s47F

From: Airport Developments

Sent: Friday, 22 March 2024 12:36 PM

To: \$47F

Cc: Airspace.Protection@casa.gov.au

Subject: AIRSERVICES RESPONSE: SA-WF-017 P2 - Twin Creek Wind Farm

Hi there,

I refer to your request for an Airservices assessment of the proposed Twin Creek Wind Farm.

Airspace Procedures

With respect to procedures designed by Airservices in accordance with ICAO PANS-OPS and Document 9905, at a height of 706.1 m AHD (2317 ft AMSL) the wind farm will not affect any sector or circling altitude, nor any instrument approach or departure procedure at any aerodrome.

Note: procedures not designed by Airservices were not considered in this assessment.

Communications/Navigation/Surveillance (CNS) Facilities

We have assessed the proposed activity to the above specified height for any impacts to Airservices Precision/Non-Precision Navigation Aids, Anemometers, HF/VHF/UHF Communications, A-SMGCS, Radar, PRM, ADS-B, WAM or Satellite/Links and have no objections to it proceeding.

Air Traffic Control (ATC) Operations

There are no additional instructions or concerns from our ATC.

Summary

The proposed activity does not impact Airservices operations or facilities at any aerodrome.

If you have any further queries, please let our team know.

Kind regards,





s47F

Airspace Development & Protection Coordinator

s47F

Alastair Hodgson Building – Building 330, Tower Road, Melbourne Airport, Tullamarine VIC 3043 www.airservicesaustralia.com





We acknowledge the Traditional Owners of Country throughout Australia and recognise their continuing connection to land, waters and culture. We pay our respects to their Elders past, present and emerging.

From: S47F

Sent: Thursday, February 1, 2024 2:50 PM

To: Airport Developments < Airport. Developments @ Airservices Australia.com >

Subject: FW: Twin Creek Wind Farm [SEC=OFFICIAL]

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OFFICIAL

Dear Air Services,

Estate Planning have been asked to comment on the Aviation Impact Statement (AIS) for the proposed Twin Creek Windfarm near the township of Kapunda, South Australia and is located approximately 44.8 km west of the Waikerie Army Cadet Depot and 98 km north east of RAAF Base Edinburgh. The purpose of the report is to review potential impacts and provide aviation safety advice in respect to relevant requirements of air safety regulations and procedure's and undertake consultation with relevant aviation agencies.

The proposed wind farm will comprise of 42 wind turbines with a tip height of 220m Above Ground Level (AGL). The ground elevation for the highest WTG is 486.1 m AHD (2317 ft AMSL). The coordinates for each individual turbine are stated in the attached impact assessment.

In this instance I am seeking your comments / concerns regarding the proposed wind farm. Your response, including nil comments, is requested by 13 **February 2024**.

Kind regards,

s47F

Development Officer Security and Estate Group Department of Defence

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From: Jira automation To: **Airport Developments**

Subject: Obstacle Assessment: SA-WF-017 P2 - Twin Creek Wind Farm Complete

Date: Tuesday, 5 March 2024 9:03:50 AM

of Information Act 1987 **CAUTION:** This email was sent from an external email address. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

SA-WF-017 P2 - Twin Creek Wind Farm

Airspace Design response:

I refer to the application for wind farm at the above address.

With respect to procedures designed by Airservices in accordance with ICAO PANS-OPS and Document 9905, at a height of 706.1 m AHD (2317 ft AMSC) the wind farm will not affect any sector or circling altitude, nor any instrument approach or departure procedure at any aerodrome.

Note: procedures not designed by Airservices at wind farm aerodrome were not considered in this assessment.

Link to Files

*** This is a Jira automated notification. Please do not reply to this email. ***

A stral astral Airservices *** https://airservicesaustralia1.atassian.net ***

s47F

From: Airport Developments

Sent: Tuesday, 6 February 2024 2:48 PM

To: s47F

Subject: RE: Twin Creek Wind Farm [SEC=OFFICIAL]

Hi there,

Airservices has received your request for assessment of the proposed Twin Creek Wind Farm. For any enquiries about your application, please contact us quoting: SA-WF-017 P2. Please note, assessments take approximately six weeks to complete.

We send CASA a copy of the Airservices response.

