FINAL REPORT

RYE PARK WIND FARM

AEROPLANE LANDING AREA ASSESSMENT

J0438

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Report to:

Trustpower Australia Holdings Pty. Ltd.

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EXECUTIVE SUMMARY

The Ambidji Group has undertaken an investigation and analysis of unregistered aerodromes/airstrips, known as Aeroplane Landing Areas (ALA) within the vicinity of the Rye Park Wind Farm for Trustpower Australia. This work was brought about, in part by recommendations made by the New South Wales Department of Planning and Environment in the Secretary's decision to disallow the development of the Yass Valley Wind Farm. In this decision a recommendation was made to the effect that "*all identifiable unregistered aerodromes/airstrips within 55.6km of the wind farm boundary be identified; all known and usable airstrips within 10km of the boundary be identified; the nature of flying activities at all identified aerodromes and airstrips be listed and following the collation of the above information, a review of the potential impacts on these airstrips be undertaken*."

The use of a place for the landing and taking-off of an aeroplane is governed by Civil Aviation Regulation 92 which places the onus on the pilot to ensure that the place is suitable for the proposed aircraft operation. This applies equally to large passenger aircraft landing at Canberra International airport and light aircraft landing at an unmade airstrip on a farm.

Aerodromes in Australia are classified as certified, registered, military (including Joint user) or Aeroplane Landing Areas (ALA). Certified, registered and military aerodromes are regulated and information about them is held in the public domain within the Aeronautical Information Publication (AIP) published by Airservices Australia on behalf of the Civil Aviation Safety Authority (CASA) as part of Australia's obligations to the International Civil Aviation Organisation (ICAO). ALA are not required to be notified to authorities, so any information regarding them is not required to be held in the public domain. To this end ALA are no longer required to be shown on aeronautical charts or be listed in the AIP.

The survey maps produced by NATMAP on behalf of Geoscience Australia for the area surrounding the Rye Park Wind Farm (RPWF) are based on survey data ranging in age from 1974 to 2003 and carry a disclaimer that "*This map was not field checked and some information may be inaccurate."* Whilst some of these maps show airstrips and aerodromes their position does not always correlate with current known information. Airstrips, particularly grass strips in paddocks do not show up on satellite based mapping services such as *Google Earth.* This makes identifying airstrips difficult in the extreme.

From information provided by Trustpower it was possible to identify fifteen airstrips within the area of the Rye Park Wind Farm. Of these fifteen, eleven owners were contacted and freely provided information regarding the nature and use of their ALA. Four of the owners advised they no longer have an ALA. The information provided showed that the majority of airstrips were used infrequently for two to four days per year, but not every year, for aerial agricultural applications operations. Three of the ALA owners indicated that their airstrips were fenced off, graded and available for use all year. The rest of the ALA were in paddocks normally used for grazing and available for aircraft use only after removing the animals and inspecting and mowing the strip to be used.

Of the seven usable ALA only one could be considered to be adversely impacted by the construction of the Rye Park Wind Farm.

1. INTRODUCTION

The Ambidji Group Pty Ltd (Ambidji) has been commissioned by Trustpower Holdings Australia Pty Ltd (Trustpower) to undertake an assessment of the Aeroplane Landing Areas (ALA) within and abutting the proposed Rye Park Wind Farm (RPWF). The purpose of this assessment is to address the comments concerning aviation activity at unregistered and non-certified aerodromes and airstrips made in the NSW Government Planning and Environment, Secretary's Environmental Assessment Report January 2015, for the Yass Valley Wind Farm (SSD08_0246).

The Rye Park Wind Farm was originally owned by Epuron Pty Ltd. Ambidji undertook an Aeronautical Impact Assessment, a Qualitative Risk Assessment and produced an Aviation Impact Statement of the RPWF for Epuron in January 2014. Trustpower now owns the RPWF and has commissioned Ambidji to undertake further aviation assessment work.

1.1 Rye Park Wind Farm

The wind farm layout proposes 109 wind turbines with a maximum height of 157m (515ft) above ground level (AGL). Epuron, the previous owner of RPWF, advised that the highest ground elevation within the proposed site is 770m (2526ft) above mean sea level (AMSL). This gives a maximum turbine tip height of 927m (3042ft) AMSL at turbines RYP_139 and RYP_50.

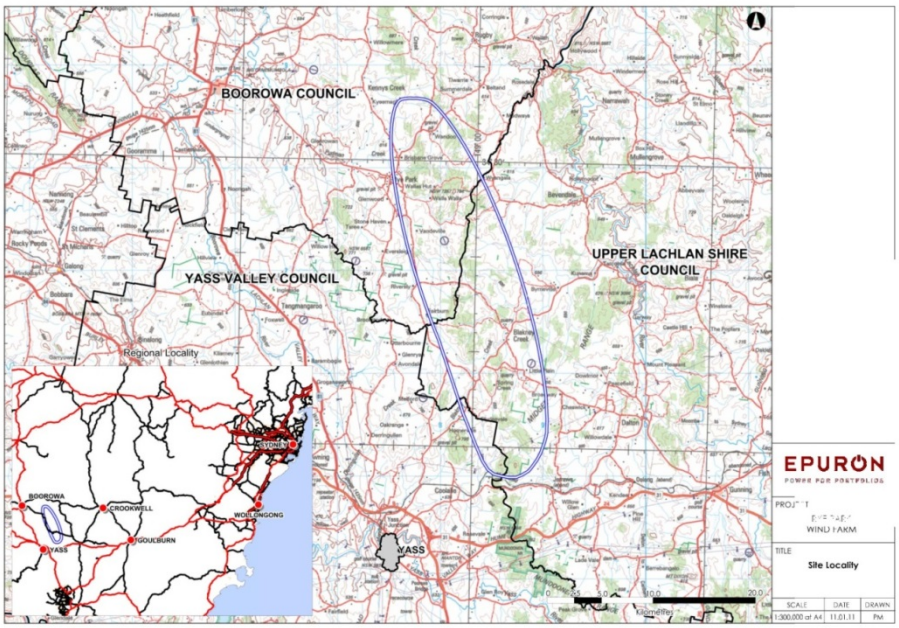

Figure 1.1 – Location of Rye Park Wind Farm

The wind farm layout, turbine tip heights and Figure 1.1 were originally supplied to Ambidji by Epuron and are taken from the Ambidji report *Rye Park Wind Farm Aeronautical Impact Assessment, Aviation Impact Statement and Qualitative Risk Assessment; The Ambidji Group, 16 January 2014.*

1.2 NSW Planning and Environment – Yass Valley Wind Farm Assessment

In January 2015 NSW Planning and Environment refused permission for the development of the Yass Valley Wind Farm. The reasons for refusing the application are contained in the *State Significant Development Assessment: Yass Valley Wind Farm (SSD08_0246) Secretary's Environmental Assessment Report, Section 79C of the Environmental Planning and Assessment Act 1979*[1] report.

To further inform their decision NSW Planning and Environment engaged an independent expert:

> "- to review the Applicant's aeronautical/aviation impact assessment, with the intent of identifying any gaps within the Applicant's assessment and whether it accords with all relevant guidelines and industry standards."

This review was conducted by *The Airport Group* from Brisbane who delivered their report, *Final Report – Peer Review of Aviation Impact Assessments and Consultation*[2] to the Department in September 2014. This report is attached to the Secretary's Report as Appendix H Aviation Review.

The Secretary's Report, at page 21, states:

> "The Review highlighted that the Applicant's impact studies did not accurately identify and assess the impacts on surrounding airstrips, and that in its view, some airstrips in the area will be affected. In this respect the review recommends that:
>
> - All identifiable unregistered aerodromes/airstrips within 55.6km from the perimeter of the proposed wind farm be identified;
> - All known and usable airstrips within 10km from the perimeter of the proposed wind farm be identified;
> - The nature of flying activities at all identified aerodromes and airstrips be listed; and
> - Following the collation of the above information, a review of the potential impacts on these airstrips is undertaken."

[1] http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6698 as at April 2015
[2] http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=2765 as at April 2015

1.3 Aerodromes and Airstrips

Aerodromes and airstrips fall into four categories:

- Military or Joint (combined military and civilian);
- Certified;
- Registered; and
- Uncertified or Aeroplane Landing Areas

A Military aerodrome is operated by the Department of Defence and is suitable for the operation of military aircraft. A Joint User aerodrome is a Military aerodrome used by both military and civilian aircraft, for example Darwin International and Townsville International Airports.

A Certified Aerodrome, certified under Civil Aviation Safety Regulation (CASR) 139.040, is available for Regular Public Transport and Charter operations and has a runway suitable for use by an aircraft having a maximum carrying capacity of more than 3,400kg or a passenger seating capacity of more than 30 seats.

A Registered Aerodrome, registered under CASR 139.260, is one to which CASR 139.040 does not apply and the operator has applied to the Civil Aviation Safety Authority (CASA) to have it registered.

An Uncertified Aerodrome is any other aerodrome or airstrip and is generally referred to as an Aeroplane Landing Area (ALA). These range in capability and size from having a sealed runway with lighting capable of accommodating corporate jet aircraft to a grass paddock that is smooth enough to land a single engine light aircraft or a purpose built aerial agricultural aircraft.

Military, Certified and Registered aerodromes are listed in the Aeronautical Information Publication[3] (AIP) and are subject to a NOTAM[4] service that provides the aviation industry with current information on the status of the aerodrome facilities. This information is held in the public domain, is available through aeronautical publications and charts and is kept current by mandatory reporting requirements.

Uncertified aerodromes and ALA are not required to be listed in the AIP so information about them is not held in the public domain, is not available through aeronautical publications and charts and is not required to be reported. Where ALA information is published in the AIP it is clearly annotated that it is not kept current. Consequently ALA can come into use and fall out of use without any formal notification to CASA or any other authority. Airstrips that appear on survey maps often no longer exist; others exist but do not feature on maps. Similarly a grass paddock used as an ALA is not usually discernable on satellite mapping services such as Google Earth.

[3] AIP; a mandatory worldwide distribution system for the promulgation of aviation rules, procedures and information

[4] NOTAM (Notice to Airmen); a mandatory reporting service to keep aerodrome and airways information current and available to the aviation industry world wide

Military, Joint, Certified and Registered aerodromes usually have Obstacle Limitation Surfaces (OLS) and Procedures for Air Navigation – Operations (PANS-OPS) surfaces prescribed to protect the airspace associated with published instrument approach and landing procedures. An uncertified aerodrome or ALA cannot have a published instrument approach and landing procedure so cannot have associated prescribed airspace protected by OLS or PANS-OPS.

Within the area of the RPWF Canberra and Wagga Wagga are certified aerodromes, Goulbourn and Tumut are registered aerodromes and Crookwell and Gundaroo are uncertified aerodromes.

1.4 Aeroplane Landing Areas

There are no regulations defining the characteristics, construction or maintenance of aeroplane landing areas.

Certified and registered aerodromes are regulated by Part 139 of the CASR. The Manual of Standards (MOS) Part 139 publishes the detailed requirements to be met in order to be certified or registered.

ALA's are sometimes built to the requirements of CASR Part 139 but the owner chooses not to seek certification or registration. Others can be appropriately formed and marked gravel runways suitable for all weather use by light aircraft up to 5,700kg Maximum Takeoff Weight (MTOW) such as those commonly used as Air Ambulance aircraft. Often ALA's are nothing more than a relatively smooth and mowed strip in a farm paddock.

The only information published by CASA regarding ALA dimensions is contained in Civil Aviation Advisory Publication (CAAP) 92-1(1) *Guidelines for Aeroplane Landing Areas* dated July 1992. This is an advisory publication only and carries no regulatory requirement.

