

SGS HART AVIATION

REPORT ON AVIATION RELATED ISSUES

SITE:	COOPERS GAP WIND FARM
ON BEHALF OF:	AECOM
PROJECT NUMBER:	16-0012-01
ASSESSMENT DATE:	15 March 2016
ADVISOR:	Mel Dunn

CONFIDENTIAL





	Advisory on Coopers Gap Wind Farm for AECOM	Page: 2 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

TABLE OF CONTENTS

EXECUTIVE SUMMARY	4
1. TERMS OF REFERENCE	5
2. SCOPE OF CONSIDERATION.....	5
3. REVIEW OF COOPERS GAP WIND FARM.....	5
3.1. Methodology.....	5
3.2. Assumptions, Limitations & Exclusions	6
3.3. Overview of Proposed Wind Farm	6
3.4. Specific Issues and Associated Risk Assessment	6
3.4.1. Airfields in the vicinity of the proposed wind farm.....	6
3.4.2. Aviation Operations - General	8
3.4.3. Reference masts for meteorological monitoring	10
3.4.4. Airspace considerations	11
3.4.5. Aerial fire fighting activities	15
3.4.6. Aerial agricultural operations	15
3.4.7. Rural ambulance services	16
3.5. Coopers GAP Wind Farm and Aviation Safety.....	16
3.5.1. Obstacle lighting – current regulatory situation	16
3.5.2. Risk to aviation operations – general	17
3.5.3. Comparisons with other wind farm developments.....	19
4. SUMMARY COMMENTS	20
5. CONCLUSIONS.....	23
6. ABBREVIATIONS USED IN THIS REPORT.....	24

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 3 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD


7. APPENDICES	25
7.1. Excerpt from WAC (3340) – Brisbane {20 th Edition}.....	25
7.2. Excerpt from VNC- 4 Brisbane {12 November 2015}.....	26
7.3. Excerpt from En Route Chart (ERC) Low–Brisbane/Townsville L4 {12 November 2015}.....	27
7.4. Excerpt from ERC High H1 {12 November 2015}.....	28
7.5. General View of Area of Wind Farm.....	29
7.6. Coopers GAP Wind Farm Study Area Showing Tentative Position of Wind Turbines within Corridor Concept	30
7.7. NASAG Obstacle Lighting Standard for Wind Turbines & Wind Monitoring Towers	31
7.8. Aircservices Aviation Assessments for Wind Farm Developments Policy	32
7.9. Excerpts from CASA Manual of Standards (MOS) 139.....	35
7.10. ICAO ANNEX 14 Recommendations Rewind Farms	36

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	Advisory on Coopers Gap Wind Farm for AECOM	Page: 4 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

EXECUTIVE SUMMARY

SGS HART Aviation undertook an aviation assessment, including investigating local aircraft movements and locations of nearby airfields, to determine the potential impact on aviation operations of the proposed Coopers Gap Wind Farm and the need or otherwise for obstacle lighting.

As a result of this aviation assessment, SGS HART Aviation reached the considered view that the risk to civil aviation operations in the vicinity of the proposed Coopers Gap Wind Farm is low.

However, the proposed maximum height of the wind turbines (180m) being above 500 ft (~152.4m) is such that the tips of the blades will penetrate navigable airspace and this is a cause for concern.

Further, there is some evidence that low level military jet operations occur in the region. Consultation with the Department of Defence is, therefore, necessary.


As a consequence of the assessment by SGS HART Aviation, if the wind turbines are to be higher than 500ft (152.4m), it is recommended that obstacle lights should be installed in accordance with the recommendations of ICAO Annex 14.

If the wind turbines were of a height less than 500ft (152.4m), SGS HART Aviation considers that obstacle lights would not be necessary in respect of the proposed Coopers Gap Wind Farm, at least for civil operations. If low level military aircraft operations are to be held in the vicinity at night or in low visibility conditions, then obstacle lights would be deemed to be necessary.

Further, SGS HART Aviation recommends that, if it has not already been done, the top 1/3rd of the existing and any proposed Meteorological (met) masts / wind monitoring towers be painted in alternating contrasting bands of colour and marker balls or high visibility flags or sleeves be placed on the outside guy wires consistent with the recommendations of the National Airports Safeguarding Advisory Group (NASAG) Guideline D.

An essential risk mitigation feature is for the wind turbines to be identified on the relevant aeronautical charts i.e. both the civil WACs and the RAAF produced chart series.

Pending such identification on maps, it is advisable to ensure that all potentially affected aviation operators are made aware of the planned existence of the wind farm. Airservices, if they were made aware of the wind farm, would normally do this via NOTAM action covering both the construction phase and prior to identification on maps. Such NOTAMs could include advice as to the presence of met masts / wind monitoring towers as well. It is, therefore, essential that the wind farm developer advise both Airservices and the RAAF AIS.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 5 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

1. TERMS OF REFERENCE

AECOM commissioned SGS HART Aviation to undertake a review of aviation-related issues potentially associated with the proposed Coopers Gap Wind Farm, situated northwest of Brisbane.

As part of this review, SGS HART Aviation was particularly requested to provide specialist advice in relation to any lighting requirements for the project.

2. SCOPE OF CONSIDERATION

SGS HART Aviation was required to address the following scope of works: -


- Assessment of all the aviation-related issues relevant to the Coopers Gap Wind Farm area:
 - i. Including risk assessment issues; and
 - ii. Liaison with AECOM as necessary.
- Review the need, or otherwise, for obstacle lighting:
 - iii. Assessment of risks associated with aviation operations and the need or otherwise for obstacle lighting:
 - a. Using AS/NZ 4360 risk assessment methodology as necessary.
 - iv. Liaison with CASA and Airservices regarding requirements.

3. REVIEW OF COOPERS GAP WIND FARM

3.1. Methodology

In SGS HART Aviation's considerations of the issues, the following approach was taken: -

- Assessment and review of all aviation related elements associated with the site including:
 - Charts, maps, airspace (including Prohibited, Restricted and Danger areas [PRDs]), airfield and airstrip guides / directories, en route and visual terminal charts, Notices to Airmen (NOTAMs), etc.
- Review all aviation activities and potential aviation activities occurring or likely to occur within the boundaries of the proposed wind farm or potentially affected by the presence of the wind farm, including both civil and military operations.
- Consideration of the relevance of any Australian regulatory authority requirements and international standards, recommendations and guidelines.
- On the basis of the above assessments, assessment of risks associated with aviation operations and the need or otherwise for obstacle lighting.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 6 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

3.2. Assumptions, Limitations & Exclusions

No specific assumptions, limitations and exclusions exist.

The information and any assessments contained within are based on the information provided by AECOM and independent research of the Coopers Gap Wind Farm and its surrounds.

3.3. Overview of Proposed Wind Farm

The proposed Coopers Gap Wind Farm is located approximately 45km west southwest of Kingaroy in the South Burnett region of Queensland. The region has some areas of rain forest, but is predominantly rural and is Queensland's largest wine region.

The area of the project site (including involved properties) is spread over 99.056km² (approximately 9,906 hectares), with the wind turbines to be generally located on the ridge tops in the Great Dividing Range in the area. See Appendices 7.5 & 7.6.

The wind turbines and associated infrastructure (access roads, transmission infrastructure, etc) will be located within a corridor along the ridge tops, rather than a set wind turbine layout, as shown in Appendix 7.6. The current turbine layout is modelled on the Vestas V126 wind turbine but the set of parameters that the final selection must fit within are as follows: -

Wind Farm Feature	Statistic
Number of turbines	Up to 115*
Maximum tip height	180m
Maximum rotor diameter	140m

*Although the corridor can probably hold a maximum of 115 turbines, as advised by AGL a nominal layout of 102 turbines has been used for this assessment to provide a worst case scenario in terms of turbine tip height.

3.4. Specific Issues and Associated Risk Assessment


3.4.1. Airfields in the vicinity of the proposed wind farm

In assessing the impact on aviation operations it was necessary to identify what aviation operations exist within, or in the vicinity of, the nominated area.

As a matter of principle, an area of 30km from any proposed wind farm site is normally investigated for any aviation-related activities even though Obstacle Limitation Surfaces (OLS) do not extend beyond 15km from even the largest aerodromes. Whilst this is recognised as a conservative approach, to meet Airservices' needs consistent with the policy as stated in Appendix 7.8, the area investigated was extended to 30nm (55.56km).

As will be seen from later comments, no airfields or aerodromes were identified in the vicinity of the proposed wind farm site which would be impacted, nor would any associated obstacle limitation surfaces be affected.

Aerodromes or airfields outside a radius of approximately 30km from a wind farm site are not generally specifically considered of concern. Operations from aerodromes beyond 30km are covered under general comments later under Aviation Operations – General.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 7 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

Licensed aerodromes:

It was determined that there are no licensed aerodromes (Registered or Certified) in the vicinity of the Coopers Gap Wind Farm.

The nearest Certified aerodrome is at Kingaroy, approximately 45km east-north-east of the area. As such, there are no issues of concern regarding the possibility of any penetration on the OLS of any licensed aerodrome.

Unlicensed aerodromes:

Only two unlicensed aerodromes were identified within, or close to, 30km from the wind farm site as detailed below: -

Lyndley Station

Lyndley Station is an unlicensed aerodrome approximately 21km to the southwest of the wind farm site. This aerodrome is identified on the World Aeronautical Chart (WAC) (3340) BRISBANE as shown in Appendix 7.1.