Kind regards,





s47F

Airspace Development & Protection Coordinator

s47F

Alastair Hodgson Building – Building 330, Tower Road, Melbourne Airport, Tullamarine VIC 3043 www.airservicesaustralia.com





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From: S47F

Sent: Thursday, February 1, 2024 2:50 PM

To: Airport Developments < Airport. Developments @ Airservices Australia.com >

Subject: FW: Twin Creek Wind Farm [SEC=OFFICIAL]

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OFFICIAL

Dear Air Services,

Estate Planning have been asked to comment on the Aviation Impact Statement (AIS) for the proposed Twin Creek Windfarm near the township of Kapunda, South Australia and is located approximately 44.8 km west of the Waikerie Army Cadet Depot and 98 km north east of RAAF Base Edinburgh. The purpose of the report is to review potential impacts and provide aviation safety advice in respect to relevant requirements of air safety regulations and procedure's and undertake consultation with relevant aviation agencies.

The proposed wind farm will comprise of 42 wind turbines with a tip height of 220m Above Ground Level (AGL). The ground elevation for the highest WTG is 486.1 m AHD (2317 ft AMSL). The coordinates for each individual turbine are stated in the attached impact assessment.

In this instance I am seeking your comments / concerns regarding the proposed wind farm. Your response, including nil comments, is requested by 13 **February 2024**.

Kind regards,

s47F

Development Officer Security and Estate Group Department of Defence

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From:

To: Airport Developments

Subject: RE: SA-WF-017 P2 - Twin Creek Wind Farm Date: Friday, 22 March 2024 10:57:00 AM

Attachments: image001.gif

OFFICIAL

OK for radar.

Regards.

s47F

MIEAust CPEng NER APEC Engineer IntPE(Aus) RPEQ RPEV

Snr Engineering Specialist

Airservices Australia

Building 330 - Tower Road Melbourne Airport Tullamarine

s47F s47F

Website



OFFICIAL

From: Engineering Development Applications

Freedom of Information Act 1989 <EngDevelopmentApplications@AirservicesAustralia.com>

Sent: Friday, February 9, 2024 9:33 AM

To: \$47F

Cc: Airport Developments < Airport. Developments @ Airservices Australia.com >;

Engineering Development Applications

<EngDevelopmentApplications@ArservicesAustralia.com>

Subject: RE: SA-WF-017 P2 - Twin Creek Wind Farm

OFFICIAL

Hi **s47F**,

Could you please assess the below application for impacts to radars. Please reply directly to airport developments and do not CC in the engineering development applications email. Regards,

s47F

Engineering Specialist (Surv) Maintenance & Services

OFFICIAL

From: Airport Developments < <u>automation@airservicesaustralia1.atlassian.net</u>>

Sent: Tuesday, February 6, 2024 2:15 PM To: Engineering Development Applications

<EngDevelopmentApplications@AirservicesAustralia.com>

Cc: Airport Developments < <u>Airport.Developments@AirservicesAustralia.com</u>>

Subject: SA-WF-017 P2 - Twin Creek Wind Farm

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Hi Team

Could you please assess this development application and provide your responses to me by Feb 27, 2024?

Details:

-attely 77 km

 attely 7
- weetly. Weetly

From: **Vertical Obstruction Data**

To: Airport Developments; Vertical Obstruction Data Subject: RE: SA-WF-017 P2 - Twin Creek Wind Farm Date: Tuesday, 6 February 2024 4:46:38 PM **Attachments:** SA-WF-017 P2 - Twin Creek Wind Farm (3).pdf

image005.png image006.png image007.png image008.png image009.png image010.png

OFFICIAL

Hi ^{s47F}

- Ine Freedom of Information Act 1982 Please see attached the assessment for SA-WF-017 P2.

Kind regards,

s47F

AIS Data Aeronautical Information Specialist

s47F

Alan Woods Building, 25 Constitution Avenue

Canberra ACT 2600, Australia

www.airservicesaustralia.com



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OFFICIAL

From: Airport Developments < Airport. Developments @ Airservices Australia.com >

Sent: Tuesday, February 6, 2024 3:12 PM

To: Vertical Obstruction Data < VOD@AirservicesAustralia.com>

Subject: SA-WF-017 P2 - Twin Creek Wind Farm

OFFICIAL

Sould you please assess this development application and provide your responses to me by 27 February?