Civil Aviation Regulation (CAR) 92 establishes the responsibilities of a person intending to use an aerodrome. This regulation states:

> *(1) A person must not land an aircraft on, or engage in conduct that causes an aircraft to take off from, a place that does not satisfy one or more of the following requirements:*
>
> *a. The place is an aerodrome established under the Air Navigation Regulations;*
>
> *b. The use of the place as an aerodrome is authorized by a certificate granted, or registration under Part 139 of CASR;*
>
> *c. The place is an aerodrome for which an arrangement under section 20 of the Act is in force and the use of the aerodrome by aircraft engaged in civil air navigation is authorized by CASA under that section;*
>
> *d. The place (not being a place referred to in paragraph (a), (b) or (c)) is suitable for use as an aerodrome for the purposes of the landing and taking-off of aircraft;*

and, having regard to all the circumstances of the proposed landing or take-off (including the prevailing weather conditions), the aircraft can land at, or take-off from, the place in safety.

(2) CASA may, in relation to an aerodrome, issue directions relating to the safety of air navigation

(3) A person must not contravene a direction (Penalty 25 penalty points)

(4) An offence against sub regulation (1) or (3) is an offence of strict liability

(Section 20 of the Act refers to the use of Military aerodromes by civilian aircraft.)

From paragraph (1)d it can be seen that any place can be used as an aerodrome provided it is deemed suitable by the pilot in command for safe operation of the aircraft.

1.5 Locating ALA

As stated previously ALA can come and go without any requirement to notify CASA and that a mowed strip in a grazing paddock does not readily show up on Google Earth.

Given that there is no regulation of ALA, their location and serviceability is not required to be held in the public domain, the existence of an ALA is known only to the owner who may choose to share it with pilots whom they wish to use it, for example aerial agricultural contractors or friends with a light aircraft.

In response to the Secretary's report (page 21) recommendation - first dot point regarding identifying airstrips, it is extraordinarily difficult to identify *unregistered aerodromes/airstrips* from maps and Google Earth even when the location is known. I would suggest that even identification from the air would be extraordinarily difficult unless the location was accurately known.

A review of the relevant NATMAP survey maps of both 1:250,000 and 1:100,000 scales demonstrated that an airstrip shown on the 1:250,000 map did not necessarily show up on the corresponding 1:100,000 map and vice versa.

The Yass Valley Council has produced an Emergency Services Map Directory dated 2011. At least one of the ALA depicted in this directory as suitable for emergency services operations, ALA 16 is not suitable for aircraft operations until considerable work has been undertaken to prepare it for use. Several of the ALA owners contacted during this assessment advised that their ALA were not available for aircraft use until the livestock had been removed and the airstrip mowed. Other owners advised that their ALA were available for aerial firefighting but had never been used for that purpose. As previously stated, there is no requirement for the existence of ALA to be notified to Authorities. Given this fact it is extremely difficult for anyone to maintain an accurate list of ALA's, their location, runway direction and length, runway surface, and their availability.

2. METHODOLOGY

2.1 Data Sources

Trustpower provided Ambidji with details they held of ALA on the boundary and within the RPWF that showed the airstrip location coordinates, the property owner and contact details. These airstrips were plotted onto Google Earth along with the proposed wind turbine positions.

A search of the RPWF area on Google Earth was undertaken.

The Ambidji report *Rye Park Wind Farm Aeronautical Impact Assessment, Aviation Impact Statement and Qualitative Risk Assessment; The Ambidji Group, 16 January 2014* has discussed the impact of the RPWF on the identified certified and registered aerodromes as well as the uncertified aerodromes of Gundaroo and Crookwell within 30nm of the RPWF. This report also identified a number of ALA on the boundary or within the wind farm and discussed the likely impact of the RPWF on the operation of these ALA.

The AIP Enroute Supplement (ERSA) and the Aircraft Owners & Pilots Association of Australia (AOPA) National Airfield Directory were reviewed.

The following maps and charts were reviewed looking for information about ALA:

- Canberra Visual Terminal Chart (VTC) 13th Nov 2014
- World Aeronautical Chart (WAC) 3457 Canberra 17th Edition
- NATMAP (Geoscience Australia) maps of the area at 1:100,000 and 1:250,000 scales

The table below identifies the NATMAP maps reviewed.

1:100,000		1:250,000	
Map Name	Map Number & Edition	Map Name	Map Number & Edition
Yass	8628 Ed 2 (1988)	Cootamundra	S155-11 Ed 2 (2000)
Gunning	8728 Ed 1 (1974)	Goulburn	S155-12 Ed 3 (2003)
Goulburn	8828 Ed 2 (1987)	Bathurst	S155-08 Ed 3 (2005)
Cootamundra	8528 Ed 2 (2000)	Canberra	S155-16 Ed 4 (2005)
Junee	8428 Ed 2 (2000)		

Table 2.1 NATMAP Maps – these are current editions[5]

[5] Verified from Geoscience Australia website at http://www.ga.gov.au/scientific-topics/geographic-information/topographic-maps-data/printed-topographic-maps/1-100k-scale-maps

2.2 Map Review

The listed maps were studied looking for marked aerodromes and airstrips.

The stated map reliability on the current editions of the 1:100,000 vary from 1973 to 1999, with the maps being printed from 1974 to 2000. Similarly the 1:250,000 current edition map reliability vary from 1994 to 2003 with the maps being printed from 2000 to 2005. The WAC Canberra reliability is 2012 and the chart was printed in 2012. The Canberra VTC is dated 13 November 2014 with the next edition due on 28 May 2015. The Google Earth used is the public domain version with the image dates shown as 2015.

A correlation between the ALA listed in the Trustpower information and the Goulburn S155-12 map was undertaken. This established that a number of the listed ALA did not appear on the map and that several ALA shown on the map did not correlate with the listed locations.

2.3 Document Review

A review of the Aeronautical Information Publication (AIP) EnRoute Supplement Australia (ERSA) and the Aircraft Owners and Pilots Association (AOPA) National Airfield Directory was undertaken seeking any listed ALA in the RPWF area.

2.4 Consultation with Listed ALA Owners

Telephone contact was made with as many of the listed ALA owners as possible. The owners were asked if they had an airstrip on their property and then a series of questions about the nature of the airstrip and its use. The owners were also asked if they knew of other airstrips nearby and contact details for the owners. This snowball process led to the identification of other airstrips in the area.

2.5 Interview Results Matrix

The results of the interviews with the ALA operators were entered into a spreadsheet and analysed looking for common threads in the answers.

2.6 Analysis of Relative Positions of ALA and nearby Turbines

An analysis of the relative positions of ALA and nearby turbines was undertaken to establish the degree of hazard posed to aircraft operations at the various ALA. This analysis looked at the position of the turbines in relation to the airstrip extended centreline and distance along that extended centreline from the airstrip threshold.

From experience, the majority of ALA's have significant obstacles, such as downhill slopes, trees or power lines to avoid and that the addition of large clearly visible wind turbines does not greatly increase the manoeuvring required for landing and take-off from the ALA.

3. FINDINGS

3.1 Map Review

A review of the Canberra WAC revealed unregistered aerodromes at *Murrumbateman, Gundaroo, Crookwell and Harden* with no marked ALA in the vicinity of the RPWF.

A review of the Canberra VTC revealed unregistered aerodromes at *Murrumbateman, Gundaroo, Crookwell and Harden* with no marked ALA in the vicinity of the RPWF

A review of the Goulburn S155-12 revealed a number of ALA in the RPWF area. See Figure 3.1 on next page.

The locations of these ALA were correlated, where possible with the list of ALA supplied by Trustpower. Some of the ALA shown on the map correlated to positions of ALA listed in the data provided by Trustpower, however the majority did not.

The Goulburn S155-12 map reliability is shown as 2003 and has the disclaimer "*This map was not field checked and some information may be inaccurate."*

Fig 3.1 Section of Map Goulburn S155-12 showing some ALA around RPWF

3.2 Document Review

A review of the ERSA showed ALA details for Crookwell and Gundaroo only. A review of the AOPA Airfields Directory revealed the difficulty involved in ascertaining the names and details of ALA, as they are listed by names that are not necessarily those shown on the maps or of nearby towns. The review of these documents did not reveal any additional ALA.

3.3 Consultation with Listed Landowners

Contact was made with as many of the listed landowners as possible. They were all asked the following questions:

- Do you have an airstrip on your property;
- Is the airstrip used;
- Who uses it;
- What type of aircraft use it;
- How often is it used;
- What obstacles exist;
- Is it useable all year;
- What type of aerial application is used;
- When is aerial application undertaken; and
- Do you know of any other ALA in the area?

The answers to these questions were entered into a spreadsheet matrix to facilitate evaluation of common threads. The “snowball effect” question revealed two extra ALA within the vicinity of the RPWF.

3.4 Results Matrix

The information gained from the interviews with the land owners was entered into a spreadsheet which acts as a record of interview and provides an analysis of common threads across each of the interviews.

Thirteen ALA owners were listed in the data supplied by Trustpower. Two additional ALA owners were contacted as the result of the snowball question. Three of the fifteen ALA owners are participating turbine hosts.

Of the fifteen ALA owners identified three were non-contactable due to wrong or disconnected telephone numbers and one owner did not return several calls, giving a 74% contact success rate. All those owners contacted were pleased to have the opportunity to input their views and were forthcoming with their answers.

Of the eleven owners contacted four no longer use their ALA’s. The common reason given was that aerial application has now become expensive and is no longer used.

Five of the seven operational ALA’s are used by neighbors for aerial applications and

one ALA is used only by the owner to occasionally land his own light aircraft. The remaining ALA is used by the owner for aerial applications. All the owners of the operational ALA's advised that their airstrips were available for aerial firefighting aircraft; however none had been used for that purpose.

Only one owner claimed that his airstrip was used "often" by aerial applications aircraft and another owner advised his ALA is used by private light aircraft, Recreational Aviation Australia (RAA) registered aircraft (ultralights) and aerial applications aircraft. This ALA has occasionally been used by small twin engine light aircraft. These two, plus one other ALA are fenced, graded and formed airstrips rather than just a grass strip within a grazing paddock which seems to be the case for the majority of the others.

As can be seen from the photograph below, modern aerial agricultural aircraft do not require formed, graded and level runways; they only need short grass on relatively smooth ground that is not necessarily level.

Figure 3.2 - An Airtractor 502B operating from a typical farm ALA

The majority of the identified airstrips are used only two to four days a year and not necessarily every year.

The cost of aerial application, greater access by improved ground based application equipment and the general move away from regular pasture fertilizing were common threads in the information obtained during the interviews.

Results Matrix Table

	No contact		No longer have ALA		Permanent, available all year

Colour decode for Table 3.1

ALA No.	Type of ALA	Used By	Used For	Frequency of Use	Obstacles	Aerial Ag use*	Comments
1							Wrong Number
2							
3							Didn't return calls
4							Wrong Number
5							
6							Aerial Ag too costly
7	grazing paddock	Self	Own aircraft	4days /year		None	Aerial Ag too costly
8	grazing paddock	Self + others	Aerial Ag	6 times in last 10yrs	Trees SE end	Top dress	Aerial Ag costly Not many top dress these days
9	grazing paddock	Self	Aerial Ag	3days /year		Top dress	Whole area being sub-divided
10							No longer use aerial spreading
11							Disconnected #
12	All year Grass	Self + others	Aerial Ag	15-20 days /year		All + seed	
13	All year formed	Self + others	Aerial Ag	Often		All	Aerial Ag costly
14	grazing paddock	Self + others	Aerial Ag + PVT	4days /year	Hill at end	Top dress	Aerial Ag costly
15	All year gravel	Self + others	Aerial Ag + PVT + RAA	Regularly		Used by others	Known as Braeburn

ALA No.	Type of ALA	Used By	Used For	Frequency of Use	Obstacles	Aerial Ag use*	Comments
16	Grazing paddock	Self	Aerial Ag	1 day/year		Top Dress	Requires much work before being useable
17							

*Top Dress = fertilizer spreading; All = fertilizer, insecticide and herbicide spraying; Seed = aerial seeding of pastures.