This private airstrip has a 1,270m unsealed grass strip oriented 06 – 24. Permission is required prior to use.

This airstrip is suitable for private small light aircraft VFR operations only and the presence of the Coopers Gap Wind Farm would have no impact on any such operations. See also later comments re VFR operations.

Jimbour House

Jimbour House is a private unlicensed airfield located approximately 32km to the southwest of the wind farm site. The airfield is not identified on the relevant WAC (3340) BRISBANE.


Jimbour House is reported to have one sealed strip, 915m long, oriented 07 – 25. Manual lighting is available for an emergency operation. Permission is required prior to use.

This airstrip is suitable for private small light aircraft VFR operations only and the presence of the Coopers Gap Wind Farm would have no impact on any such operations. See also later comments re VFR, IFR and Night VFR operations.

If one extends the area of consideration out to 30nm (55.56km) from the proposed Coopers Gap Wind Farm site, three other airfields come into play as follows: -

Trevanna Station

This is a small unlicensed airstrip approximately 22nm (40.74km) east of the proposed Coopers Gap Wind Farm site. It has a grass strip 750m long, oriented 08 – 26. This airstrip would only be suitable for private small light aircraft VFR operations and the presence of the Coopers Gap Wind Farm would have no impact on any such operations. It is marked as “emergency use only”.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 8 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

Nanago (Joe Anderson Airfield)

This is a small unlicensed airstrip approximately 27nm (50km) nor-nor-east of the proposed Coopers Gap Wind Farm site. It has a grass strip 1,000m long, oriented 05 – 23. This airstrip would only be suitable for private small light aircraft VFR operations and the presence of the Coopers Gap Wind Farm would have no impact on any such operations.

Dalby

This is an uncertified aerodrome some 27nm (50km) south of the proposed Coopers Gap Wind Farm site. The aerodrome has two sealed strips, one 915m long, oriented 04 – 22 and the other 1,265m long, oriented 13 – 31. The aerodrome operator is Western Downs Regional Council. Pilot activated lighting is available for night operations. This aerodrome can operate medium sized regional aircraft. Gliding, hang gliding and ultralight operations are also carried out from this aerodrome. Permission is required prior to use. The presence of the Coopers Gap Wind Farm would have no impact on any operations from this aerodrome.

Other aerodromes

A comprehensive search of all available documentation on airfields including, the En Route Supplement Australia (ERSA), the Aircraft Owners and Pilots Association (AOPA) National Airfield Directory and FightAce® Country Airstrip Guide, failed to identify any other airstrips within the immediate vicinity of the proposed Coopers Gap Wind Farm site.

3.4.2. Aviation Operations - General

VFR Operations

Whilst there are some exceptions in respect of operations that require low flying (e.g., during takeoff and landing, search & rescue and agricultural spraying operations) pilots undertaking VFR operations (i.e., during daylight hours) must not fly over:


- Any city, town or populous area, at a height lower than 1,000ft; or
- Any other area at a height lower than 500ft.

The regulations define the height specified above as the height above the highest point of the terrain vertically below the aircraft, and any object in it, within a radius of 600m for aircraft and 300m for helicopters. In principle, therefore, all VFR aircraft operations should be above the level of any wind turbines. However, any objects extending higher than 500ft above the terrain clearly penetrate navigable airspace and this should not be overlooked in assessing the potential impact of wind farms on aviation operations.

In any event, the wind turbines should be clearly visible to pilots undertaking VFR operations.

IFR and Night VFR Operations.

Such operations would be undertaken under either Night VFR or IFR flight plan conditions, which require operations not below the Lowest Safe Altitude (LSALT), except when landing or taking off.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 9 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

In principle: -

- a. Where the highest obstacle is more than 360ft above the height determined for terrain, the LSALT must be 1,000ft above the highest obstacle; or
- b. Where the highest obstacle is less than 360ft above the terrain, or there is no charted obstacle, the LSALT must be 1,360ft above the elevation determined for terrain; except that
- c. Where the elevation of the highest terrain or obstacle in the tolerance area is not above 500ft, the LSALT must not be less than 1,500ft.

Civil Aviation Regulations require that, unless it is necessary for takeoff or landing, a Night VFR aircraft must not be flown at a height less than 1,000ft above the highest obstacle within a 10nm (~18.5km) radius of the aircraft in flight.

In the circumstances, the Coopers Gap Wind Farm should have no impact on civil Night VFR or IFR operations which may occur in the vicinity, possibly originating from the closest certified aerodrome at Kingaroy.

As per VFR operations, the altitude limitations in respect of both civil Night VFR and IFR operations as mentioned above are important in the context of assessing whether obstacle lights are required or not for the wind turbines.

Gliding operations

Gliding operations may occur in the vicinity of the proposed Coopers Gap Wind Farm. Such operations do originate from Kingaroy Airport and other airfields south of the Coopers Gap Wind Farm site.


Gliding operations would be subject to the same constraints as VFR operations mentioned above and the presence of the wind farm should not have any impact on such operations. However, knowledge of the presence of the wind farm is essential to ensure that gliding operators avoid the area in the event of a need for an outlanding. See Section 3.4.4 re airspace considerations and the need for advice to Airservices Australia and the RAAF.

SGS HART Aviation was advised that, through the Community Infrastructure Designation process, the Gliding Federation of Australia (GFA) will be consulted. In this respect, SGS HART Aviation has noted that the Queensland Gliding Association has been advised of the proposal and the existence, position and height of the five temporary development Meteorological (met) masts installed at the site of the proposed Coopers Gap Wind Farm.

Hang Gliding and Paragliding operations

No evidence was found of any hang gliding and paragliding occurring in the region with the exception of Dalby which is too far away to be of any concern. However, such operations are often launched from ridges on hills in areas similar to that where the Coopers Gap Wind Farm is proposed to be built.

There are precedents where safe launch areas have been provided within a wind farm complex by, for example, ensuring the nearest turbine being a minimum of 1,000m forward of the launch area and with more than 300m between the blade tips of wind turbines on either side of the designated launch area. If such becomes an issue, it is advised to liaise with the local hang gliding association to establish an agreed position.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 10 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

AECOM has indicated that, whilst it is not inclined to encourage any hang gliding operations within the confines of the Coopers Gap Wind Farm it will, through the Community Infrastructure Designation process, liaise with the Hang Gliding Federation of Australia to discuss the issues. In this respect, SGS HART Aviation has noted that the Queensland Hang Gliding Association has been advised of the proposal and the existence, position and height of the five temporary development met masts installed at the site of the proposed Coopers Gap Wind Farm.

3.4.3. Reference masts for meteorological monitoring

Wind monitoring masts are usually present on proposed wind farm sites as a source of preliminary wind data for the project.


SGS HART Aviation was advised that five temporary development met masts have been installed at the site of the proposed Coopers Gap Wind Farm. The coordinates and heights of these met masts are shown below.

Met Mast	Easting	Northing	Height (max)
CG1	347122	7042866	61m (tubular)
CG2	345634	7039537	61m (tubular)
CG3	347396	7045895	82m (lattice)
CG4	348402	7039566	82m (lattice)
CG5	336703	7048697	62m (tubular)
Co-ordinate system is UTM zone 56, MGA94 datum			

SGS HART Aviation comments that wind monitoring masts, particularly those of a light lattice structure, can be quite difficult to see. For this reason, these masts may be of particular concern to any local aerial agricultural operators. It is, therefore, very important that advice as to the presence of these masts is readily available.

SGS HART Aviation draws particular attention to the measures recommended in the National Airports Safeguarding Advisory Group (NASAG) Guideline D {excerpt at Appendix 7.7}, which, among other things, recommends as a minimum contrasting colours and marker balls should be used. The NASAG Guideline also suggests a flashing strobe light during daylight hours as an alternative. Since the area is considered to be a relative low risk area from an aviation operational perspective, and the presence of the temporary development met masts has been provided to, among others, the Aerial Agricultural Association of Australia (AAAA), SGS HART Aviation considers that a flashing strobe light is not necessary. However, SGS HART Aviation recommends that, if it has not already been done, the top 1/3rd of the wind monitoring towers be painted in alternating contrasting bands of colour and marker balls or high visibility flags or sleeves be placed on the outside guy wires. This is consistent with the NASAG Guideline D and such action will assist in allaying some of the fears of the aerial agricultural community.

Since the height of the met masts / wind monitoring masts is less than 110m, these monitoring towers are not required to be reported to the Civil Aviation Safety Authority (CASA) under Civil Aviation Safety Regulation (CASR) 139.365, which requires CASA to be informed of structures 110m or more above ground level.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 11 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

However, the CASA Advisory Circular AC 139-08(0) of April 2005 “Reporting of Tall Structures” refers to the fact that the RAAF Aeronautical Information Services (AIS) has been assigned the task of maintaining a database of tall structures the top measurement of which is: _

- 30m or more above ground level - within 30km of an aerodrome, or
- 45m or more above ground level elsewhere.

The principles of the Advisory Circular are sound and it is strongly recommended that the existence of any such met masts / wind monitoring towers is advised in accordance with the procedures mentioned in the referenced Advisory Circular. (See also Section 3.4.4 c).

SGS HART Aviation has noted that the CASA has been notified of the above met masts. It is further noted that the Department of Defence has been advised of the proposal and the existence, position and height of the five temporary development met masts installed at the site of the proposed Coopers Gap Wind Farm.