Hyperlink: here

Details:

- Activity Twin Creek Wind Farm
- Coordinates 34.293379227° S 139.091321573° E (WTG7)
- Maximum height WTG7 706.1 m AHD (2317 ft AMSL) Activity code - AAA/029.01.03.02

If you have any queries, please let our team know.

Kind regards,



s47F

Airspace Development & Protection Coordinator

s47F

Alastair Hodgson Building – s47F , Tower Road,

Melbourne Airport, Tullamarine VIC 3043

www.airservicesaustralia.com



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OFFICIAL

From: Airport Developments < automation@airservicesaustralia1.atlassian.net >

Sent: Tuesday, February 6, 2024 2:45 PM **To:** Engineering Development Applications

<EngDevelopmentApplications@AirservicesAustralia.com>

Cc: Airport Developments < <u>Airport.Developments@AirservicesAustralia.com</u>>

Subject: SA-WF-017 P2 - Twin Creek Wind Farm

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Hi Team

Could you please assess this development application and provide your responses to me by Feb 27, 2024?

Details:

- \cdot Address Twin Creek Wind Farm Mid-North region of South Australia, approximately 77 km northeast of the City of Adelaide.
- · Activity Word Farm
- · Coordinates 34.293379227° S 139.091321573° E (WTG7)
- Maximum height The maximum Project height is identified as: WTG7, with a maximum tip height of 706.1 m AHD (2317 ft AMSL)
- · Activity code AAA/029.01.03.02

If you have any queries, please let our team know.

Link to Files

This is an automatic notification. You may reply to this notification directly.

Grid LSALT Assessment

Task ID	SA-WF-017 P2 - Twin Creek Wind Farm
Date	06/02/2024
Operator	s47F
	Ret
Summary	
A Grid LSALT assessm	ent has been completed on the Twin Creek Wind Farm.
Findings	
Assessment of the wi	nd farm shows will not penetrate the published Grid LSALT.

Summary

Findings

Structure	Structure Height(m) (AMSL)	LSALT height	Penetration	Remark
Wind Farm	707	732	No	

Actions

NIL

s47F

Digitally signed by **s47F** Date: 2024.02.06 16:43:58 +11'00'

From: **Airport Developments** To: **Vertical Obstruction Data**

Subject: SA-WF-017 P2 - Twin Creek Wind Farm Date: Tuesday, 6 February 2024 3:11:00 PM

Attachments: image001.png

image002.png image003.png image004.png

Hi Team.

27 Act 1982 the Freedom of Information Could you please assess this development application and provide your responses to me by 27 February?

Hyperlink: here

Details:

- Activity Twin Creek Wind Farm
- Coordinates 34.293379227° S 139.091321573° E (WTG7)
- Maximum height WTG7 706.1 m AHD (2317 ft AMSL) Activity code - AAA/029.01.03.02

If you have any queries, please let our team know.

Kind regards,



s47F

Airspace Development & Protection Coordinator

Alastair Hodgson Building - Building 330, Tower Poad, Melbourne Airport, Tullamarine VIC 3043

www.airservicesaustralia.com





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From: Airport Developments <automation@airservicesaustralia1.atlassian.net>

Sent: Tuesday, February 6, 2024 2:45 PM To: Engineering Development Applications

<EngDevelopmentApplications@AirservicesAustralia.com>

Cc: Airport Developments < Airport. Developments @ Airservices Australia.com >

Subject: SA-WF-017 P2 - Twin Creek Wind Farm

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Hi Team

Could you please assess this development application and provide your responses to me by Feb 27, 2024?

Details:

- · Address Twin Creek Wind Farm Mid-North region of South Australia, approximately 77 km northeast of the City of Adelaide.

- Adleased by Airse vices Australia under the Freedom of Information Act, 1982

s47F

From: s47F

Sent: Friday, 22 March 2024 12:33 PM

To: Airport Developments

Subject: SA-WF-017 P2

OFFICIAL







s47F

Airspace Development & Protection Coordinator

s47F

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OFFICIA

2

s47F

Airservices response: SA-WF-031 - TWIN CREEK WINDFARM BESS - north-

Monday, 14 April 2025 11:17:00 AM

Good morning

Lirefer to your request for an Airservices assessment of the proposed activity at Tween Creek Windfarm, SA

With respect to procedures designed by Airservices in accordance with ICAO PANS-OPS and Doc 9905, at a maximum height of 706.1m/2317ft AHD the wind farm will not affect any sector or circling altitude, nor any instrument approach or departure procedure at any aerodrome or any air routes.