Table 3.1 Results Matrix Table

3.5 Analysis of Relative Positions of ALA and nearby Turbines

3.5.1 ALA 1

This ALA is located outside the boundary of the RPWF and is 4,332m from the nearest turbine (#131). The airstrip direction is 04/22 and is 390m in length. The owner of this airstrip could not be contacted so any further detail regarding its use and serviceability cannot be verified.

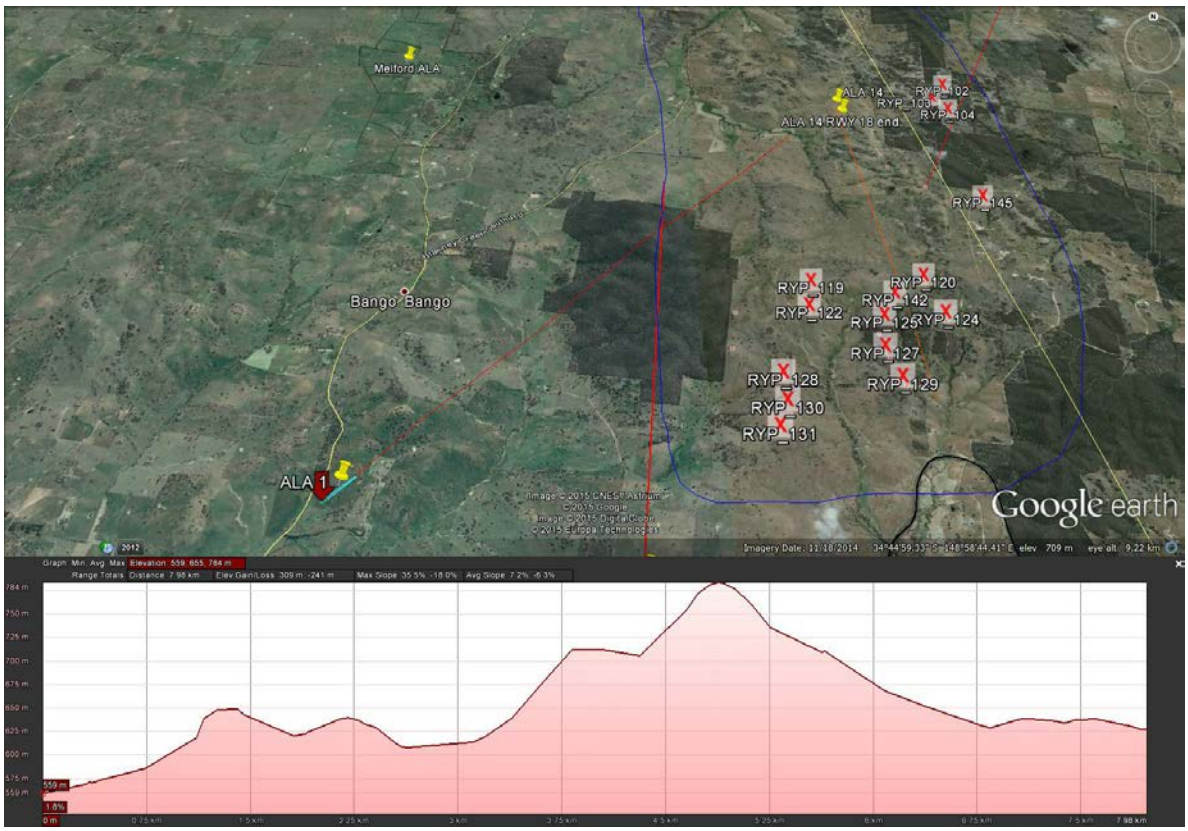

Figure 3.3 - ALA 1 Nearest Turbines and elevations along Runway Centreline

The turbines are considered sufficiently distant to not pose any additional restriction on the use of this ALA.

Aircraft operations at this ALA **should not be adversely affected** by the RPWF.

3.5.2 ALA 3

This ALA is located outside the boundary of the RPWF and is 4760m from the nearest turbine (#129). The airstrip direction is 05/23 and is 500m in length. The owner of this airstrip could not be contacted so any further detail regarding its use and serviceability cannot be verified.

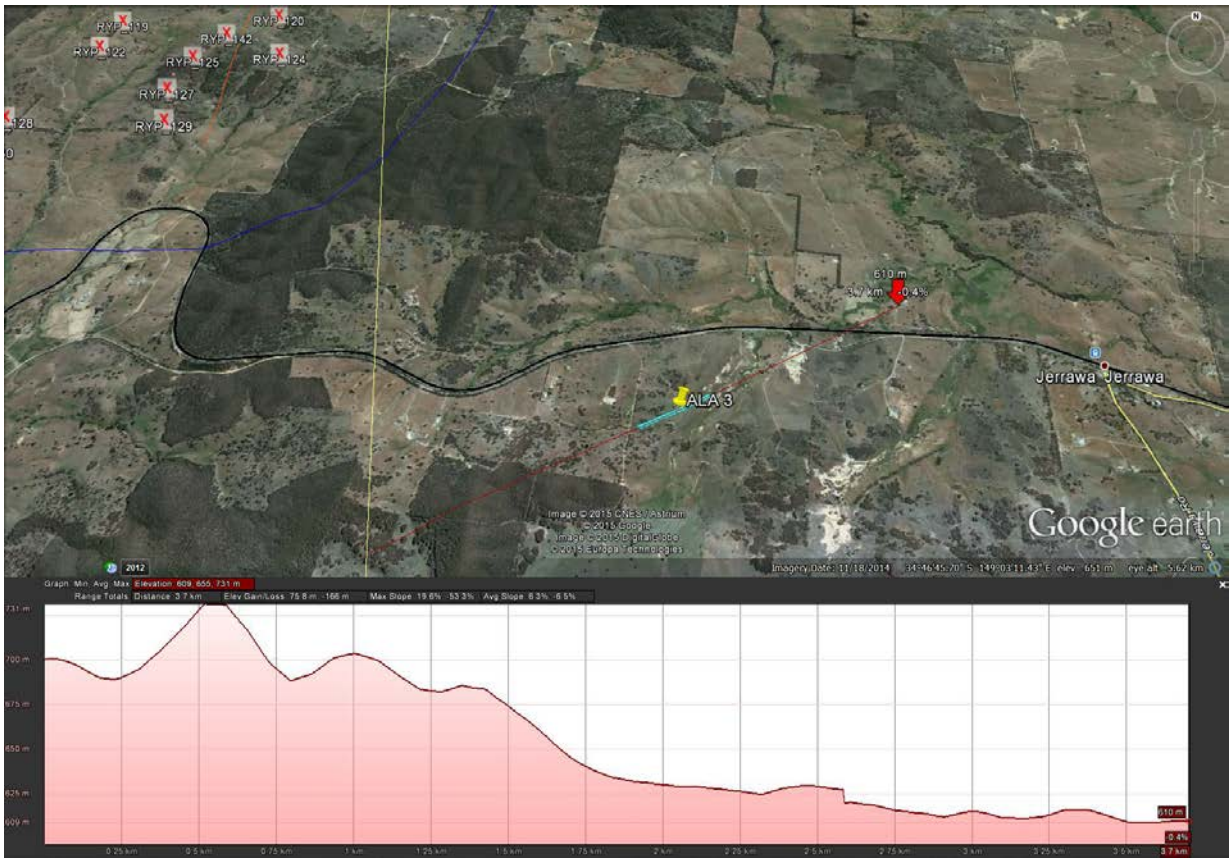

Figure 3.4 - ALA 3 Nearest Turbines and elevations along Runway Centreline

The turbines are considered sufficiently distant to not pose any additional restriction on the use of this ALA.

Aircraft operations at this ALA **should not be adversely affected** by the RPWF.

3.5.3 ALA 4

This ALA is located outside the boundary of the RPWF and is 4638m from the nearest turbine (#102). The airstrip direction is 02/20 and is 550m in length. The owner of this airstrip could not be contacted so any further detail regarding its use and serviceability cannot be verified.

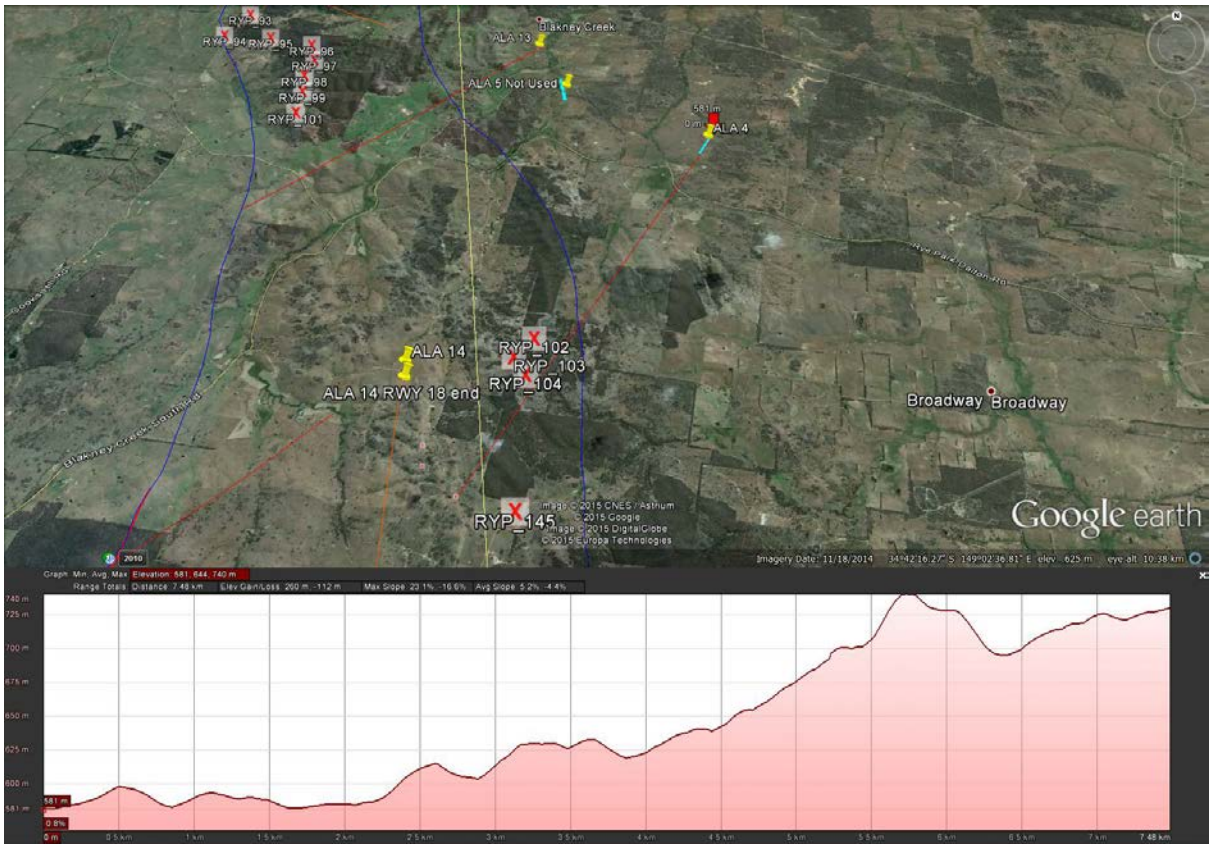

Figure 3.5 - ALA 4 Nearest Turbines and elevations along Runway Centreline

The turbines are considered sufficiently distant to not pose any additional restriction on the use of this ALA.

Aircraft operations at this ALA **should not be adversely affected** by the RPWF.

3.5.4 ALA 7

This ALA is within the RPWF boundary. The airstrip direction is 16/34 and is 700m long grass within a paddock normally used for grazing. This ALA has turbines in both runway directions. The nearest turbine to the RWY 16 centreline is turbine #73 whilst turbine #67 is the closest to the RWY 34 centreline.