3.4.4. Airspace considerations

In assessing the potential impact on aviation operations the En Route Charts (ERC), Visual Terminal Charts (VTC), Visual Navigation Charts (VNC) and Terminal Area Charts (TAC) potentially relevant to the area concerned were studied in depth.

In addition, the Designated Airspace Handbook and the relevant World Aeronautical Chart [WAC] (3340) BRISBANE were studied for any issues of concern.


The proposed Coopers Gap Wind Farm is in Class E airspace. It is well clear (below) the airspace control zones for Oakey, Amberley, Kingaroy and Brisbane Airports and the operating height of aircraft over the area is such that the presence of the wind farm would have no effect at all. There are no aircraft traffic control issues nor is there any potential influence on any instrument approach procedures or aeronautical navigation aids.

The nearest Danger Area is D664, which is the flying training area for Kingaroy Airport, will not be affected. Other Restricted or Danger Areas have been identified in the Oakey military control zone, but these are too far away to be of any concern.

No active Notices to Airmen (NOTAM), which might impact on the development of the wind farm, were found.

It is noted that “high speed low level military jets operating random routes” are identified as possible within the vicinity of the proposed Coopers Gap Wind Farm. See the excerpt from the Visual Navigation Chart (VNC-4) BRISBANE at Appendix 7.2. This may very well be of concern and it is necessary to consult with the Department of Defence on this matter. See c) below.

Although only one particular issue of concern has been identified in respect of airspace considerations, it is considered that there is still a need for consultation with CASA, Airservices and the Department of Defence and particular comments on this follow. SGS HART Aviation was advised that, through the Community Infrastructure Designation process, AECOM will liaise with those organisations as required, indeed SGS HART Aviation saw evidence that much had already been done in this respect.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 12 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

a) CASA

It is considered advisable that CASA be informed of the proposed Coopers Gap Wind Farm. This will give an opportunity to CASA to comment. It will also serve to alert CASA as to the number and proposed heights of the wind turbines in anticipation of the formal requirement to advise CASA of any obstacles which will be 110m or more above ground level – CASR 139.365 refers. This is not designed to anticipate any requirements for obstacle lights or to seek a CASA view on such. This is a matter for later consideration. (See 3.5 below).

Such liaison has already been undertaken and it is understood will continue to occur through the Community Infrastructure Designation process.

b) Airservices.

The proposed Coopers Gap Wind Farm will not affect any sector or circling altitude, nor any approach or departure altitudes. It is, however, necessary to consider in some more detail the possible effect on en route LSALT.

In reviewing the proposed location of the wind turbines SGS HART Aviation received advice that the highest wind turbine within the proposed wind farm will likely be approximately 839.9m (i.e. ~2,756ft) amsl. This means that the highest wind turbine proposed to be installed (i.e. 180m high, ~ 590ft) would be 1,019.9m (i.e. ~3,346ft) amsl at the tips (i.e. ground level + 590ft). By definition [see Section 3.5.2 a)] the minimum LSALT required to ensure clearance of all the wind turbine “obstacles” would then be 3,346ft + 1,000ft = 4,346ft.


In reviewing the particular routes which pass over or within 10nm of the proposed wind farm, the following have been identified: -

Route	Way points	LSALT
V179	Ibuna to Taroom	LSALT 5,300ft
W196	Jedda to Taroom	LSALT 5,300ft
W347	Oakey to Gayndah	LSALT 5,200ft
W698	Kingaroy to Oakey	LSALT 4,900ft

The above routes are identified on the En Route Chart (ERC) Low L4 – excerpt shown at Appendix 7.3.

The ERC High H1 covering the area concerned was also studied. An excerpt is shown at Appendix 7.4. In reviewing the particular routes which pass over or within 10nm of the proposed wind farm, the following have been identified: -

Route	Way points	LSALT
V179	Ibuna to Taroom	LSALT 5,300ft
A464	Tezza to Taroom	LSALT 5,900ft
A464	Taroom to Tezza	LSALT 5,300ft
G326	Winky to Morro	LSALT 5,100ft
V327	Rollo to Hawke	LSALT 4,700ft

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 13 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

It will be seen that in all cases the defined LSALT for the listed routes are more than 1,000ft higher than the highest proposed wind turbine and, as such, the proposed Coopers Gap Wind Farm development will not impact on LSALT of any of the identified routes which pass over or within 10nm of the proposed wind farm.

There is one additional route which was assessed, viz: -

Route	Way points	LSALT
W 270	Oakey to Taroom	3,200ft
W 270	Taroom to Oakey	3,600ft

This route was particularly assessed as it was noted that the minimum LSALT was 3,200ft – i.e. well below the identified LSALT to overfly within 10nm of the proposed wind farm, yet this route seemed to be close enough to warrant assessment. SGS HART Aviation was advised that the ground level of the ridges on which the wind turbines are proposed to be placed varies between 551.5m and 839.9m – i.e. ~1,809ft to 2,756ft amsl. This would mean that, if no wind turbines were present at all, the LSALT required over the site would be 3,756ft – somewhat more than the minimum defined LSALT of 3,200ft for route W 270. SGS HART Aviation reached the view, therefore, that the LSALT for route W 270 has already taken into account the existing terrain within 10nm of that route and no changes to the defined LSALTs for that route would be likely required as a consequence of the establishment of the Coopers Gap Wind Farm.

Following the above considerations, therefore, SGS HART Aviation is of the view that there will be no effect on any en route LSALTs as a result of the establishment of the Coopers Gap Wind Farm as proposed.


It is well appreciated that Airservices will likely undertake its own independent assessment after receiving the data on the proposed wind farm. Whilst considered to be unlikely, Airservices may very well reach a different view regarding the effect on established LSALTs for the various routes. In that event, there may be a charge imposed on the proponent for any assessment exercise and any necessary changes which Airservices might consider need to be made to the relevant aeronautical charts.

Regardless, any changes to LSALTs that might arise would have limited, if any, adverse impact on aircraft operations over the routes concerned.

The proposed Coopers Gap Wind Farm will not impact on Precision/Non-Precision Navigational Aids, HF/VHF Communications, Advanced Surface Movement Guidance and Control Systems, Radar or Satellite/Links.

In respect of civil radar sites, the nearest radar identified is at Brisbane, some 90 – 100nm southeast of the proposed Coopers Gap Wind Farm site. This is primary and secondary surveillance radar. The remoteness of this radar from the proposed Coopers Gap Wind Farm site is such that SGS HART Aviation is of the view that the presence of the wind farm will have no adverse effect on the operation of such radar.

Whilst Airservices works closely with CASA in respect of airspace considerations and other matters, there is value in advising that organisation separately, in respect of the proposed wind farm development and for any met masts / wind monitoring masts. Sometimes Airservices chooses, in consultation with CASA, to issue a Notice to Airmen (NOTAM) advising of associated hazards. There is also a close link between Airservices AIS and the RAAF AIS.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 14 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

As indicated earlier, SGS HART Aviation undertook a search of the Aircservices' web site and did not discover any NOTAMs relevant to the proposed Coopers Gap Wind Farm site.

c) Department of Defence & RAAF AIS.

Among other things, the RAAF Aeronautical Information Service (AIS) issues (military) aviation charts defining low level operational routes used by the RAAF aircraft. These often cover low level jet aircraft operations.

SGS HART Aviation has held discussions with the Department of Defence in an endeavour to obtain specific information on the above matters in respect of the proposed Coopers Gap Wind Farm. The Department of Defence proved reluctant to provide specific information and advised formally as follows: -

“Land Planning & Spatial Information (LPSI) coordinates the Defence assessment of wind farm proposals. The Defence assessment not only ascertains any impact on the aviation activities of RAAF, Army and Navy but also any impact on Defence communications and the operation of Defence Radars. Please forward any proposals to LPSI.Director@defence.gov.au for Defence assessment.”

Despite the above formal position, which clearly needs to be taken into account, SGS HART Aviation undertook its own assessment of the situation.

It is noted that in one other wind farm development known to SGS HART Aviation the RAAF raised one concern to do with the marking of temporary meteorological masts and improved marking was implemented. As noted above in 3.4.3 there are temporary wind monitoring masts present in the area of the proposed Coopers Gap Wind Farm. Consequently, there is a need to advise the RAAF of those masts. It is understood that this has already been done by AECOM.


It is noted that “high speed low level military jets operating random routes” are identified as possible within the vicinity of the proposed Coopers Gap Wind Farm. See the excerpt from the Visual Navigation Chart (VNC-4) BRISBANE at Appendix 7.2. This may very well be of concern and it is necessary to consult the Department of Defence on this matter as advised above. It should be noted that there is evidence that the Department of Defence has some flexibility in its approach. There is at least one known precedent (in respect of a WA development) where the RAAF varied its defined low level route to accommodate a development.

Note that it will be particularly important to determine if any low flying night operations are planned as this will strongly influence the need or otherwise for obstacle lighting on the wind turbines. If low level night operations were proposed in the vicinity of the Coopers Gap Wind Farm, it is considered that obstacle lighting would be mandatory.

The only military Restricted or Danger Areas identified anywhere near the proposed Coopers Gap Wind Farm are within the Oakey military control zone and the presence of the Coopers Gap Wind Farm will have no effect on these.