Note: Procedures not designed by Airservices at any aerodrome were not considered in this assessment.

Communications/Navigation/Surveillance (CNS) Facilities

We have assessed the proposed activity to the above specified height for any impacts to Airservices Precision/Non-Precision Navigation Aids Anemometers, HF/VHF/UHF Communications, A-SMGCS, Radar, PRM, ADS-B, WAM or Satellite/Links and have no objections to proceeding

Note: Meteorological instruments not owned by Airservices were not considered in this assessment. In accordance with 2 at 39 (Aerodromes) Manual of Standards, Chapter 19, we recommend consulting with the Bureau of Meteorology (the Bureau) to ensure that the proposed activity does not adversely affect their equipment. The Bureau can be contacted at airport.development

Air Traffic Control (ATC) Operations

There are no additional instructions or concerns from ATC.

The proposed activity does not impact Airservices operations or facilities at any aerodrome or any air routes

Vertical Obstacle Notification

As this proposed activity is more than 30m (99ft) AGL, please follow the below notification process:

- 1. Complete the Vertical Obstacle Notification Form: ATS-FORM-0085 Vertical Obstruction Data Form.pdf (airservicesaustralia.com)
- Submit completed form to: VOD@airservicesaustralia.com as soon as 'no development reaches the maximum height.

For further information regarding the reporting of tall structures, please contact the VOD team:

- Phone (02) 6268 5622Email <u>VOD@airservicesaustralia.com</u>
- Or refer to: Civil Aviation Safety Regulation Part 175 Airse vices and You - Airservices (airservicesaustralia.com)

If you have any queries, please let our team know.

Thanks and Regards,

Airport Development & Protection
Email: airport.developments@airservicesaustral
Phone: 0436 325 205

Website

I acknowledge Aboriginal and Torres Straitslander peoples as the traditional custodians of country throughout Australia where we live, learn and work.

From: s47F

Sent: Monday, 17 March 2025 1.26 PM

To: Airport Developments Cc: Vertical Obstruction Date

Subject: RE: DA 313/\'\o`\9,'23 - REFERRAL - TWIN CREEK WINDFARM + BESS - north-west of Truro, South Australia

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"ve attached a spreadsheet of the individual turbine height details from the aviation assessment (Table 1) and a shapefile from the proponent (which was previously requested by the local landscape board).

s47F

- Environmental Impact Assessment

Planning and Land Use Services | Department for Trade and Investment

L10, 83 Pirie Street, Adelaide SA 5000 • GPO Box 1815 Adelaide SA 5001 s47F

s47F

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From: Airport Developments < Airport. Developments @ Airservices Australia.com >

Sent: Monday, 17 March 2025 8:25 AM

To:s47F Airport Developments < Airport. Developments @ Airservices Australia.com >

Cc: Vertical Obstruction Data < VOD@AirservicesAustralia.com >

Subject: RE: DA 313/V039/23 - REFERRAL - TWIN CREEK WINDFARM + BESS - north-west of Truro, South Australia

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I acknowledge Aboriginal and Torres Strait Islander peoples as the traditional custodians of country throughout Australia where we live, Namand work.

OFFICIAL

From: \$47F
Sent: Friday, 14 March 2025 2:26 PM
To: Airport Developments Airport-Developments <a href="Airport-Deve

OFFICIAL

Thanks for the response.

Would you prefer a data (mapping) file or a spreadsheet with this information?

s47F

am Leader – Environmental Impact Assessment

Planning and Land Use Services | Department for Trade and Investment

L10, 83 Pirie Street, Adelaide SA 5000 • GPO Box 1815 Adelaide SA 5001

s47F

W plan.sa.gov.au W dti.sa.gov.au DISCLAIMER:

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 $\textbf{From:} \ Airport \ Developments < \underline{Airport. Developments@AirservicesAustralia.com} > \underline{Airport. Developments.}$

Sent: Friday, 14 March 2025 10:21 AM

To:s47F

Cc: Vertical Obstruction Data < VOD@AirservicesAustralia.com >

Subject: RE: DA 313 \(\) \(\) \(\) \(\) \(\) \(\) 39/23 - REFERRAL - TWIN CREEK WINDFARM + BESS - north-west of Truro, South Australia

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OFFICIAL

OFFICIAL

Good n orning,

Thank you for enquiring about the process of submitting a development application to Airservices.