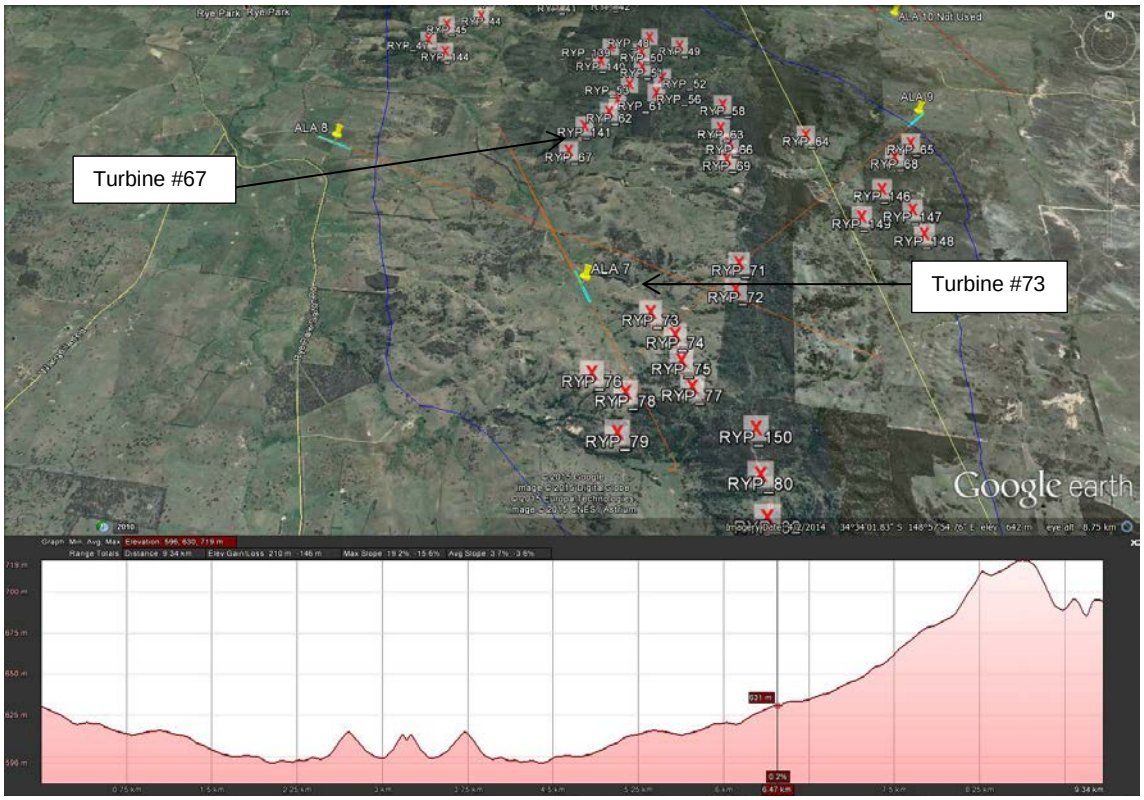

Figure 3.6 - ALA 7 Nearest Turbines and elevations along Runway Centrelines

Turbine #67 is 636m east of the RWY 34 centreline 1981m from the runway end.

Turbine #73 is 506m east of the RWY 16 centreline 509m from the runway end.

This ALA has a number of turbines close to the runway centrelines as depicted in Table 3.2 below.

Runway Direction	Turbine No.	Distance and Direction from Centreline (m)	Distance from Runway End (m)
16	73	506 E	509
16	74	613 E	940
16	79	436 W	1879
16	76	406 W	1095
16	75	523 E	1290
16	78	172 W	1436
16	77	485 E	1620
34	67	636 E	1981
34	141	1012 E	2422
34	62	1411 E	2439

Table 3.2 – Turbines along ALA 7 Runway Centreline

This ALA is used occasionally, maybe 4 times a year for the owner to land his own light aircraft. This aircraft is normally hangered at Young aerodrome. The owner no longer uses aerial agricultural applications due to the high cost as well as changes to pasture management practices.

The use of this airstrip could be constrained by the proposed turbine locations given their proximity to the centreline and runway ends. Arriving aircraft conducting a normal circuit approach to either runway will be constrained by the proximity of the turbines. Departures to the northwest from runway 34 will be able to turn left away from the turbines; however departures to the southeast from runway 16 would turn left into a line of turbines whilst a right turn would need to be executed shortly after take-off to avoid turbines situated 1100m from the runway end.

Mitigation of any restrictions on the use of this ALA could occur by the removal or relocation of some turbines or the relocation or redirection of the airstrip. Any mitigation would need to be discussed with the owner of the ALA.

Aircraft operations at this ALA **could be adversely affected** by the RPWF.

3.5.5 ALA 8

This ALA is located to the west of the RPWF. The airstrip direction is 12/30 and is a 600m grass strip that is part of a grazing paddock. The nearest turbine to the runway centreline is turbine #67.

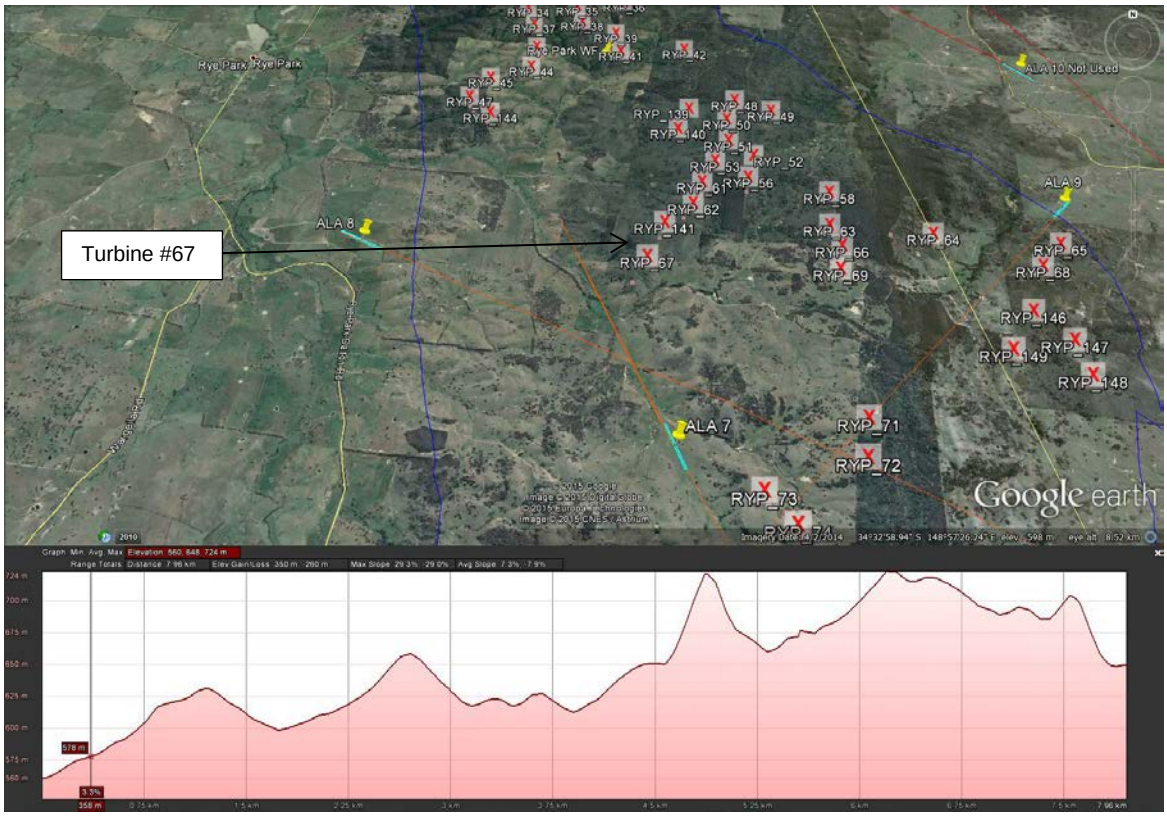

Figure 3.7 – ALA 8 Nearest Turbines and elevations along Runway Centreline

Turbine #67 is 1244m northeast of the RWY 12 centreline 2738m from the runway end.

This turbine is considered to be sufficiently distant from the runway centreline and away from the runway end to not pose any additional restriction on the use of this ALA.

The owner advised that the ALA is used by himself and several neighbours for aerial agricultural applications, although this has only occurred probably 6 times in the last decade. He also mentioned that top dressing pastures, either by aerial or ground application has become prohibitively expensive. The ALA is usually mowed each spring, has been recently graded and is considered to be a good strip which is available for aerial firefighting, although it has never been used for this purpose. The owner also advised that there are trees on the south eastern end so operations are normally to the northwest away from the wind farm.

Aircraft operations at this ALA **should not be adversely affected** by the RPWF.

3.5.6 ALA 9

This ALA is located to the east of the RPWF. The airstrip direction is 04/22 and is a 600m grass strip that is part of a grazing paddock. The nearest turbine to the runway centreline is turbine #65.

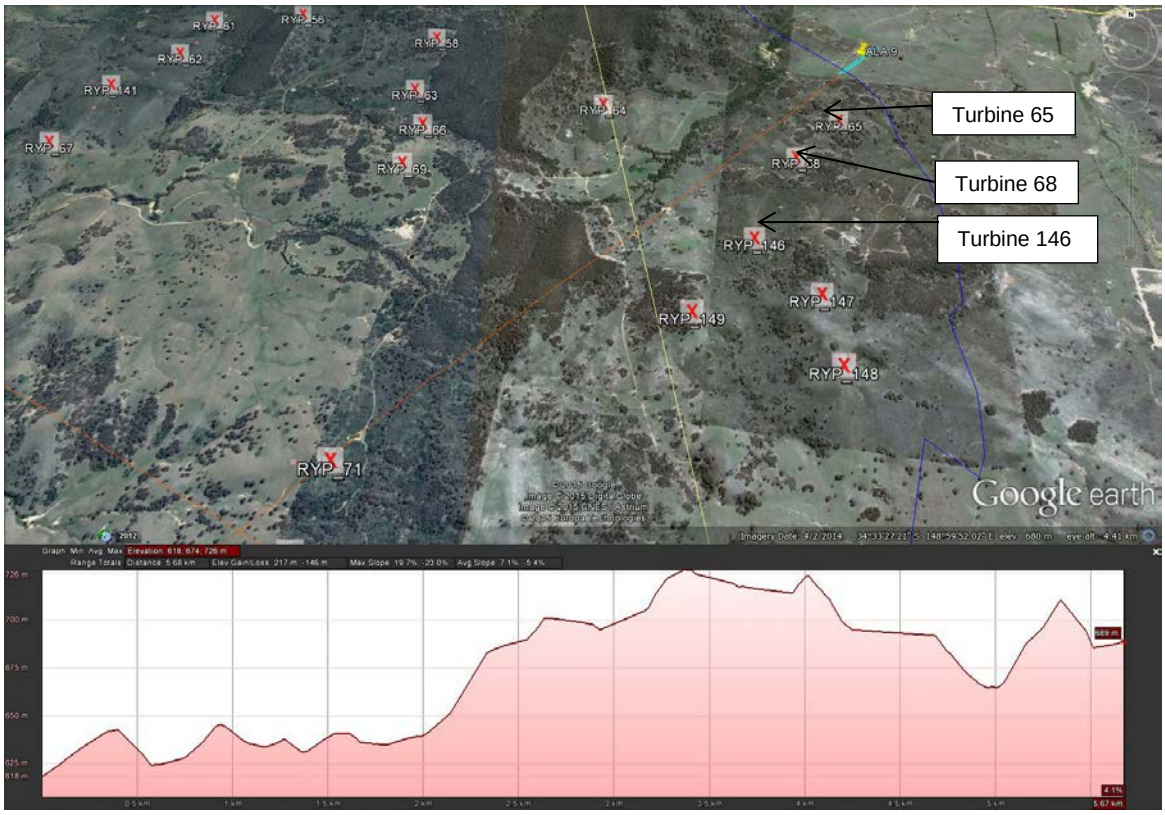

Figure 3.8 – ALA 9 Nearest Turbines and elevations along Runway Centreline

Turbine #65 is 284m southeast of the RWY 22 centreline 456m from the runway end. There is another turbine (#68) 295m southeast of the RWY 22 centreline 927m from the runway end. Turbine #64 is 793m northwest of the RWY 22 centreline and 1351m from the runway end. Turbine #146 is 527m southeast of the RWY 22 centreline and 1629m from the runway end. These turbines are considered sufficiently distant to not pose any additional restriction on the use of this ALA. The location of turbines #64, #68 and #146 could impact on a left turn made shortly after take-off from RWY 22, although extending the straight ahead path until after turbine #68 mitigates the impact.