SGS HART Aviation has not identified any adverse effects on primary radar (civil or military) or secondary surveillance radar which would arise as a result of the establishment of the Coopers Gap Wind Farm.

The nearest military radar identified is at Oakey, approximately 43nm southeast of the proposed Coopers Gap Wind Farm site. The next nearest is at Amberley, approximately 84nm southeast of the proposed Coopers Gap Wind Farm site. The remoteness of these radars from the proposed Coopers Gap Wind Farm site is such that SGS HART Aviation is of the view that the presence of the wind farm will have no adverse effect on the operation of such radars.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 15 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

The above view has not the least been influenced by a recent decision of the US Federal Aviation Administration (FAA) in respect of a wind farm planned off the coast of Massachusetts. In this case the FAA said that, because the wind farm will be located more than 2.4nm (4.4km) from the closest radar sites, there will be no effect on radar images.

Consequently, SGS HART Aviation considers that the only potential adverse effect on Defence-related operational issues will be associated with the low level jet operations in the vicinity. There is, therefore, an absolute need for a formal approach to the Department of Defence to be made to address this matter, if it has not already been done.

Note that it is the RAAF AIS which keeps and manages a central aeronautical data base of tall structures, including those reported in accordance with the advice detailed within the AC 139-08(0), mentioned in Section 3.4.3 above. This data base is made available for use by other mapping agencies and the RAAF AIS liaises closely with Airservices' AIS in this respect.

3.4.5. Aerial fire fighting activities

Aerial fire fighting activities can be separated into two elements – those using helicopters and those using fixed wing aircraft.

SGS HART Aviation is of the opinion that any operations of fixed wing aircraft for fire fighting purposes within the confines of the proposed Coopers Gap Wind Farm would be hazardous and are not recommended. This is a position held in respect of all wind farms.

The operation of helicopters within the confines of the wind farm is perhaps possible, but not desirable.

It is also possible that aerial fire fighting could be undertaken above the level of the wind turbines (i.e. above the highest possible turbine, viz: ~590ft in the case of the proposed Coopers Gap Wind Farm), but dropping water or retardant from this height would reduce the effectiveness. This is a matter for the expert fire fighting operators to assess.

The position in respect of the proposed Coopers Gap Wind Farm is no different from any other wind farm.

Helicopter or fixed wing aircraft operations within the confines of any wind farm and below the top of the wind turbines are potentially hazardous and not recommended.


3.4.6. Aerial agricultural operations

Agricultural aerial spraying and, possibly, fertilising, may occur in the region and it is, perhaps, important to understand the position of the aerial agricultural fraternity in respect of wind farms.

The Aerial Agricultural Association of Australia (AAAA) holds the view that wind farms and their pre-construction wind monitoring towers are a direct threat to aviation safety and especially aerial application.

It should be noted that aerial application includes not only spraying but also seeding and the spreading of fertilisers.

Aerial agricultural operations generally occur between 20 – 30m from the ground. Any objects, such as a wind turbine, which penetrate the airspace above 20 – 30m, will need to be taken into account if planning to undertake any such aerial agricultural operations.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 16 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

It should be noted, of course, that it is standard operating practice that any approved low level operations, by their very nature, are required to check for any obstacles which might impact on such operations, before undertaking any such operations. Except in special cases where night spraying of crops is deemed necessary, all such operations would be day VFR. No such “special cases” are deemed to exist in the region.

Aerial agricultural operations from any airstrips which might be established on the fringes of the proposed wind farm and clear of any wind turbines could be undertaken satisfactorily as agricultural operators are familiar with operating from constrained areas.

In summary, aerial spraying, seeding or fertilising operations, be they by helicopter or fixed wing aircraft, within the confines of any wind farm and below the top of the wind turbines is potentially hazardous and not recommended.

3.4.7. Rural ambulance services

The existence of wind turbines does have the potential to limit the flexibility of operations of helicopter ambulance services within the confines of the wind farm, but it would not be an issue outside the boundaries of the wind farm.

For fixed wing air ambulance operations it is an issue which is not considered relevant to the proposed Coopers Gap Wind Farm. Such services do not exist within the confines of the proposed wind farm site now and the presence of the wind farm would not change that position. In the event that an air ambulance operation is required, it is probable that the runway at Kingaroy Airport would be used. This available option will not change with the construction of the Coopers Gap Wind Farm.

The potential impact on either helicopter or fixed wing ambulance services are common factors for all wind farms. The situation in respect of the proposed Coopers Gap Wind Farm does not raise any different or special issues.


3.5. Coopers GAP Wind Farm and Aviation Safety

3.5.1. Obstacle lighting – current regulatory situation

Before commenting on the need, or otherwise, for obstacle lighting on the proposed wind turbines within the Coopers Gap Wind Farm, it is thought necessary to summarise the current regulatory position in this respect within Australia.

CASA powers in respect of the control of obstacles in and around aerodromes flow from the Civil Aviation Regulations 1988 (CAR), Part 9, Subpart 95, which provides for the marking or removal of hazardous objects within the OLS of any aerodrome. For major aerodromes, the OLS could extend up to 15 km from the aerodrome.

CASR 1998, Subpart 139.E covers the specific definitions of hazardous objects and the reporting requirements.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 17 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

In summary CASR 139.E requires: -

1. Aerodrome operators to monitor the surrounding airspace for any object that might infringe the OLS and to notify CASA;
2. Any person who proposes to construct any structure which will be 110m or more AGL to inform CASA; and
3. CASA may determine whether the proposed structure(s) will be a hazardous object because of its location, height or lack of marking or lighting.

Detailed aerodrome design requirements are within the CASA Manual of Standards 139 – Aerodromes. Chapter 7 covers the detailed requirements for Obstacle Restriction and Limitation.

In support of the above regulations, CASA issued two Advisory Circulars; viz:

- AC 139-08(0) “Reporting of Tall Structures” April 2005; and
- AC 139-18(0) “Obstacle Marking and Lighting of Wind Farms” December 2005.


There is no doubt that CASA has the necessary regulatory powers to control the marking and removal of hazardous objects within the OLS around aerodromes and for the reporting of tall structures. However, there is some question as to CASA’s powers to insist on marking and / or lighting of obstacles outside the OLS of an aerodrome. As a consequence, in mid 2008, CASA withdrew Advisory Circular AC139-18(0) and initiated an internal review process to look at how wind farms located near aerodromes are assessed and regulated. Subsequently, following the release of the Australian Government’s National Aviation Policy White Paper in December 2009, the Department of Infrastructure and Transport, which was then the policy department of Government overseeing CASA (it is now the Department of Infrastructure and Regional Development), established a National Airports Safeguarding Advisory Group (NASAG). Amongst other things, NASAG developed a draft Guideline D “Managing the Risk of Aviation Safety of Wind Turbine Installations (Wind Farms)/Wind Monitoring Towers”. This was first released in draft form in February 2012 as Version 4.1.1. The latest version is 4.1.3, dated 15 July 2012.

The principles of the NASAG Guideline D (an excerpt of which is included at Appendix 7.7) are being upheld in this aviation assessment.

3.5.2. Risk to aviation operations – general

In an overall sense, the view is that the risk to aviation operations due to the presence of the proposed Coopers Gap Wind Farm is low is based on the following: -

- There are no certified or registered aerodromes within the wind farm area or in the near vicinity. The nearest certified or registered aerodrome is at Kingaroy, approximately 45km (24.3nm) east-north-east of the area. As such, there are no issues of concern regarding the possibility of any penetration on the OLS of any licensed aerodrome.
- There are two private unlicensed airfields near to the proposed Coopers Gap Wind Farm boundary. These are Lyndley Station (an unlicensed aerodrome approximately 21km to the southwest) and Jimbour House (a private unlicensed airfield located approximately 32km to the southwest). These airfields are only suitable for ad hoc VFR traffic. Operations from these airfields will not be affected by the presence of the wind farm.
- Other aerodromes are further away and would not be affected.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 18 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

- VFR operations should be above the height of the wind turbines if such are operated strictly in accordance with the Regulations, but the actuality of such operations are such that SGS HART Aviation considers there will be some degree of doubt concerning this in practice.
- Civil Night VFR or IFR aircraft operations are required to abide by lowest safe altitude requirements, which ensure all such operations which should be above the highest point of any of the wind turbines within the Coopers Gap Wind Farm.
- Any approved low level operations, by their very nature, are required to check for any obstacles which might impact on such operations, before undertaking any such operations. All such operations would be day VFR.
- The proposed Coopers Gap Wind Farm turbines will not affect any sector or circling altitude, nor any approach or departure altitudes. They will not impact on Precision/Non-Precision Navigational Aids, HF/VHF Communications, Advanced Surface Movement Guidance and Control Systems, Radar or Satellite/Links.
- The proposed Coopers Gap Wind Farm turbines will not affect any en route LSALTs.

In effect, there are no regular aviation operations within 30km (indeed within 30nm) from the proposed Coopers Gap Wind Farm and no obstacle limitation surfaces associated with any aerodrome will be affected.

However, whilst it is considered that the overall risk to aviation operations in the vicinity of the proposed Coopers Gap Wind Farm is likely to be low, there are two areas where the risk to aviation operations is slightly higher than normal; viz:

- The nominal maximum turbine tip height is such that the wind turbines would extend into navigable airspace by some 58ft; and
- Low level military jet operations may occur in the region.