Airs vices requires the coordinates and maximum heights (incl ground elevation) of each individual windfarm.

Once we receive this information, we will initiate assessment for Procedure for Air Navigation Systems Operation and Communication

Navigation and Surveillance. We send CASA a copy of the Airservices response.

Please let our team know if you require any further details.

Thanks and Regards,

Airport Development & Protection

Email: airport.developments@airservicesaustralia.com

Phone: 0436 325 205

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From: Vertical Obstruction Data < VOD@AirservicesAustralia.com>

rmation Act 1982

Sent: Thursday, 13 March 2025 2:53 PM

To: Airport Developments < Airport. Developments @ Airservices Australia.com >

Cc: Vertical Obstruction Data < VOD@AirservicesAustralia.com >

Subject: FW: DA 313/V039/23 - REFERRAL - TWIN CREEK WINDFARM + BESS - north-west of Truro, South Australia

OFFICIAL

Hi team.

For your review.

Kind regards,

947F

Aeronautical Information Specialist

Directs47F Email s47F

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OFFICIAL

From: s47F

Sent: 13. marts 2025 15:24

To: Vertical Obstruction Data < VOD@AirservicesAustralia.com >

Subject: DA 313/V039/23 - REFERRAL - TWIN CREEK WINDFARM + BESS - north-west of Truro, South Australia

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To whom it may concern - Twin Creek Windfarm

The South Australia State Planning Commission has recently received updated documentation for the Twin Creek Wind arm and Energy Storage Project. For windfarm developments, we have generally sought CASA/ASA's views on similar applications across the state, as they relate to aviation safety and facility operations.

The development comprises: the installation of up to 42 wind turbine generators (WTG) with an individual cap city of up to 7.2MW (for a total project capacity of up to 270MW). The maximum tip height of each WTG will be up to 220m. Ancillary elements include a Battery Energy Storage System (with an indicative storage capacity of 215MW), two substations, connecting 275kV transmission lines, control and maintenance buildings, is lated civil and earthworks. Temporary construction facilities will also be established.

Planning documentation can be publicly downloaded from the Plan SA website - https://plan.sa.gov.a./have_your_say/notified_developments/state_developments SPC is now seeking your department's advice on the development – however I also appreciate the taken to review and comment on such proposals. It is noted, however, that the Aviation Assessment accompanying the planning application, jobs not identify any operational or facility impacts.



ACT 1082

Could any comments be provided not later than 11 April 2025. Happy to discuss.

Kind Regards -

\$47FTeam Leader – Environmental Impact Assessment

Planning and Land Use Services | Department for Trade and Investment L10, 83 Pirie Street, Adelaide SA 5000 • GPO Box 1815 Adelaide SA 5001

Es47F

ES4/IP

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s47F

From: Vertical Obstruction Data

Sent: Thursday, 13 March 2025 3:53 PM

To: Airport Developments
Cc: Vertical Obstruction Data

Subject: FW: DA 313/V039/23 - REFERRAL - TWIN CREEK WINDFARM + BESS - north-west of Truro, South Australia

Categories: Waiting on information, \$47F

OFFICIAL

Hi team, For your review. Kind regards,

s47F

Aeronautical Information Specialist

Direct S47F Email S47F

We acknowledge the Traditional Owners of Country throughout Australia and recognise their continuing connection to land, waters and culture. We pay our respects to their Elders past, present and emerging.

OFFICIAL

From: S47F

Sent: 13. marts 2025 15:24 **To:** Vertical Obstruction Data

Subject: DA 313/V039/23 - REFERRAL - WIN CREEK WINDFARM + BESS - north-west of Truro, South Australia

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To whom it may concern - Twin Creek Windfarm

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For windfarm developments, we have generally sought CASA/ASA's views on similar applications across the state, as they relate to aviation safety and facility operations.