The owner advises that the ALA is used only for aerial agricultural applications aircraft on their property 2 to 3 times a year, usually in autumn.

The owner commented on the changing nature of the whole area in that a number of farms have been sub-divided into “hobby farms” of a small area that precludes the use of aerial agricultural applications.

Aircraft operations at this ALA **should not be adversely affected** by the RPWF.

3.5.7 ALA 11

This ALA is located outside the boundary of the RPWF and is 3995m from the nearest turbine (#20). The airstrip direction is 17/34 and is 390m in length. The owner of this airstrip could not be contacted so any further detail regarding its use and serviceability cannot be verified.

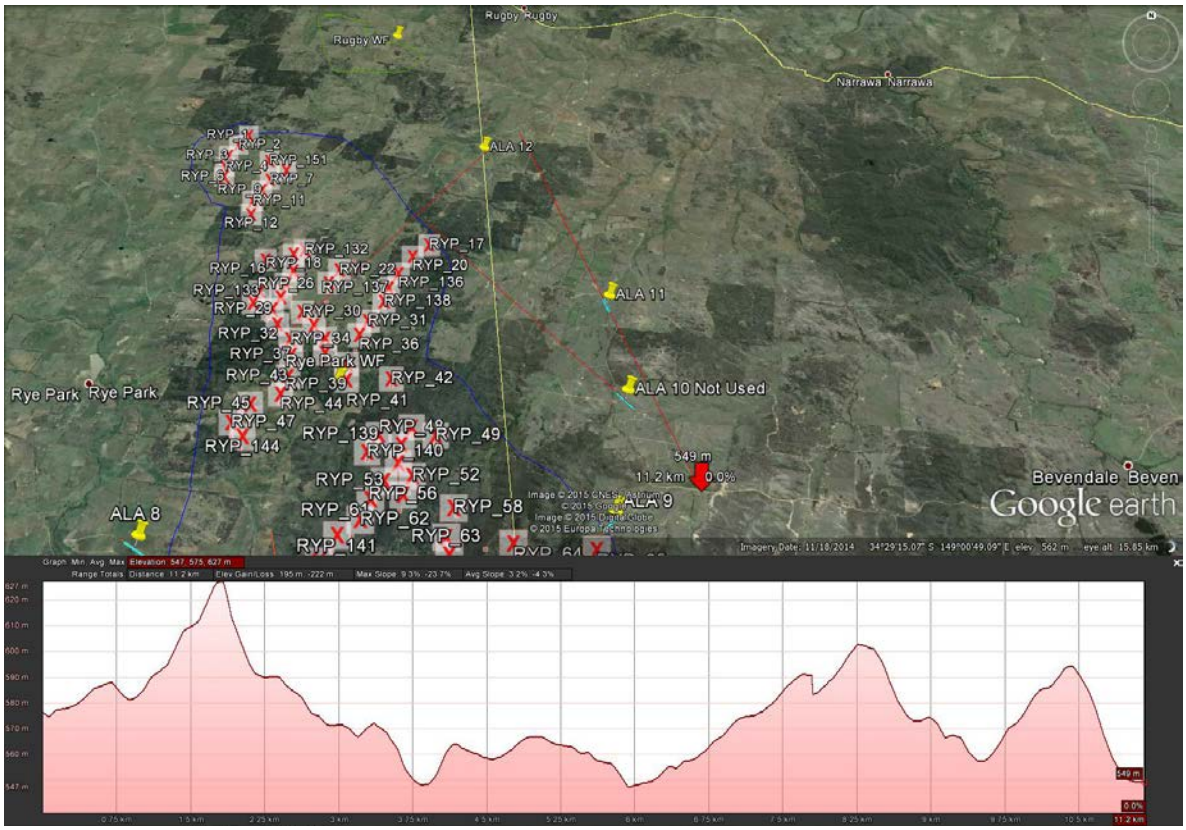

Figure 3.9 - ALA 11 Nearest Turbines and elevations along Runway Centreline

The turbines are considered sufficiently distant to not pose any additional restriction on the use of this ALA.

Aircraft operations at this ALA **should not be adversely affected** by the RPWF.

3.5.8 ALA 12

This ALA is located to the northeast of the RPWF. The airstrip direction is 03/21 and is a formed 600m fenced off strip that is available all year. As a 'bit of history' the ALA was designed by Max Hazelton, an early New South Wales pioneer of aerial agricultural applications flying. The nearest turbine to the runway centreline is turbine #17.

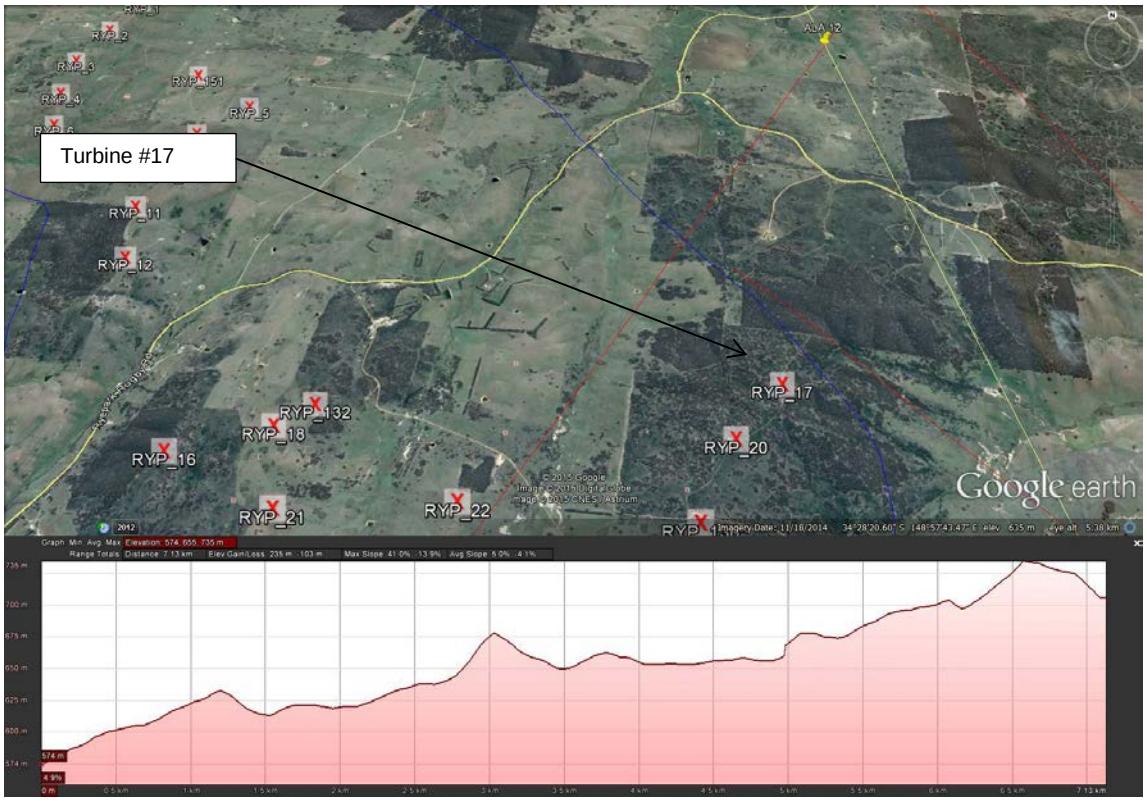

Figure 3.10 - ALA 12 Nearest Turbines and elevations along Runway Centreline

Turbine #17 is 1025m northwest of the RWY 21 centreline 33375m from the runway end. There is another turbine (#20) 954m southeast of the RWY 21 centreline 3864m from the runway end. These turbines are considered sufficiently distant to not pose any additional restriction on the use of this ALA.

This ALA is used by the owner and several neighbours for aerial agricultural operations up to 15 to 20 days per year, usually in autumn. The ALA is occasionally used by RA-Aus aircraft and a gyrocopter. The owner advised that the surrounding grazing land is too steep to use ground based application of fertiliser, herbicide and insecticide.

Aircraft operations at this ALA **should not be adversely affected** by the RPWF.

3.5.9 ALA 13

This ALA is 1.6km northeast of the RPWF boundary with the nearest turbine to the airstrip centreline being turbine #101. This ALA is a graded runway with a direction of 04/22 and a length of 510m. The owner advised it is "used often."

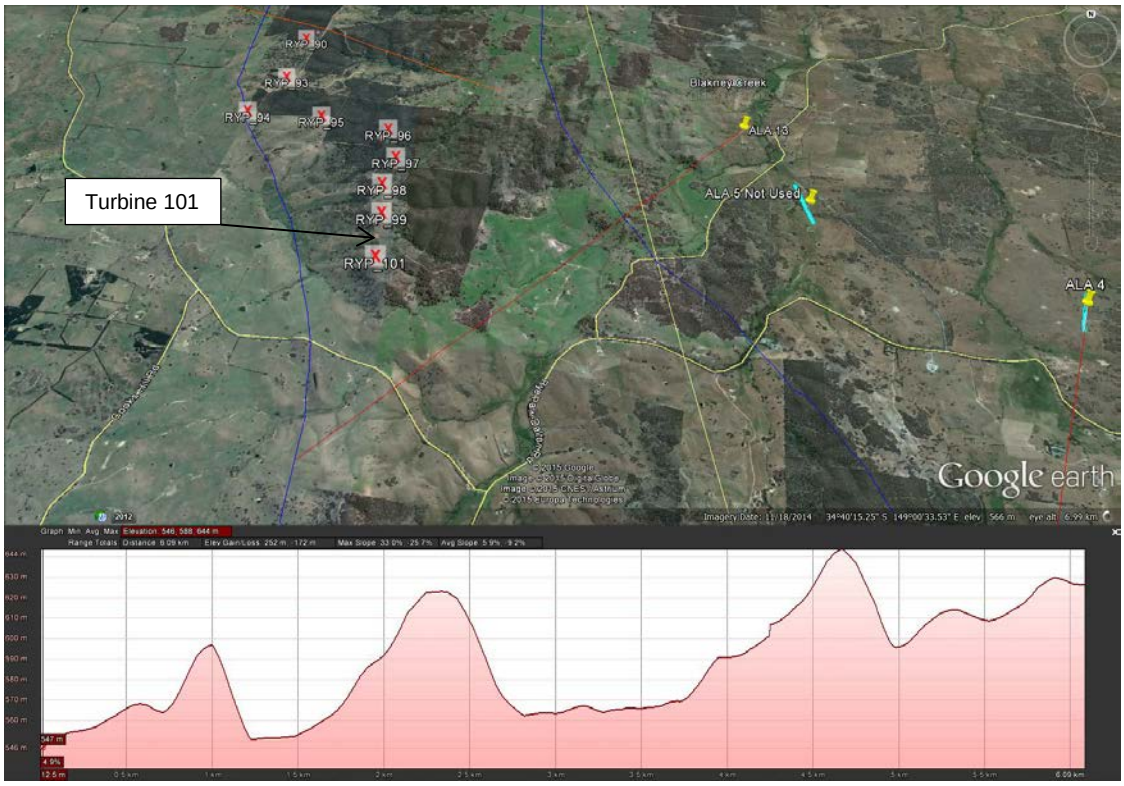

Figure 3.11 - ALA #13 Nearest Turbines and elevations along Rwy22 Centreline

Turbine #101 is 1177m northwest of the runway 22 centreline 3708m from the runway end as depicted in Figure 3.3 above. This turbine is considered to be sufficiently distant from the runway centreline and away from the runway end to not pose any additional restriction on the use of this ALA. As can be seen from the earth profile an aircraft has to climb away quickly to avoid terrain along the runway centreline when operating toward the RPWF.