The proposed (nominal) maximum tip height for the wind turbines in the Coopers Gap Wind Farm is 180m (~590ft) Above Ground Level (AGL) i.e. more than 500ft AGL. As such, the wind turbines would extend into navigable airspace if this maximum tip height is constructed.


What is meant by “navigable airspace”?

Under the Civil Aviation Regulations, aircraft undertaking VFR operations, except during take off and landing, are required to maintain a minimum height of 500ft AGL outside of built up areas and 1,000ft over built up areas. Any aircraft undertaking VFR operations outside controlled airspace is, therefore, legally entitled to operate as low as 500ft AGL.

The Civil Aviation Regulations further require that, unless it is necessary for takeoff and landing, an IFR or a Night VFR aircraft operation must not be flown at a height less than 1,000ft above the highest obstacle within a 10nm radius of the aircraft in flight. This defines the LSALT for any such operation which, by definition, would be higher than any wind turbine in the proposed Coopers Gap Wind Farm development.

In principle, therefore, this defines “navigable airspace”.

The proposed maximum tip height of the wind turbines within the proposed Coopers Gap Wind Farm is 180m (i.e. ~590ft). Consequently, the risk profile for aviation operations would increase, albeit only slightly. This latter view is based on the fact that, as previously mentioned, with the exception of possible low level military jet operations, only limited civil aircraft operations are likely to occur in the vicinity of the proposed wind farm.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 19 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

Nevertheless, the risk would be higher, principally because obstacles above 500ft (~152m) start to penetrate *navigable airspace* and some aircraft operations can potentially occur in the vicinity of the wind farm. For this reason, SGS HART Aviation is of the view that, for wind turbines which are higher than 500ft AGL, obstacle lights should be installed.

As a consequence of the above, SGS HART Aviation considers that, if the maximum height wind turbine were installed, obstacle lights are necessary for the Coopers Gap Wind Farm. It is further considered that such obstacle lights should be medium intensity lights installed in accordance with the requirements of CASA MOS 139, (copy attached at Appendix 7.10) which are consistent with ICAO Annex 14 recommendations, as detailed in Appendix 7.10 of this report. Further consultation with CASA and the Department of Defence in respect of this matter may very well be required.

Additional risk mitigation


The risk to aviation operations would be further reduced if, in the fullness of time, the wind turbines were identified on the relevant aeronautical charts i.e. both the civil WACs and the RAAF produced chart series. This is considered an essential risk mitigation element. Pending such identification on maps, it would be advisable to ensure that all aviation operators are made aware of the existence of the wind farm. Airservices, if they were made aware of the wind farm, would normally do this via NOTAM action covering both the construction phase and prior to identification on maps. It is, therefore, essential that the wind farm developer advise both Airservices and the RAAF AIS not only of the wind farm itself but also of any temporary or permanent met masts / wind monitoring towers.

3.5.3. Comparisons with other wind farm developments.

To assist in comparing the Coopers Gap Wind Farm with others throughout Australia, attention is drawn to the fact that there are many examples of wind farms currently in operation, which have no obstacle lights installed, or have had the obstacle lights turned off as a result of a low aviation risk assessment.

Such examples include: Brown Hill Wind Farm (Hallett 1), Hallett Hill Wind Farm (Hallett 2) North Brown Hill Wind Farm (Hallett 4) and the Snowtown Wind Farm (all in South Australia north of Adelaide). Wind farms outside South Australia include the Oaklands Hill Wind Farm, the Capital Wind Farm on the eastern edge of Lake George in the Australian Capital Territory and the Codrington Wind Farm in Victoria west of Warrnambool. The latter has been operational since 2001.

It should be added that the wind turbines present in all the above-mentioned wind farms have turbine heights less than 500ft AGL and are, therefore, below navigable airspace.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 20 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

4. SUMMARY COMMENTS


The following summary comments and recommendations are made: -

- Airfields in the vicinity.
 - There are two private unlicensed airfields near to the proposed Coopers Gap Wind Farm boundary; viz: Lyndley Station (21km from the site) and Jimbour House (32km from the site). Operations from these airfields will not be affected by the presence of the wind farm. No other airfields or airstrips could be identified within the confines, or in the immediate vicinity, of the proposed wind farm site. The nearest licensed (Certified) aerodrome is at Kingaroy, some 45km distance from the site.

- Aviation operations – general.
 - With the exception of special low level operations as would occur with, such as, agricultural operations if they were required, Night VFR and IFR operations should be clear of any wind turbines.
 - VFR operations may be at risk as some of the turbines will penetrate navigable airspace by some 90ft.

- Reference towers for meteorological monitoring.
 - Meteorological (met) / wind monitoring masts can be difficult to see and their presence should be advised to the RAAF AIS in accordance with the advice given within Advisory Circular AC 139-08(0) “Reporting of Tall Structures”.
 - Any such met masts / wind monitoring masts should be marked consistent with the recommendations of the National Airports Safeguarding Advisory Group (NASAG) Guideline D.
 - AECOM should notify the Aerial Agriculture Association of Australia (AAAA) of any met masts / wind monitoring masts at Coopers Gap.
 - AECOM advice to SGS HART Aviation is that this will be done as part of the Community Infrastructure Designation process, and:
 - SGS HART Aviation found evidence that some action had already been undertaken in this respect.
 - SGS HART Aviation commends this action.


- Airspace considerations.
 - CASA.
 - CASA should be advised of the proposed Coopers Gap Wind Farm so it has the opportunity to comment as to whether there are any potential problems in respect of air routes over the site or any Prohibited, Restricted and Danger (PRD) areas which might be in the vicinity. Whilst no such areas of concern have been identified by SGS HART Aviation, CASA’s comments in these matters should not be overlooked.
 - The advice to CASA will also serve as an alert as to the number and proposed heights of the wind turbines in anticipation of the formal requirement to advise CASA of any obstacles which will be 110m or more above ground level.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 21 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

- AECOM has indicated that such advice will also be provided as part of the Community Infrastructure Designation process, and:
 - SGS HART Aviation found evidence that some action had already been undertaken in this respect.

- Airservices.
 - The proposed Coopers Gap Wind Farm will not affect any sector or circling altitude nor any approach or departure. The farm will not impact on Precision/Non-Precision Navigational Aids, HF/VHF Communications, Advanced Surface Movement Guidance and Control Systems, Radar or Satellite/Links.
 - It has been assessed that there will be no effect on any en route LSALTs as a result of the establishment of the Coopers Gap Wind Farm as proposed.
 - Airservices will likely undertake its own assessment in respect of LSALTs.
 - Airservices should be advised of the proposed wind farm development and any temporary met mast / wind monitoring towers.
 - AECOM has indicated that such advice will be provided as part of the Community Infrastructure Designation process.
 - Airservices may choose, in consultation with CASA, to issue a Notice to Airmen (NOTAM) advising of the presence of any such towers.
 - SGS HART Aviation undertook a search of the Airservices' web site and did not discover any NOTAMs relevant to the site.


- Department of Defence & RAAF AIS.
 - The RAAF AIS should be advised on the proposed Coopers Gap Wind Farm development and any temporary or permanent met masts / wind monitoring towers.
 - AECOM has indicated that such advice will be provided as part of the Community Infrastructure Designation process.
 - Discussions with the Department of Defence and the RAAF AIS proved somewhat un-informative. However, SGS HART Aviation's investigations did identify that there are possibly low level jet operations in the vicinity of the proposed Coopers Gap Wind Farm. This may be of concern and it is, therefore, essential that the Department of Defence be consulted on this matter. Otherwise, the presence of the Coopers Gap Wind Farm should not be of concern to the RAAF / Department of Defence.
 - The exception could be if any low flying at night were proposed by the RAAF / Department of Defence as this will influence the need for obstacle lighting on the wind turbines regardless of the height.
 - AECOM needs to clarify the situation with the RAAF / Department of Defence.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 22 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

- Aerial fire fighting activities.
 - The position in respect of the proposed Coopers Gap Wind Farm is no different from any other wind farm. Helicopter or fixed wing aircraft operations within the confines of any wind farm and below the top of the wind turbines are potentially hazardous and not recommended.
 - It is possible that aerial fire fighting could be undertaken above the level of the wind turbines, but dropping water or retardant from this height would reduce the effectiveness. This is a matter for the expert fire fighting operators.

- Aerial agricultural operations.
 - Aerial spraying, seeding or fertilising operations, be they by helicopter or fixed wing aircraft, within the confines of any wind farm and below the top of the wind turbines is potentially hazardous and not recommended.
 - The situation in respect of the proposed Coopers Gap Wind Farm is no different from that for any other wind farm.

- Rural air ambulance services.
 - The existence of wind turbines has the potential to limit the flexibility of operations of helicopter ambulance services within the confines of the wind farm and there is little that can be done about that. This is a common factor for all wind farms.
 - Otherwise, the proposed Coopers Gap wind farm will have little effect on the provision of rural air ambulance services currently available in the region.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 23 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

5. CONCLUSIONS

The risk to aviation operations in the vicinity of the proposed Coopers Gap Wind Farm is considered to be low. However, the maximum height of the proposed wind turbines (180m) is such that the tips of the blades will penetrate navigable airspace. This is a cause for concern.

Further, there is some evidence that low level military jet operations occur in the region. Consultation with the Department of Defence is, therefore, necessary, particularly in respect of whether any low level night operations are planned.