The development comprises: the installation of up to 42 wind turbine generators (WTG) with an individual capacity of up to 7.2MW (for a total project capacity of up to 270MW). The maximum tip height of each WTG will be up to 220m. Ancillary elements include a Battery Energy Storage System (with an indicative storage capacity of 215MW), two substations, connecting 275kV transmission lines, control and maintenance buildings, related civil and earthworks. Temporary construction facilities will also be established.

Planning documentation can be publicly downloaded from the Plan SA website - https://plan.sa.gov.au/have_your_say/notified_developments/state_developments

SPC is now seeking your department's advice on the development – however I also appreciate the time taken to review and comment on such proposals.

It is noted, however, that the Aviation Assessment accompanying the planning application, does not identify any operational or facility impacts.

An except of the Aviation Projects report is below:

Conclusions

Based on a comprehensive analysis and assessment detailed in this report, the following conclusions were made:

Certified airports

 The Project is not located within 30 nm of any certified aerodrome, and therefore will not affect any Procedures for Air Navigation Services - Aircraft Operations PANS-OPS surfaces or obstacle limitation surfaces.

Aircraft Landing Areas (ALAs)

There are no active verified or ALAs located within 3 nm of the Project, including the transmission line.
 There is one unverified ALA identified within 3 nm of the Project, however is not anticipated to be affected by the Project.

Air Routes and Lowest Safe Altitude

3. The Project will not affect any route or grid lowest safe altitude.

Aviation Facilities

The Project will not penetrate any protection areas associated with aviation facilities.

Radar

 Due to the distance and intervening terrain between the Project and the primary and secondary radar facilities located at Adelaide airport, it is anticipated there will be no impact to radar facilities.
 Airservices Australia may conduct a simple assessment on the potential impact of the Project on the Adelaide airport primary radar facility.

Aviation Impact Statement (AIS)

- Based on the Project WTG layout and maximum blade tip height of up to 220 m AGL, the blade tip elevation of the highest WTG will not exceed 706.1 m AHD (231-7 ft AMSL), and:
 - a) is not located within 30 nm of any certified aerograme and will not affect any terminal instrument flight procedures
 - will not penetrate any OLS surfaces
 - will not have an impact on nearby designated air routes
 - will not have an impact on the grid LSALT of 3400 ft established in ERC Low and 3800 ft established in ERC High
 - e) will not have an impact on operational airspace
 - f) is wholly contained within Class G airspace

3

mation Act

Could any comments be provided not later than 11 April 2025.

Happy to discuss.

Kind Regards -

s47F

Team Leader - Environmental Impact Assessment

Planning and Land Use Services | Department for Trade and Investment L10, 83 Pirie Street, Adelaide SA 5000 • GPO Box 1815 Adelaide SA 5001

PS47F ES47F

W plan.sa.gov.au W dti.sa.gov.au

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From: Jira automation To: **Airport Developments**

Subject: Obstacle Assessment: SA-WF-031 Complete Date: Thursday, 3 April 2025 3:50:16 PM

of Information Act 1987 **CAUTION:** This email was sent from an external email address. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

SA-WF-031

Airspace Design response:

SA-WF-031

I refer to the application for a wind farm at the above address.

With respect to procedures designed by Airservices in accordance with ICAO PANS-OPS and Doc 9905, at a maximum height of 706.1m/2317ft AHD the wind farm will not affect any sector or circling altitude, nor any instrument approach or departure procedure at any aerodrome or any air routes.

Note: Procedures not designed by Airservices at any perodrome were not considered in this assessment.

Link to Files

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From: s47F

To: **Airport Developments** Subject: RE: SA-WF-031

Date: Friday, 11 April 2025 11:08:30 AM

Attachments: image001.png

No objection for radar.

Regards,

s47F

MIEAust CPEng NER APEC Engineer IntPE(Aus) RPEQ RPEV

Snr Engineering Specialist - SysTA Radar

Airservices Australia

Building 330 - Tower Road Melbourne Airport Tullamarine

ts47F

?