Given the location of the ALA relative to the surrounding high ground and the nearest turbine it is considered that the RPWF will have no impact on the operation of this airstrip.

The owner advised that the ALA is used by neighbours and himself for aerial applications, however this is very much dependent on cost as aerial application is getting very expensive. The ALA is also used by light aircraft.

The owner of this ALA is a vocal opponent to wind farms, who mentioned among a long list of objections, turbulence from turbines affects light aircraft up to 9km away and that aerial firefighting cannot be used in or near wind farms.

The issue of aerial firefighting is addressed in section 3.6 of this report.

The issue of turbulence from wind farms affecting aerial agricultural applications aircraft has been raised with the author in a previous aviation impact assessment report for the RPWF. The issue was raised by a local aerial agricultural applications operator during an interview seeking information on risks to aviation posed by wind farms. The operator had reported the turbulence occurrence to the Australian Transport Safety Bureau (ATSB). In relation to turbulence from wind turbines affecting light aircraft and aerial agricultural applications aircraft the ATSB advised:

> *"… … that we have no data in relation to wind farms. There was one occurrence earlier this year where an agricultural pilot reported experiencing turbulence that they thought came from a wind farm over 9km away. The ATSB did not investigate as there was no effective way of confirming that the wind farm had anything to do with the turbulence encountered by the pilot."*[6]

The terrain in the RPWF area and the Yass - Rye Park area in general is conducive to turbulence generated by the flow of the wind over the hills and through the valleys. The area is well known to light aircraft pilots for its turbulence and changeable weather conditions.

Aircraft operations at this ALA **should not be adversely affected** by the RPWF.

[6] Personal email from ATSB dated 21 October 2013

3.5.10 ALA 14

This ALA is located within the southern portion of the RPWF. The airstrip direction is 18/36 and is a grass 500m strip that is part of a grazing paddock. There are 3 turbines adjacent to the ALA located to the east 1350m (#103), 1500m (#104) and 1617m (#102) respectively.

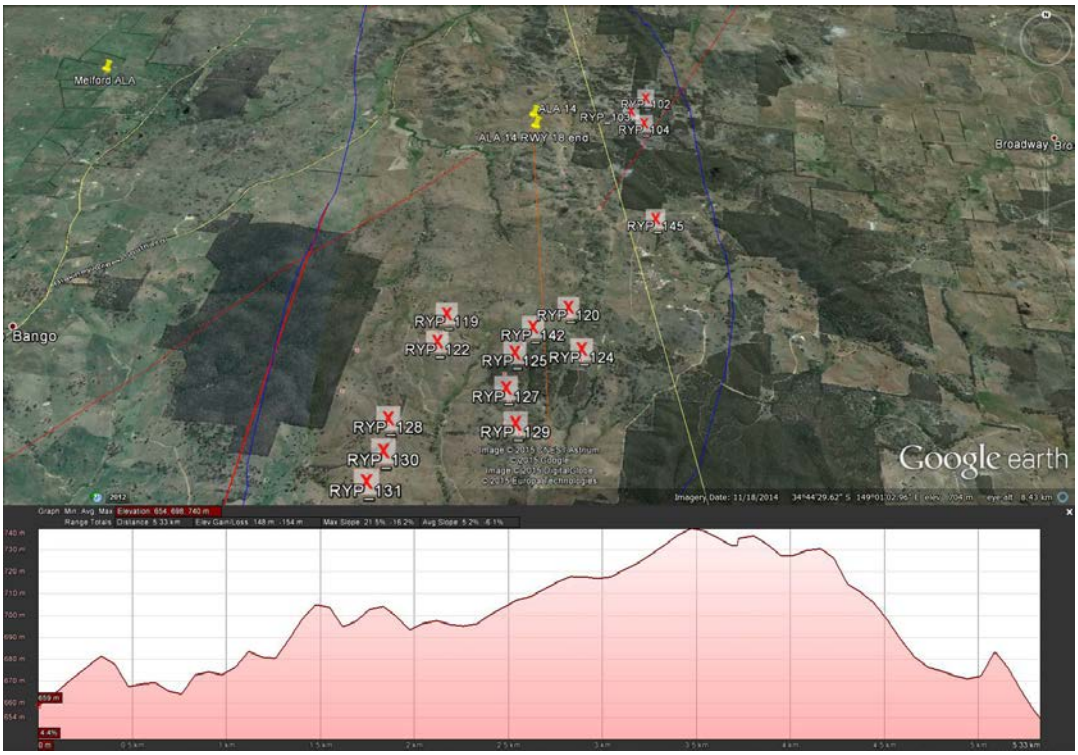

Figure 3.12 - ALA 14 Nearest Turbines and elevations along Runway Centreline

Turbine #120 is 284m east of the RWY 18 centreline 3249m from the runway end.

Turbine #142 is 108m east of the RWY 18 centreline 3508m from the runway end

These turbines are considered sufficiently distant to not pose any additional restriction on the use of this ALA.

The owner advises that there is a hill at the end of the strip that requires a left turn. Examination of Google Earth indicates that there is a hill at each end of the ALA and that any necessary left turn would occur before turbines #120 and #142 to the south and that there are no turbines to the north.

This ALA is used for aerial agricultural applications 4 times a year, usually in autumn by the owner and occasionally neighbours. The ALA has occasionally been used by private light aircraft.

The owner wants his ALA listed in the wind farm documentation. He stated that he is now using land based applications as aerial application is getting very expensive.

Aircraft operations at this ALA **should not be adversely affected** by the RPWF.

3.5.11 ALA 15

This ALA, known as *Braeburn* is 1km southwest of the RPWF boundary and has a formed gravel runway with a direction of 18/36 and a length of 600m. The nearest turbine to the runway centreline is turbine #131.

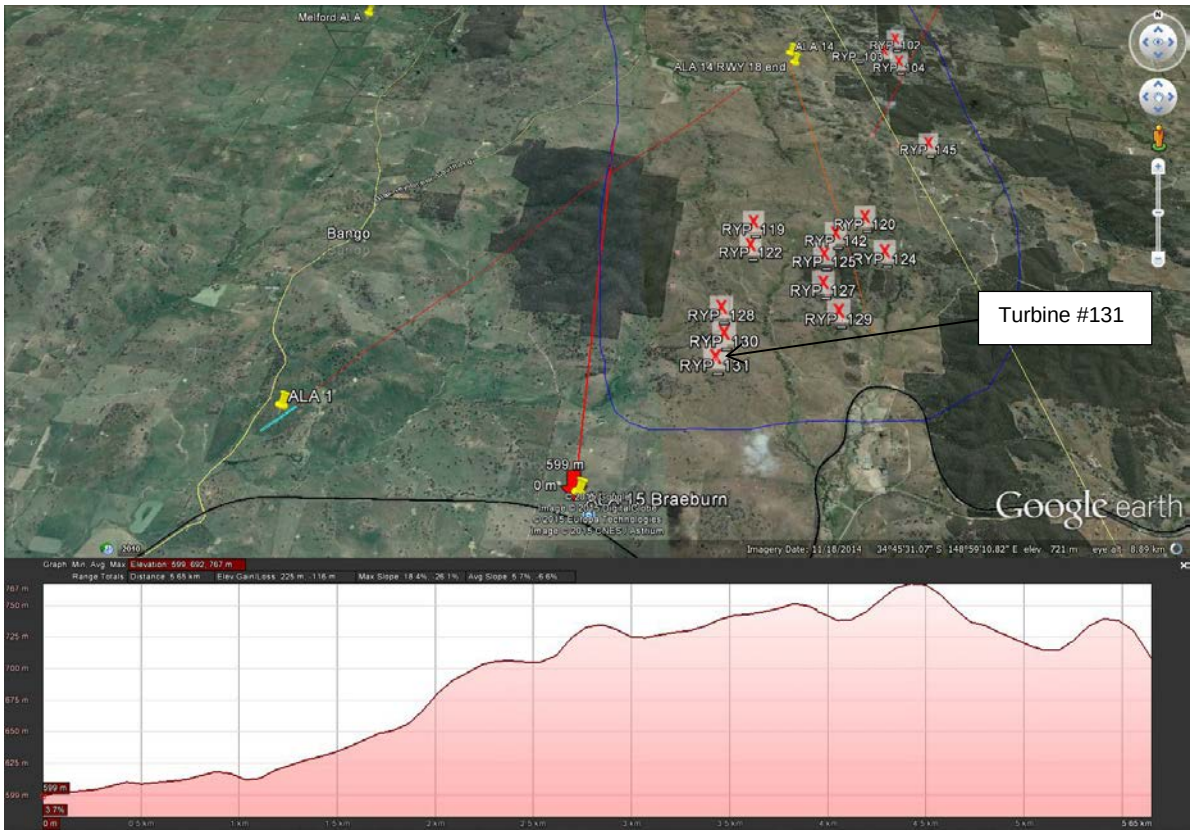

Figure 3.13 – Braeburn ALA Nearest Turbines and elevations along Rwy36 Centreline

Turbine #131 is 1313m east of the runway 36 centreline 1199m from the runway end as depicted in Figure 3.4 above. This turbine is considered to be sufficiently distant from the runway centreline and away from the runway end to not pose any additional restriction on the use of this ALA. As can be seen from the earth profile an aircraft departing from RWY 36 toward the RPWF boundary has to climb to avoid rising terrain.

This ALA is regularly used by a mixture of light aircraft, aerial agricultural applications

aircraft and Recreational Aviation Australia registered aircraft. The owner flies an RA-Aus registered Brumby aircraft (see picture above) at the airstrip.

Given that the normal departure procedure is for aircraft to turn left after take-off then an aircraft departing to the north on runway 36 will turn away from the RPWF. An aircraft arriving to land toward the south using runway 18 will have sufficient room to execute a normal circuit pattern of downwind on the east side of the strip to join cross wind.

Aircraft operations at this ALA **should not be adversely affected** by the RPWF.

3.5.12 ALA 16

This ALA is 3km west of the RPWF boundary and is normally a grazing paddock which requires considerable work to make it suitable for aircraft operations. When it is prepared, runway has a direction of 18/36 and a length of 600m. The nearest turbine to the runway centreline is turbine #47.

