling, nor any approach or departure from Goulburn airport.

Regards,

Steve Tattam

Senior Advisor
Airport Relations/Industry Relations
Corporate & International Affairs
Airservices Australia

Secretariat to ASTRA - <http://www.astra.aero/>

Ph: 02 6268 4891
Mob: 0402 776 524
Email: steve.tattam@airservicesaustralia.com

25 Constitution Avenue, Canberra, ACT, 2600

<http://www.airservicesaustralia.com>

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From: Keith Tonkin [mailto:ktonkin@aviationprojects.com.au]
Sent: Tuesday, 29 June 2010 9:47 AM
To: Tattam, Steve
Subject: FW: Crookwell 3 Wind Farm - request for assessment of aviation impacts Part 2 of 2

Hi Steve,

Find attached the location plan for the proposed Crookwell 3 Wind Farm.

Best regards,
Keith Tonkin MBA (Aviation Management), CPRM
Managing Director



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Street 2/43 Upper Brookfield Road, Brookfield Qld 4069

Web www.aviationprojects.com.au

From: Keith Tonkin [mailto:ktonkin@aviationprojects.com.au]
Sent: Friday, 4 June 2010 1:52 PM
To: 'mitchell.sloan@airservicesaustralia.com'
Subject: Crookwell 3 Wind Farm - request for assessment of aviation impacts Part 2 of 2

Dear Mitchell,

Find attached a request for an assessment of the proposed Crookwell 3 Wind Farm.

Attachments:

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Best regards,
Keith Tonkin MBA (Aviation Management), CPRM
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Annexure 6 – Curriculum Vitae

Keith Tonkin

1. Keith Tonkin is Managing Director of Aviation Projects Pty Ltd. In addition to over 20 years of flying experience in the military flying transport and fast jet aircraft, he has operated jet airliners on international and domestic routes and flown various general aviation aircraft.
2. Qualifications:
 - Master of Business Administration (Aviation Management);
 - Bachelor of Science;
 - Advanced Diploma of Aviation (Military Pilot);
 - Certified Practising Risk Manager; and
 - Air Transport Pilot.
3. Affiliations:
 - Corporate Member, Australian Airports Association;
 - Member, Aviation Law Association of Australia and New Zealand; and
 - Associate Fellow, Risk Management Institution of Australasia.

Michael Sullivan

4. Michael Sullivan has over 20 years operational flying and instructional experience in military fast jet and training aircraft as well as in jet airliners on international and domestic routes and various general aviation aircraft.
5. Qualifications:
 - Master of Aviation (Human Factors);
 - Bachelor of Science;
 - Air Transport Pilot;
 - Grade 2 instructor rating; and
 - Low level aerobatics endorsement.

Michael Gahan

6. Mike Gahan has over 40 years experience in the sphere of air traffic management, and applies this extensive experience to advanced technology air traffic systems, airspace management, training design and management and co-ordination of joint international aviation policy and procedures.
7. Qualifications:
 - Graduate – RAAF Command and Staff College;

- Air Traffic Control (ICAO) Licence RAAF 020;
- Graduate Diploma in Management Studies; and
- Advanced Diploma of Aviation (Air Traffic Services).

8. Affiliations:

- Director (Asia Pacific)– Air Traffic Control Association (US);
- Associate Member – Guild of Air Traffic Control Officers (UK); and
- Member – Australian Institute of Management.

Cathy Pak Poy

9. As joint Chief Executive Officer of Strategic Airspace, Cathy has approximately 20 years experience with PANS-OPS procedure design criteria and its application in Australia under Manual of Standards Part 173 as well as ICAO Annex 14 and obstacle limitation surfaces under Manual of Standards Part 139.

10. Qualifications:

- Master of Business Administration (Technology Management); and
- qualified to undertake RNP-AR procedure design.

11. Affiliations:

- Advisor to the Australian Member of the ICAO Instrument Flight Procedures Panel (which develops and maintains the PANS-OPS standard) since 2003.