As a consequence, if the maximum height wind turbine is installed, it is recommended that obstacle lights should be installed in accordance with the recommendations in CASA MOS 139, which are equivalent to ICAO Annex 14 recommendations.

If the maximum height of the wind turbines were limited to less than 500ft AGL (i.e. less than ~152m) obstacle lights would not be deemed to be necessary unless low level military night operations in the vicinity are planned.

It is recommended that temporary or permanent met masts / wind monitoring towers be marked consistent with the recommendations of the National Airports Safeguarding Advisory Group (NASAG) Guideline D.

An essential risk mitigation feature is for the wind turbines to be identified on the relevant aeronautical charts i.e. both the civil WACs and the RAAF produced chart series.

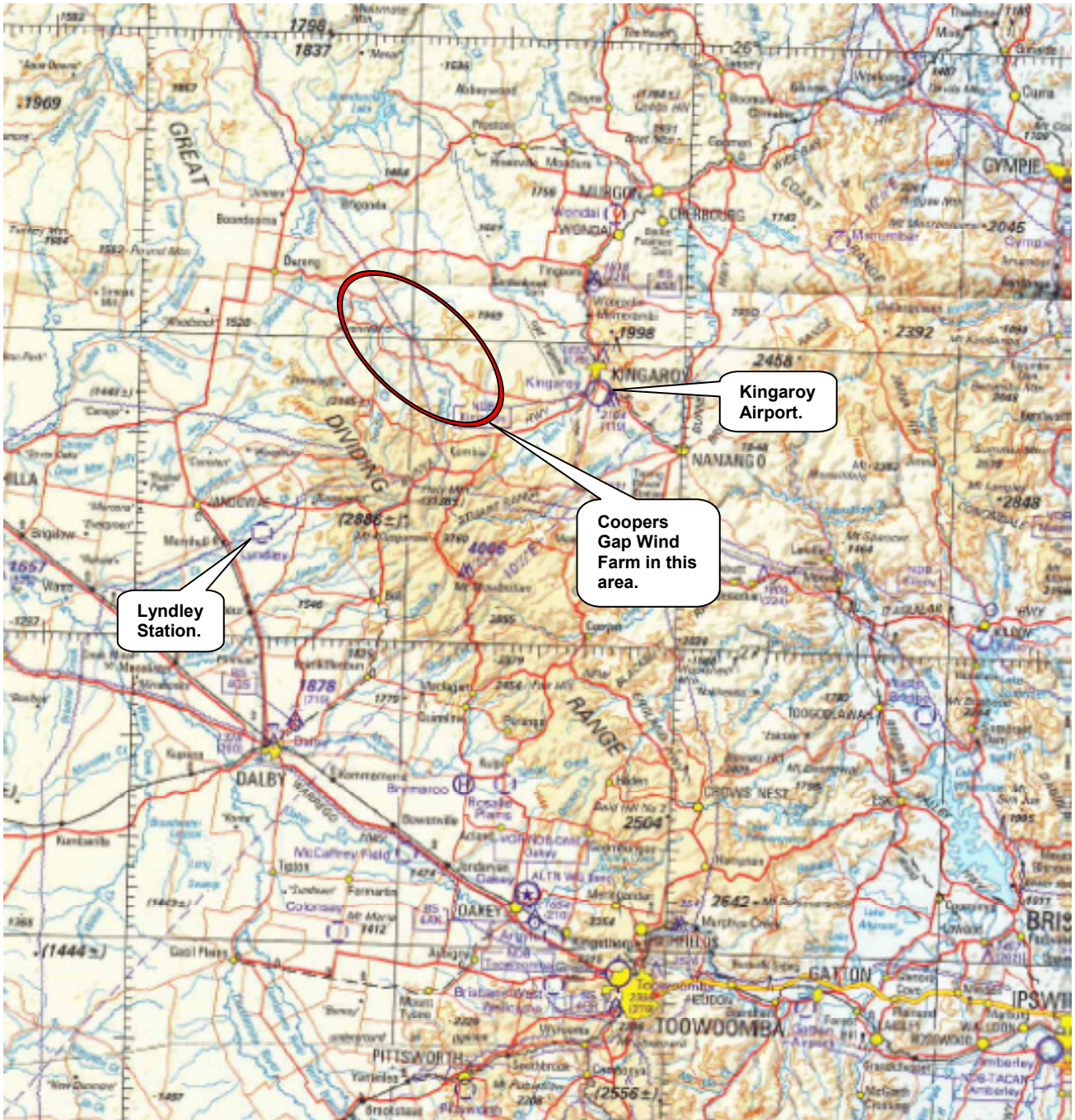
Pending such identification on maps, it is advisable to ensure that all potentially affected aviation operators are made aware of the presence of any temporary or permanent met masts / wind monitoring towers and of the planned existence of the wind farm itself. Airservices, if they were made aware of such matters, would normally advise the aviation industry via NOTAM action covering both the construction phase and prior to identification on maps. It is, therefore, essential that the wind farm developer advise both Airservices and the RAAF AIS.

6. ABBREVIATIONS USED IN THIS REPORT

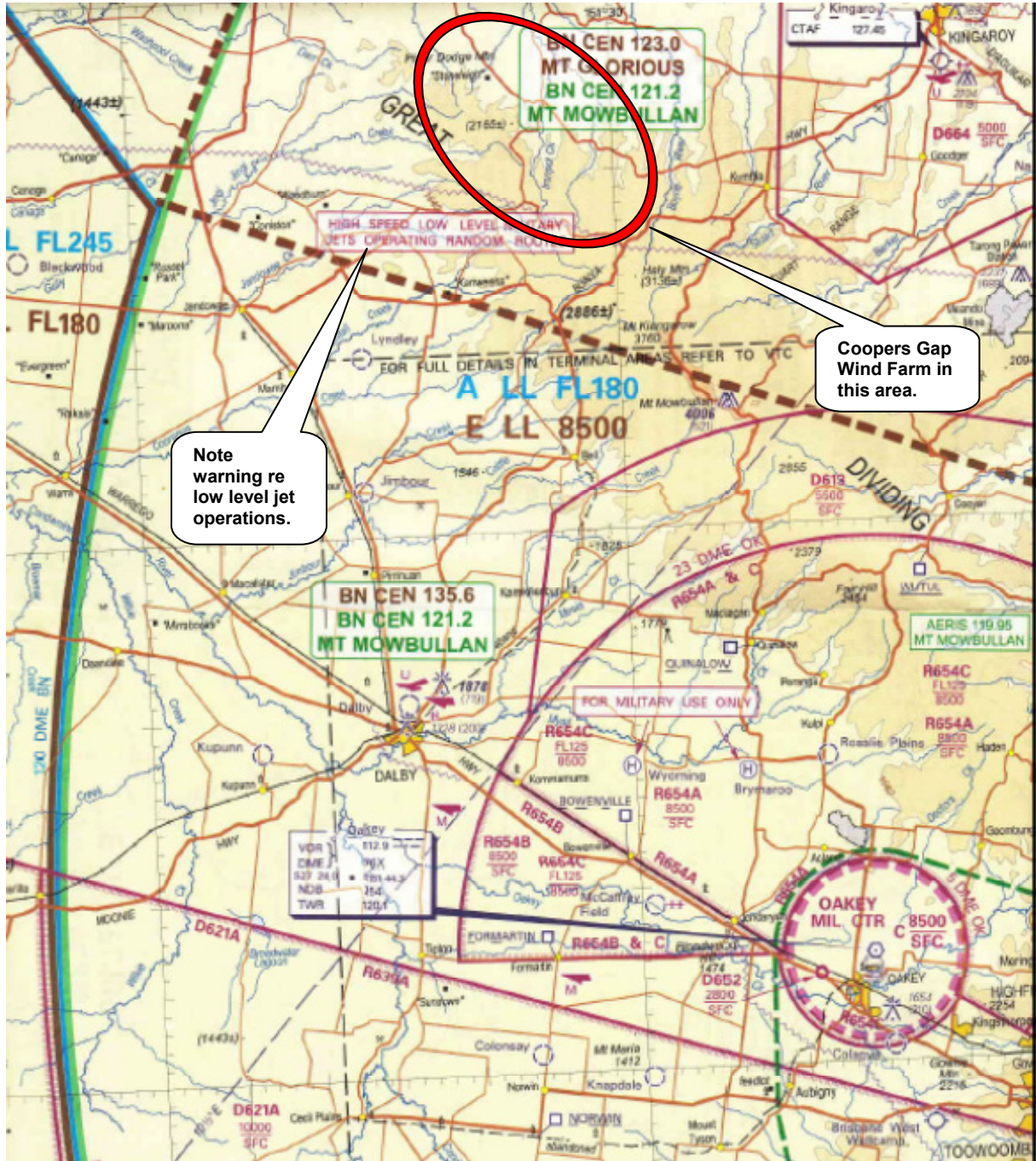
AAAA	Aerial Agricultural Association of Australia	km	Kilometre
AC	Advisory Circular	LPSI	Land Planning & Spatial Information
AGL	Above Ground Level	LSALT	Lowest Safe Altitude
AIS	Aeronautical Information Services	m	Metre
ALA	Aircraft Landing Area	MOS	Manual of Standards
amsl	Above Mean Sea Level	MW	Megawatt
AOPA	Aircraft Owners and Pilots Association of Australia	nm	nautical mile
AS	Australian Standard	NASAG	National Airports Safeguarding Advisory Group
CAAP	Civil Aviation Advisory Publication	NOTAM	Notice to Airmen
CASA	Civil Aviation Safety Authority	NZ	New Zealand
CAR	Civil Aviation Regulation	OLS	Obstacle Limitation Surfaces
CASR	Civil Aviation Safety Regulation	PANS-OPS	Procedures for Air Navigation Services – Aircraft Operations
CID	Community Infrastructure Designation	PRD	Prohibited, Restricted, Danger areas
EIS	Environmental Impact Statement	RAAF	Royal Australian Air Force
ERC	En Route Chart	TAC	Terminal Area Chart
ERSA	En Route Supplement Australia	USA	United States of America
FAA	Federal Aviation Administration	VFR	Visual Flight Rules
ft	Feet	VNC	Visual Navigation Chart
GFA	Gliding Federation of Australia	VHF	Very High Frequency
ICAO	International Civil Aviation Organisation	VTC	Visual Terminal Chart
IFR	Instrument Flight Rules	WA	Western Australia
HF	High Frequency	WAC	World Aeronautical Chart