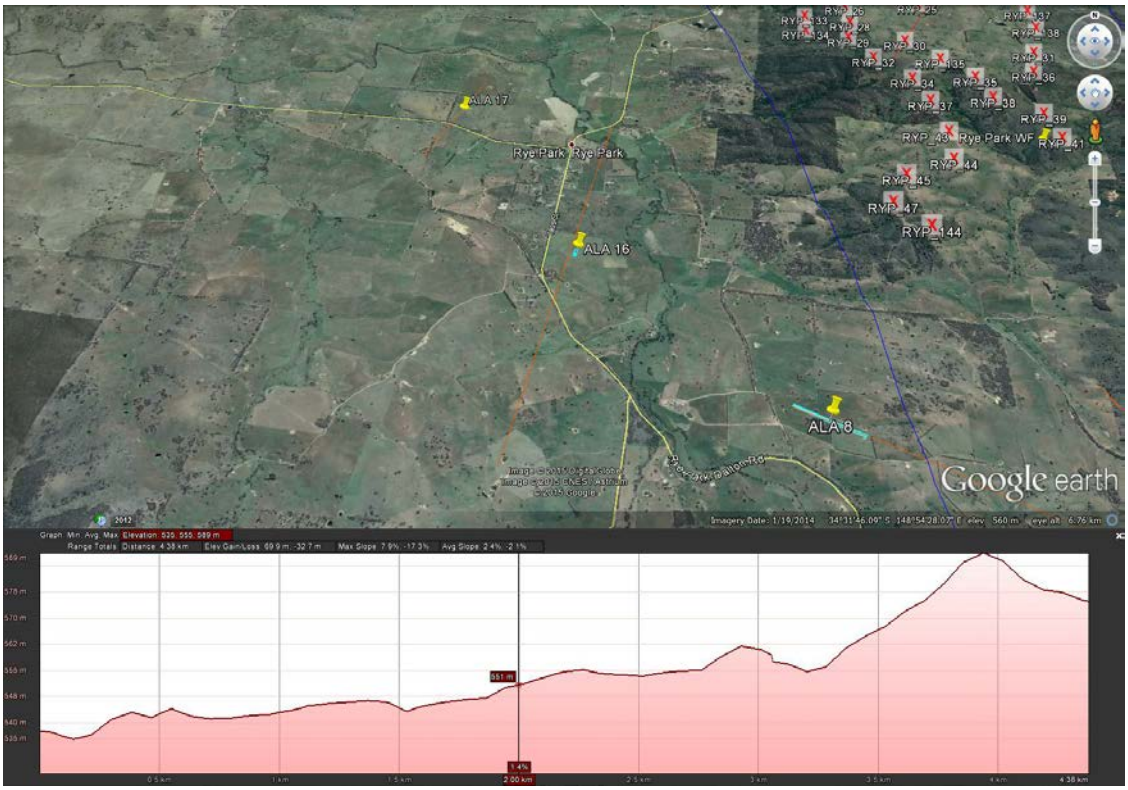

Figure 3.14 – ALA 16 Nearest Turbines and elevations along Rwy36 Centreline

Turbine #47 is 2930m west of the runway 36 centreline 1997m from the runway end as depicted in above. This turbine is considered to be sufficiently distant from the runway centreline and away from the runway end to not pose any additional restriction on the use of this ALA. As can be seen from the earth profile an aircraft departing from RWY 36 has to climb to avoid rising terrain.

The owner advises that this ALA is used no more than one day a year for top dressing pasture using an aerial agricultural aircraft, usually a Fletcher FU-24.

The runway centreline is approximately parallel to the wind farm boundary and is sufficiently distant to have minimal impact on aircraft operations.

Aircraft operations at this ALA **should not be adversely affected** by the RPWF.

3.6 Fire Fighting

3.6.1 Aerial Fire Fighting

"It is important to remember that aircraft alone do not extinguish fires."[7]

Concern about the inability to utilise aerial firefighting in the wind farm area was expressed by some stakeholders. From previous work undertaken by Ambidji regarding firefighting within wind farms it is noted that the rural firefighting agencies in Victoria, New South Wales, South Australia, and Western Australia all view wind turbines and wind farms to be 'just another hazard' that has to be considered in the risk management process associated with aerial firefighting.

The various State rural firefighting agencies made submissions to the recent Senate Select Committee on Wind Turbines. All these submissions attached the Australian Fire and Emergency Service Authorities Council (AFAC) *Wind Farms and Bushfire Operations Position Paper 30 October 2014* document. See Appendix A. The AFAC paper states:

> *"Aerial firefighting operations will treat the turbine towers similar to other tall obstacles. Pilots and Air Operations Managers will assess these risks as part of routine procedures. Risks due to wake turbulence and the moving blades should also be considered. Wind turbines are not expected to pose unacceptable risks."*[8]

All these agencies make the point that firefighting aircraft operate to the Visual Flight Rules so can only operate during daylight hours and must remain clear of smoke in order to maintain the required visibility of the ground and obstacles such as trees, power lines, radio masts, houses and ground based fire fighters. The Victorian Country Fire Authority (CFA) recommends:

> *"… … a minimum distance between turbines of 300 metres. This provides adequate distance for aircraft to operate around a wind energy facility given the appropriate weather and terrain conditions. Fire suppression aircraft operate under the 'Visual Flight Rules'. As such, fire suppression aircraft only operate in areas where there is no smoke and during daylight hours. Wind turbines, similar to high voltage transmission lines, are a part of the*

[7] NSW Rural Fire Service submission to the Senate Select Committee on Wind Turbines, 6 March 2015, page 2
[8] AFAC *Wind Farms and Bushfire Operations Position version 2.0 30 October 2014, page 2*

landscape and would be considered in the incident action plan."[9]

The South Australian Country Fire Service has published a fact sheet titled *Understanding Aerial Firefighting* which explains the use of aircraft in firefighting. A copy is at Appendix B.

An RJ85 Multi Engine Air Tanker operating at a Wind Farm

Note the fire truck on the fire edge.

3.6.2 Ground Based Fire Fighting

The various State firefighting agencies all make the point that access for fire trucks and personnel, and consequently their ability to fight the fire within a wind farm, is greatly enhanced by the access roads built for the construction and maintenance of the turbines. These roads also act as fire breaks which will slow or contain the fire spread across the open ground. The area around the base of each tower is kept clear of vegetation and as such offers a refuge for fire fighters and their vehicles.

The CFA recommends:

[9] CFA Emergency Management Guidelines for Wind Energy Facilities version 4 – February 2012 section 2

"To enable access for fire appliances the following provisions should be considered:

- *Constructed roads should be a minimum of 3.5 metres in trafficable width (with 0.5m each side) with a four (4) metre vertical clearance for the width of the formed road surface*
- *Roads should be constructed to a standard so that they are accessible in all weather conditions and capable of accommodating a vehicle of 15 tonnes for the trafficable road width."*[10]

The CFA further recommends:

Wind Energy Facility operators must ensure that the following fuel management measures are included in their plans during the Fire Danger Period:

- *Grass should be no more than 100mm in height and leaf litter no more that 10mm deep for a distance of thirty (30) metres around constructed buildings and viewing platforms;*
- *A fuel reduced area of four (4) metres width should be maintained around the perimeter of electricity compounds and substation type facilities;"*[11]

An RFS Fire Tanker working at night

[10] CFA Emergency Management Guidelines for Wind Energy Facilities version 4 – February 2012 section 3
[11] CFA Emergency Management Guidelines for Wind Energy Facilities version 4 – February 2012 section 9

4. CONCLUSIONS

4.1 Identifying ALA

The recommendation made by the Secretary of the NSW Department of Planning and Environment in the decision to disallow approval for the Yass Valley Wind Farm that requires identification of all ALA within 55.6km (30nm) of the proposed wind farm is bordering on impossible to comply with for the reasons outlined below.

Identifying the location of ALA's is extraordinarily difficult for several reasons: -

- Information about them is not required to be notified to authorities
  - so it is not held in the public domain; and
  - ALA can "come and go" without anyone but the owner knowing;
- Within the Aeronautical Information Publication documents
  - ERSA is no longer required to list ALA; and
  - VTC, VNC and WAC are no longer required to show ALA;
- Within the AOPA Airfields Directory it is extremely difficult to locate particular airstrips because the names used in the directory do not necessarily correlate to the names of towns or locations shown on maps;
- Survey maps are based on information that is several years old and carry the disclaimer that not all the information has been verified
  - Locations shown do not necessarily correlate with the known location; and
  - Many ALA shown no longer exist;
- The majority are grass airstrips within grazing paddocks so do not show up on internet based satellite mapping systems such as Google Earth.
- Lists compiled by Councils and others for emergency services uses are notoriously difficult to maintain which makes their accuracy highly questionable.

4.2 Regulation of ALA

There are no aviation regulations governing the construction of ALA. Their use is governed by CAR 92 which applies to the use of all aerodromes and places used for the take-off and landing of aircraft. CAR 92 places the onus on the pilot to ensure that the place is suitable for the proposed aircraft operation.

From previous work done by Ambidji it is known that a wide range of anecdotal comment abounds in regard to aircraft to turbine buffer distances that would be needed as a result of the construction of wind turbines. Little of this comment is based on any detailed technical analysis and is therefore untestable. For this reason Ambidji has undertaken analysis, for the proponents of wind farms in South Australia and Victoria, into the turning and ground coverage performance of various aerial agricultural aircraft models.

4.3 Analysis of Identified ALA Usage

From the interviews with the owners of the identified ALA's it can be reliably determined that aerial agricultural applications operations within the RPWF area are neither widely nor frequently used. The common reason given for not using aerial agricultural applications was cost combined with changes to pasture management practices.

Of the seventeen identified ALA within the RPWF area only three are fenced, formed, graded all weather ALA's available for use all year round. Of these three ALA only two owners advised that their ALA were used "often" or "frequently." The remaining usable ALA's are within grazing paddocks. These airstrips are inspected and mown when they are to be used and the animals are removed for the duration of the ALA use.

The owners of all the ALA advised that their airstrips were available for aerial firefighting aircraft but that they had never been used for that purpose.

All, except one, of the identified ALA will not be adversely affected by their location and runway direction relative to the positioning of the wind turbines.

Only one identified ALA will be impacted by the relative location of wind turbines. Mitigation of the impact should be achievable through negotiation with the owner and the possible relocation of either the ALA or one or two turbines away from the runway centreline.

APPENDIX A

New South Wales Rural Fire Service Submission to Senate Select Committee on Wind Turbines Wind Farms and Bush Fire Operations

APPENDIX A

Select Committee on Wind Turbines
Submission 97

NSW RURAL FIRE SERVICE

NSW GOVERNMENT

Senator John Madigan
Chair
Select Committee on Wind Turbines
PO Box 6100
Parliament House
CANBERRA ACT 2600

Your Ref:
Our Ref: HQ15/0194

6 March 2015

Dear Senator Madigan

Thank you for your invitation to provide a submission to the Select Committee on Wind Turbines inquiry into the application of regulatory governance and economic impact of wind turbines.

Please find attached the NSW Rural Fire Service submission for Committee's consideration.

Yours sincerely

Shane Fitzsimmons AFSM
Commissioner

[Attachments]

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Select Committee on Wind Turbines
Submission 97

NSW RURAL FIRE SERVICE

NSW GOVERNMENT

SUBMISSION

Wind Farms and Bush Fire Operations

NSW Rural Fire Service (NSW RFS) firefighters are supported on firegrounds by a range of equipment and resources including firefighting personnel, fire tankers, earthmoving machinery and aircraft. A wind farm located within the vicinity of, or on, a fireground will not prevent the NSW RFS from fighting the fire.

The NSW RFS will consider using all available resources, including aircraft, that are considered necessary and appropriate to contain and extinguish a fire. The strategies for fighting fires near wind farms take into account a variety of conditions including weather, topography and ground fuel loads, as fires in any other location.

A fire moving across the area of a wind farm is generally managed in the same way as any other grass and/or bushfire.

The use of aircraft plays an integral role in current firefighting strategies, particularly in the initial attack phase. Any decision to deploy aviation resources to an incident is based on a range of factors, including the actual and forecast weather conditions and the potential fire impacts. Wind farms are also considered in the preparation of Incident Action Plans for the suppression of bush fires in their vicinity.

Aerial firefighting suppression in close proximity to wind turbines may be inhibited at times, given that the aircraft operate under the Civil Aviation Safety Authority's *Visual Flight Rules* for navigation by visual reference. Pilots are necessarily required to maintain standard distances from wind turbines, as is the case with any other potential hazard such as power lines, transmission towers, mountains and valleys.

The NSW RFS has worked with other fire fighting agencies within the Australasian Fire and Emergency Services Council (AFAC) in developing a national position on wind turbines (see attached).