7. APPENDICES

7.1. Excerpt from WAC (3340) – Brisbane {20th Edition}



7.2. Excerpt from VNC- 4 Brisbane {12 November 2015}



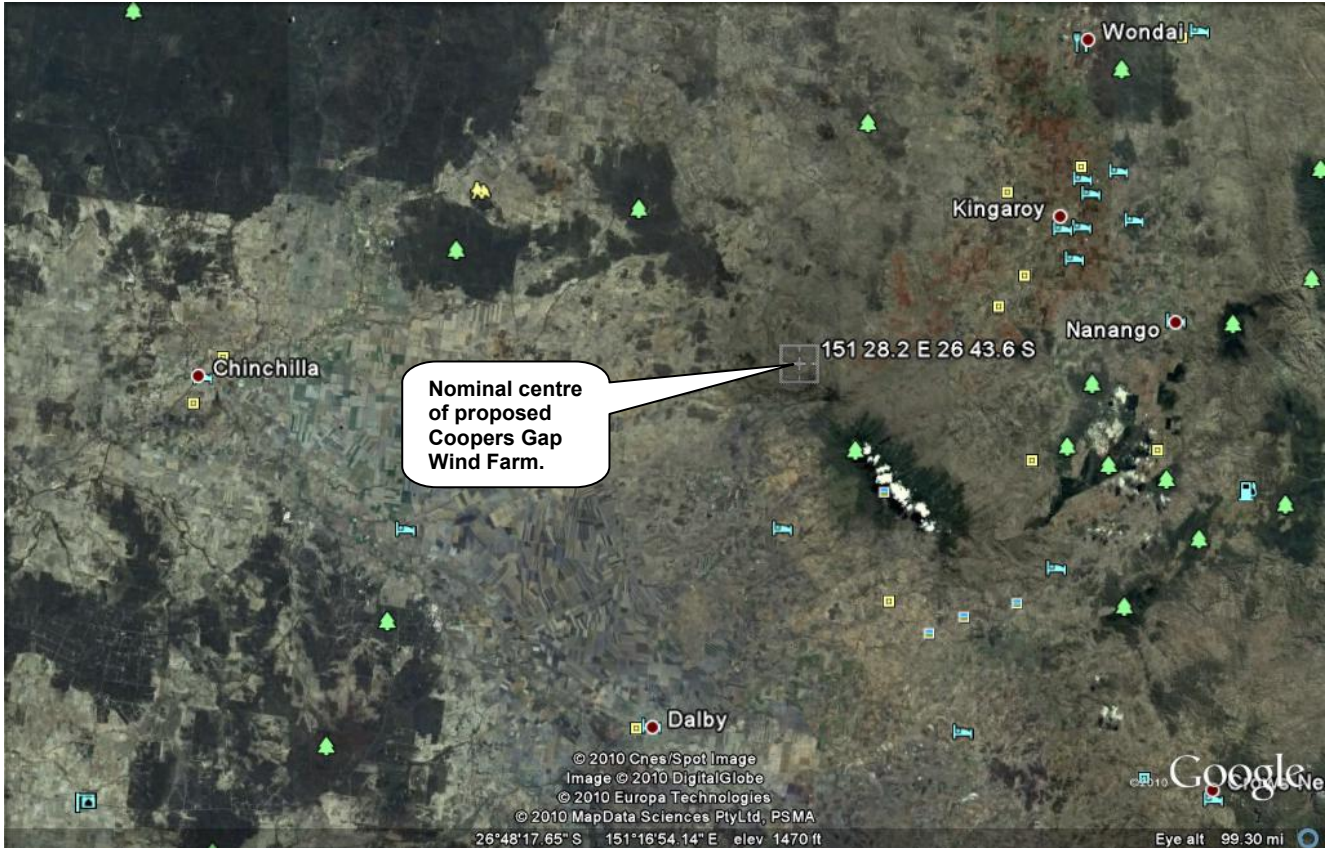
7.3. Excerpt from En Route Chart (ERC) Low-Brisbane/Townsville L4 {12 November 2015}



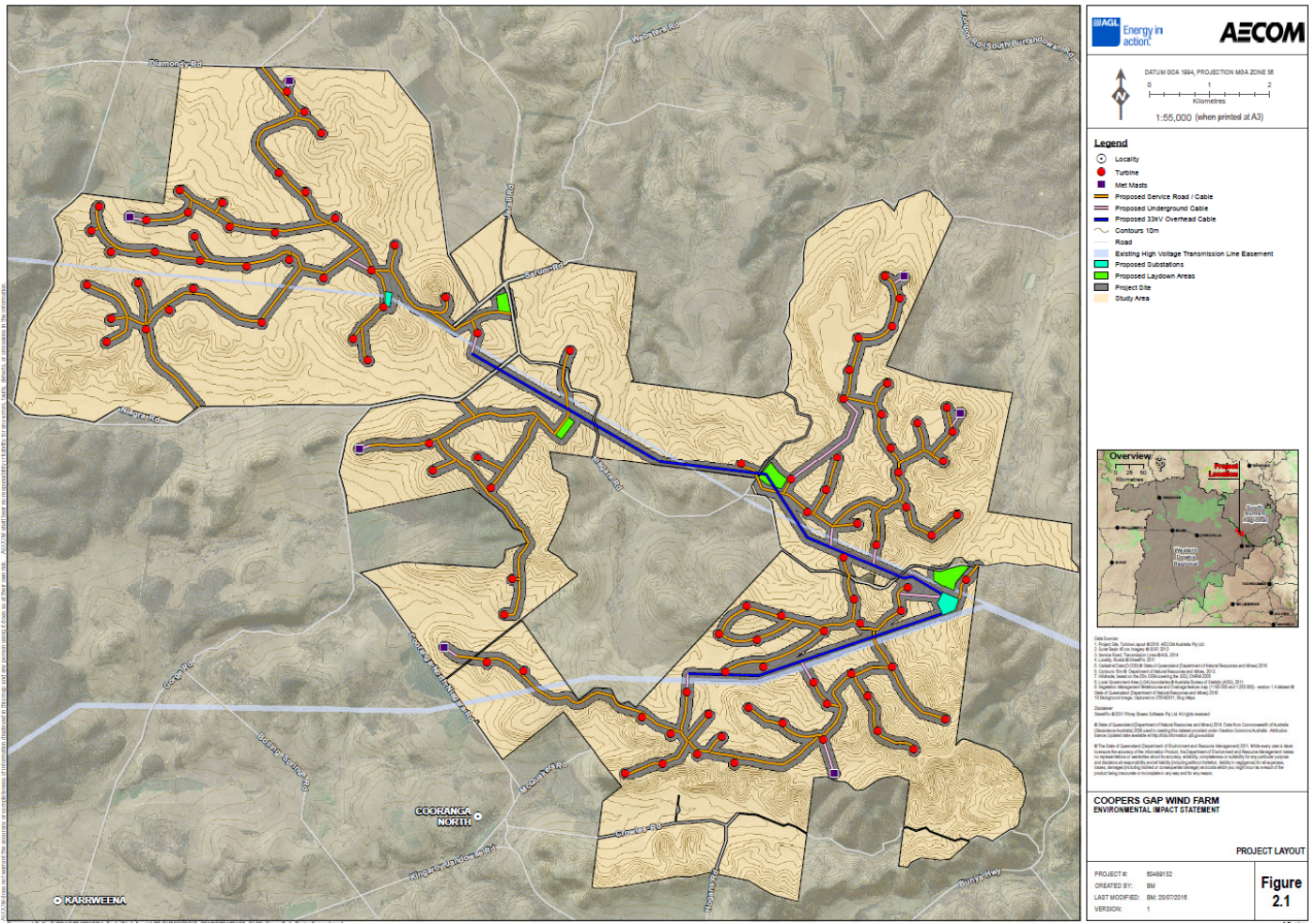
7.4. Excerpt from ERC High H1 {12 November 2015}




7.5. General View of Area of Wind Farm



7.6. Coopers GAP Wind Farm Study Area Showing Tentative Position of Wind Turbines within Corridor Concept



	Advisory on Coopers Gap Wind Farm for AECOM	Page: 31 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

7.7. NASAG Obstacle Lighting Standard for Wind Turbines & Wind Monitoring Towers

The following is an excerpt from the National Airports Safeguarding Framework Guideline D. It will be seen that there is direct equivalence with the ICAO Annex 14 Recommendations regarding wind turbines as noted in Appendix 7.11 below.

Obstacle lighting standards for wind turbines


35. When lighting has been recommended by CASA to reduce risk to aviation safety, medium-intensity obstacle lights should be used. Where used, lighting on wind farms should be installed:
- to identify the perimeter of the wind farm;
 - respecting a maximum spacing of 900m between lights along the perimeter, unless an aeronautical study shows that a greater spacing can be used;
 - where flashing lights are used, they flash simultaneously; and
 - within a wind farm, any wind turbines of significantly higher elevation are identified wherever located.
36. To minimise the visual impact on the environment, obstacle lights may be partially shielded, provided it does not compromise their operational effectiveness. Where obstacle lighting is provided, lights should operate at night, and at times of reduced visibility. All obstacle lights on a wind farm should be turned on simultaneously and off simultaneously.
37. Where obstacle lighting is provided, proponents should establish a monitoring, reporting and maintenance procedure to ensure outages, including loss of synchronisation, are detected, reported and rectified. This would include making an arrangement for a recognised responsible person from the wind farm to notify the relevant CASA office, so that CASA can advise pilots of light outages.

Alternatives to fixed obstacle lighting

38. In some circumstances, it may be feasible to install obstacle lights that are activated by aircraft in the vicinity. This involves the use of radar to detect aircraft within a defined distance that may be at risk of colliding with the wind farm. When such an aircraft is detected, the wind farm lighting is activated. This option may allow aviation safety risks to be mitigated where obstacle lighting is recommended while minimising the visual impact of the wind farm at night.

Marking and lighting of wind monitoring towers

39. Before developing a wind farm, it is common for wind monitoring towers to be erected for anemometers and other meteorological sensing instruments to evaluate the suitability or otherwise of a site. These towers are often retained after the wind farm commences operations to provide the relevant meteorological readings. These structures are very difficult to see from the air due to their slender construction and guy wires. This is a particular problem for low flying aircraft including aerial agricultural operations. Wind farm proponents should take appropriate steps to minimise such hazards, particularly in areas where aerial agricultural operations occur. Measures to be considered should include:
- the top 1/3 of wind monitoring towers to painted in alternating contrasting bands of colour. Examples of effective measures can be found in the Manual of Standards for Part 139 of the Civil Aviation Safety Regulations 1998. In areas where aerial agriculture operations take place, marker balls or high visibility flags can be used to increase the visibility of the towers;
 - marker balls or high visibility flags or high visibility sleeves placed on the outside guy wires;
 - ensuring the guy wire ground attachment points have contrasting colours to the surrounding ground/vegetation; or
 - a flashing strobe light during daylight hours.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 32 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

7.8. Airservices Aviation Assessments for Wind Farm Developments Policy



To Whom It May Concern

Corporate & International Affairs
 25 Constitution Avenue
 (GPO Box 367)
 CANBERRA ACT 2600
 t 02 6268 5101
 f 02 6268 4233
www.airservicesaustralia.com
 ABN 59 698 720 886

Airservices Aviation Assessments for Wind Farm Developments

Guidelines to manage the risk to aviation safety from wind turbine installations (Wind Farms/Wind Monitoring Towers) are under development by the National Airports Safeguarding Advisory Group (NASAG). NASAG is comprised of high-level Commonwealth, State and Territory transport and planning officials and has been formed to develop a national land use planning regime to apply near airports and under flight paths.

The wind farm guidelines will provide information to proponents and planning authorities to help identify any potential safety risks posed by wind turbine and wind monitoring installations from an aviation perspective.

Potential safety risks include (but are not limited to) impacts on flight procedures and aviation communications, navigation and surveillance (CNS) facilities which require assessment by Airservices.

To facilitate these assessments all wind farm proposals submitted to Airservices must include an Aviation Impact Statement (AIS) prepared by an aeronautical consultant in accordance with the AIS criteria set out below.

AIS must be undertaken by an aeronautical consultant with suitable knowledge and capabilities to provide a reliable and comprehensive report. All data is to be supplied in electronic form. If you are not familiar with any aeronautical consultants, you may wish to view the list on the Civil Aviation Safety Authority (CASA) website:


http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_90412

AIS Criteria

The AIS must provide a detailed analysis covering, as a minimum:

Airspace Procedures:

1. Obstacles
 - Co-ordinates in WGS 84 (to 0.1 second of arc or better)
 - Elevations AMSL (to 0.3 metres)

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 33 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

2. Drawings

- Overlaid on topographical base not less than 1:250,000. Details of datum and level of charting accuracy to be noted.
- Electronic format compatible with Microstation version 8i.

3. Aerodromes

- Specify all registered/certified aerodromes that are located within 30nm (55.56km) from any obstacle referred to in (1) above.
- Nominate all instrument approach and landing procedures at these aerodromes.
- Confirmation that the obstacles do not penetrate Annex 14 or OLS for any aerodrome. If an obstacle does penetrate, specify the extent.

4. Air Routes

- Nominate air routes published in ERC-L & ERC-H which are located near/over any obstacle referred to in (1) above.
- Specify two waypoint names located on the routes which are located before and after the obstacles.

5. Airspace

- Airspace classification – A, B, C, D, E, G etc where the obstacles are located.

Navigation/Radar:


1. Detect the presence of dead zones
2. False target analysis
3. Target positional accuracy
4. Probability of detection
5. Radar coverage implications
6. We would expect the analysis to follow the guidelines outlined in the EUROCONTROL Guidelines on How to Assess the Potential Impact of Wind Turbines on Surveillance Sensors.

http://www.eurocontrol.int/surveillance/public/standard_page/sur_WTTF.html

Airservices Review of AIS

Airservices will review the quality and completeness of an AIS and will undertake limited modelling and analysis to confirm the findings and recommendations of the report.

Provided the AIS is of sound quality and is complete in accordance with the above criteria, there will be no charge for the review or limited modelling and analysis.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 34 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD


If the AIS is not of sound quality or is not complete in accordance with the above criteria, no modelling or analysis will be undertaken. Airservices will advise the proponent that the AIS does not meet the requirements and that the proposal cannot be assessed by Airservices.

If Airservices review of an AIS confirms impacts identified in the report (or identifies additional impacts), Airservices will advise the proponent of the impacts and the required mitigating actions (where mitigation is feasible). The proponent will also be advised that there will be charges for any mitigation actions to be undertaken by Airservices.

These charges may be advised at the time but it is likely that a detailed quote will be needed and this will only be provided on request from the proponent.

Please contact Joe Doherty, Airport Development Manager (02) 62685101 or alternatively joseph.doherty@airservicesaustralia.com if you have any questions.

Current as at 5 March 2012

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 35 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

7.9. Excerpts from CASA Manual of Standards (MOS) 139

Section 9.4: Obstacle Lighting

9.4.1 General

9.4.1.1 Under the Civil Aviation Regulations, CASA may determine that an object or a proposed object which intrudes into navigable airspace requires, or will be required to be provided with, obstacle lighting. Responsibility for the provision and maintenance of obstacle lighting on a building or structure rests with the owner of the building or structure. Within the limits of the obstacle limitation surfaces of an aerodrome, responsibility for the provision and maintenance of obstacle lighting on natural terrain or vegetation, where determined necessary for aircraft operations at the aerodrome, rests with the aerodrome operator.

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 110m above ground level.

9.4.3.4A In the case of a wind farm whose wind turbines must have obstacle lighting, medium intensity lights are to be installed as follows:

(a) if any part of the wind turbine, including the rotating blades, penetrates the obstacle limitation surface (OLS) of an aerodrome, top lights must mark the highest point reached by the rotating blades;

Note: Because it is not practicable to install obstacle lights at the tip of the blades, these lights may be located on a separate structure, adjacent to the wind turbine, at a height that corresponds to the highest point of the rotating blade of the turbine.

(b) if the rotating blades do not penetrate the OLS, the top lights must be placed on top of the generator housing;

(c) obstacle lights must be provided on a sufficient number of individual wind turbines to indicate the general definition and extent of the wind farm, with intervals between lit turbines not exceeding 900m;


(d) all of the obstacle lights on a wind farm must be synchronised to flash simultaneously;

(e) the downward component of obstacle lighting may be shielded to the extent mentioned in either or both of the following sub-subparagraphs:

(i) so that no more than 5% of the nominal light intensity is emitted at or below 5° below horizontal;

(ii) so that no light is emitted at or below 10° below horizontal;

(f) to prevent obstacle light shielding by the rotating blades, 2 lights must be provided on top of the generator housing in a way that allows at least 1 of the lights to be seen from every angle in azimuth.

	Advisory on Coopers Gap Wind Farm for AECOM	Page: 36 of 37
		Reference: 16-0012-01
	ADVISORY REPORT - CONFIDENTIAL -	Date: 15-Mar-16
		Advisor: MD

7.10. ICAO ANNEX 14 Recommendations Rewind Farms

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.*

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. If two or more edges are of the same height, the edge nearest the landing area shall be marked. Where low-intensity lights are used, they shall be spaced at longitudinal intervals not exceeding 45 m. Where medium-intensity lights are used, they shall be spaced at longitudinal intervals not exceeding 900 m.

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, 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.*

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