This position paper concluded that wind turbines are not expected to pose increased risks due to wind turbulence or the moving blades. Local wind speeds and direction are already highly variable across landscapes affected by turbulence from ridge lines, tall trees and buildings.

The AFAC paper also recommended that bush fire management issues are best treated in the planning stages of a wind farm project. Local planning controls are in place to regulate these issues with respect to any infrastructure development, and some controls may refer specifically to wind farms.

It is important to remember that aircraft alone do not extinguish fires. The most effective way of managing fire incidents is the use of ground-based resources, including fire fighting personnel, tankers and heavy plant, closely integrated with aircraft when required.

Rob Rogers
Deputy Commissioner
Executive Director Operations

Select Committee on Wind Turbines
Submission 97

afac
Australasian Fire and Emergency Service Authorities Council

Wind Farms and Bushfire Operations

Select Committee on Wind Turbines
Submission 97

Version Control

Version	Author	Edits	Date
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0.2	Gary Featherston	Updated wind farm numbers and included comments from earlier reviewers.	30 August 2013
0.3	Gary Featherston	Approved by the RLM group before edits to include EMR and Total fire ban legislation.	9 September 2013
0.4	Gary Featherston	Added comments provided by the Clean Energy Council.	19 September 2013
1.0	Gary Featherston	Approved by Council	24 October 2013
1.1	Gary Featherston	Minor revision to add monitoring towers.	15 September 2014
2.0	Gary Featherston	Approved by Council, published.	30 October 2014

Select Committee on Wind Turbines
Submission 97

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Select Committee on Wind Turbines
Submission 97

1 Introduction

Wind power is a rapidly expanding mode of renewable energy production in Australia with installed capacity doubling in the past five years. As of September 2013, Australia has 64 wind farms with an installed capacity of 3058 megawatts (MW), with another ten wind farms under construction.

The increasing number of wind farms makes it important for AFAC member agencies to clarify their position and to identify those issues important for their operations in and around these facilities.

2 Purpose

This is a position to state AFAC member agencies attitude towards wind farms and their development. It aims to clarify the risks in order to inform stakeholders including regulators, members of the community and the wind farm industry.

3 Scope

The scope of this paper is limited to the issues relating to planning for bushfire prevention, preparedness, response and to recovery operations in and around existing and planned wind farms.

It excludes the environmental, social and economic issues associated with wind farms. It does not provide any judgments on the values or otherwise of wind farms.

4 Position

Bushfire management issues are best treated at the planning stage of a wind farm project. This includes the impact of bushfires on the wind farm and the potential for fires to start within the development boundaries. Local planning controls are in place to regulate these issues with respect to any infrastructure development and some local planning controls refer specifically to wind farms.

Wind monitoring towers associated with wind farm investigations and planning can be very much taller than the planned turbines and can be less visible. The location and height of monitoring towers should be noted during aerial firefighting operations.

Wind farms can interfere with local and regional radio transmissions by physical obstruction and radio frequency electromagnetic radiation. Any interference can be minimised or eliminated though appropriate turbine siting at the planning stage and by moving away from the tower if experiencing local interference during operations.

Wind farms are an infrastructure development that must be considered in the preparation of Incident Action Plans for the suppression of bushfires in their vicinity. These considerations are routine and wind farms are not expected to present elevated risks to operations compared to other electrical infrastructure.

Title: Wind Farms and Bushfire Operations

Date Approved: 30/10/2014
Page 1

Aerial fire fighting operations will treat the turbine towers similar to other tall obstacles. Pilots and Air Operations Managers will assess these risks as part of routine procedures. Risks due to wake turbulence and the moving blades should also be considered. Wind turbines are not expected to pose unacceptable risks.

Wind farms are not expected to adversely affect fire behaviour in their vicinity. Local wind speeds and direction are already highly variable across landscapes affected by turbulence from ridge lines, tall trees and buildings.

Turbine towers are not expected to start fires by attracting lightning.

Turbines can malfunction and start fires within the unit. Automatic shutdown and isolation procedures are installed within the system. Although such fires may start a grass fire within the wind farm, planning for access and fire breaks can reduce the likelihood of the fire leaving the property. This risk from such fires is less than that of many other activities expected in these rural environments.

Wind farms may operate on days of Total Fire Ban subject to relevant national, state and territory legislation.

Liaison with wind farm operators and energy industry representatives during and after bushfires should aim to ensure minimal disruption to generation capacity and rapid resumption of essential services to the community.

5 Supporting Documentation

There's power in the wind: national snapshot.
Clean Energy Council, April 2012

There's power in the wind: fact sheet.
Clean Energy Council, June 2011

Both sourced from
http://www.cleanenergycouncil.org.au/resourcecentre/factsheets.html
on 29 August 2013

Emergency Management Guidelines for Wind Farms
Country Fire Authority, April 2007

Fact Sheet 10. Wind Farming, Electromagnetic Radiation & Interference.
Australian Wind Energy Association.
Sourced from
http://www.synergy-wind.com/documents/10Electromagnetic.pdf
9 September 2013

APPENDIX B

South Australian Country Fire Service Fact Sheet Understanding Aerial Firefighting

APPENDIX B

South Australian
COUNTRY FIRE SERVICE
Aircraft SUPPORT, *Firefighters* SUPPRESS

Understanding Aerial Firefighting

The CFS combats bush, grass, scrub and forest fires primarily through the deployment of fire appliances and firefighters for the protection of life, property and the environment. These resources are complimented in a number of areas of the State with farm fire units, as they are a valuable resource in the overall control strategy when available.

At times, firefighting operations may be supported by firefighting aircraft and/or earth moving plant and equipment. Firefighting aircraft are a limited resource and therefore CFS places these aircraft in locations where life and assets are at the highest risk. There is no guarantee that every fire in the State will be serviced by aircraft, and the primary form of fire suppression has, and will always be, firefighters on the ground.

Community expectations

The popular perception amongst much of the community is that aircraft alone can put out bushfires. This is not true. CFS firefighters and fire appliances for the vast majority of instances are the primary and only method of controlling bushfires.

In many cases smoke from the fire ahead of the fire front makes it very difficult, if not impossible, for aircraft to identify and bomb specific targets. Aircraft cannot fly through heavy smoke, as there is a real danger that dense smoke will cause a 'flameout' of the jet turbine engine which is used to power each rotary or fixed wing aircraft in the firefighting fleet.

Deployment of aircraft to fires

The deployment of aircraft to any fire is made after consideration of many variables, risks, aircraft suitability and aircraft availability. Once committed, the decision to attack a fire is made by the air attack supervisor and the CFS Officer on the ground, based on firefighting tactics and a dynamic risk assessment. This will include an assessment of localised weather conditions, the fire's behaviour, obstructions to aircraft in the area, smoke and its effect on visibility, assets at risk, and aircraft performance parameters.

The final decision to fly or not fly the mission remains with the pilot in command of the firefighting aircraft.

In some circumstances aircraft cannot be deployed due to other higher priority fires, unfavourable wind and weather conditions, adverse terrain or obstructions that prevent safe flying environments.

Where vertical obstructions exist in the airspace around a fire, such as powerlines, weather masts, radio and television transmission towers, tall trees and wind turbines, a dynamic risk assessment is undertaken prior to the aircraft being committed to fire bombing operations. In some circumstances aircraft will not be utilised because risks caused by vertical obstructions exceed safe operating conditions.

Remotely Piloted Aircraft and Drones

In the event that a Remotely Piloted Aircraft RPA *(this includes Unmanned Aerial Vehicles (UAVs) or Drones)* is detected operating within the vicinity of a fire, **CFS may suspend aerial firefighting operations until it is considered safe to resume.** If aerial firefighting operations are suspended, the CFS will instigate an immediate media alert to request that the drone operator cease operations, or if members of the community are aware of the drone operator to immediately contact Police.

For further information on Aerial Firefighting go to:
http://www.cfs.sa.gov.au

www.cfs.sa.gov.au
ABN 97 677 077 835

Government of South Australia

APPENDIX C

Aeronautical Study Abbreviations

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Aeronautical Study Abbreviations

Abbreviations

Abbreviations used in this report, and the meanings assigned to them for the purposes of this report are detailed in the following table:

Abbreviation	Meaning
AC	Advisory Circular (document support CASR 1998)
ACFT	Aircraft
AD	Aerodrome
AHD	Australian Height Datum
AHT	Aircraft height
AIP	Aeronautical Information Publication
Airports Act	Airports Act 1996, as amended
AIS	Aeronautical Information Service
ALA	Aeroplane Landing Area
Alt	Altitude
AMSL	Above Minimum Sea Level
A(PofA)R	Airports (Protection of Airspace) Regulations, 1996 as amended
APARs	Airports (Protection of Airspace) Regulations, 1996 as amended
ARP	Aerodrome Reference Point
AsA	Airservices Australia
ATC	Air Traffic Control(ler)
ATM	Air Traffic Management
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
Cat	Category
DAP	Departure and Approach Procedures (charts published by AsA)
DER	Departure End of (the) Runway
DEVELMT	Development
DME	Distance Measuring Equipment
Doc nn	ICAO Document Number nn
DoIT	Department of Infrastructure and Transport. Also called “Infrastructure”. (Formerly Department of Infrastructure, Transport, Regional Development and Local Government (DITRDLG) and previously the Department of Transport and Regional Services (DoTARS))
DITRDLG	See DoIT above
DOTARS	See DITRDLG above
ELEV	Elevation (above mean sea level)
ENE	East North East
ERSA	Enroute Supplement Australia

Abbreviation	Meaning
FAF	Final Approach Fix
FAP	Final Approach Point
ft	feet
GA	General Aviation
GNSS	Global Navigation Satellite System
GP	Glide Path
IAS	Indicated Airspeed
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IHS	Inner Horizontal Surface, an Obstacle Limitation Surface
ILS	Instrument Landing System
ISA	International Standard Atmosphere
km	kilometres
kt	Knot (one nautical mile per hour)
LAT	Latitude
LLZ	Localizer
LONG	Longitude
LSALT	Lowest Safe Altitude
m	metres
MAPt	Missed Approach Point
MDA	Minimum Descent Altitude
MGA94	Map Grid Australia 1994
MOC	Minimum Obstacle Clearance
MOS	Manual of Standards, published by CASA
MSA	Minimum Sector Altitude
MSSR	Monopulse Secondary Surveillance Radar
MVA	Minimum Vector Altitude
NASAG	National Airports Safeguarding Advisory Group
NDB	Non Directional Beacon
NE	North East
NM	Nautical Mile (= 1.852 km)
nnDME	Distance from the DME (in nautical miles)
NNE	North North East
NOTAM	NOtice To AirMen
OAS	Obstacle Assessment Surface
OCA	Obstacle Clearance Altitude
OCH	Obstacle Clearance Height
OHS	Outer Horizontal Surface
OIS	Obstacle Identification Surface
OLS	Obstacle Limitation Surface
PANS-OPS	Procedures for Air Navigation Services – Aircraft Operations, ICAO Doc 8168
PRM	Precision Runway Monitor

Abbreviation	Meaning
PROC	Procedure
PSR	Primary Surveillance Radar
QNH	An altimeter setting relative to height above mean sea level
Rnnn	Restricted Airspace – promulgated in AIP as R with 3 numbers
REF	Reference
RL	Relative Level
RNAV	aRea NAVigation
RNP	Required Navigation Performance
RPA	Rules and Practices for Aerodromes — replaced by the MOS Part 139 — Aerodromes
RPT	Regular Public Transport
RWY	Runway
SFC	Surface
SID	Standard Instrument Departure
SOC	Start Of Climb
SSR	Secondary Surveillance Radar
STAR	Standard ARrival
TAR	Terminal Area Radar
TAS	True Air Speed
THR	Threshold (Runway)
TNA	Turn Altitude
TODA	Take-Off Distance Available
VFR	Visual Flight Rules
V_n	aircraft critical Velocity reference
VOR	Very high frequency Omni directional Range