From: Engineering Development Applications

Sent: Tuesday, 18 March 2025 2:14 PM

To: \$47F

Cc: Airport Developments Subject: RE: SA-WF-031

His47F

OFFICIAL ent Applications J25 2:14 PM
belo Could you please assess me below application for impacts to radars. Please reply directly to airport developments and do not CC in the engineering development applications email.

s47F

Regards,

Engineering Specialist (Surv) Maintenance & Services

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i om: Airport Development automation@airservicesaustralia1.atlassian.net

Sent: Monday, 17 March 2025 15:22

To: Engineering Development Applications

<EngDevelopmentApplications@AirservicesAustralia.com>

Cc: Airport Developments < <u>Airport.Developments@AirservicesAustralia.com</u>>

Subject: SA-WF-031

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Hi Team

Could you please assess this development application and provide your responses to me by Apr 7, 2025? tic tic

Details:

- · Address Tween Creek Windfarm, SA.
- · Activity SA
- · Coordinates see attached XLS file
- · Maximum height 706.1m AHD
- · Activity code AAA/029.01.03.02

If you have any queries, please let our team know.

Link to Files

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Airport Developments
Vertical Obstruction Data PE: VOD request - TWIN CREEK WINDEARM - north-west of Truro SA Wednesday, 19 March 2025 10:27:00 AM image009.png HION ACIL 1982 His47F No problem – I've removed the old assessment and replaced it with this one. Thanks and Regards, s47F Airport Development Airservices Australia Phone: s47F Email: s47F Website I acknowledge Aboriginal and Torres Strait Islander peoples as the traditional custodians of country throughout Australia where we live, learn in a work.

From: Vertical Obstruction Data
Sent: Wednesday, 19 March 2025 7:56 AM
To: Airport Developments
Cc: Vertical Obstruction Data
Subject: RE: VOD request - TWIN CREEK WINDFARM - north-west of Truro, SA

OFFICIAL Good morning \$47F, Apologies, I realised that I had left an incorrect comment in the Actions section of the PDF sent yesterdar. The correct version is now attached. erd. Kind regards, S47F
Aeronautical Information Specialist Directs47F Emails47F Alan Woods Building, 25 Constitution Ave Canberra ACT 2600, Australia www.airservicesaustralia.com We acknowledge the Traditional Owners of Country throughout Australia and recognise their continuing connection to land, waters and culture. We pay our respects to their Elders past, present and emerging. OFFICIAL From: Vertical Obstruction Data Sent: Tuesday, 18 March 2025 13:10 To: Airport Developments < Airport. Developments @Airservices Australia.com > Cc: Vertical Obstruction Data < VOD@Ai.se vicesAustralia.com > Subject: RE: VOD request - TWIN CRLF. WINDFARM - north-west of Truro, SA Good afternoons47F Please find attached. Kind regards, s47F Aeronautical Information Specialist Directs47F Email s47F Alan Woods Building, 25 Constitution Ave Canberra ACI 2600, Australia www.airser\icesaustralia.com ?

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Sent: Monday, 17 March 2025 16:03

To: Vertical Obstruction Data < VOD@AirservicesAustralia.com>

Subject: VOD request - TWIN CREEK WINDFARM - north-west of Truro, SA

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Hi Team,

Could you please assess this development application and provide your responses to me by 2 Apr 25?

Hyperlink: SA-WF-031.

Details:

· Address - Tween Creek Windfarm, SA.

- · Activity SA
- · Coordinates see attached XLS file
- · Maximum height 706.1m AHD
- · Activity code AAA/029.01.03.02

If you have any queries, please let our team know.

Thanks and Regards,

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From: \$47F

Sent: Monday, 17 March 2025 1:26 PM

To: Airport Developments < Airport. Developments @AirservicesAustralia.com>
Cc: Vertical Obstruction Data < VOD@AirservicesAustralia.com>
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 $I've \ attached \ a \ spread sheet \ of \ the \ individual \ turbine \ height \ details \ from \ the \ aviation \ assessment \ (lable 1) \ and \ a \ shape file \ from \ the \ aviation \ assessment \ (lable 1) \ and \ a \ shape file \ from \ the \ aviation \ assessment \ (lable 1) \ and \ a \ shape file \ from \ the \ aviation \ assessment \ (lable 1) \ and \ a \ shape file \ from \ the \ aviation \ assessment \ (lable 1) \ and \ a \ shape file \ from \ the \ aviation \ assessment \ (lable 1) \ and \ a \ shape file \ from \ the \ aviation \ assessment \ (lable 1) \ and \ a \ shape file \ from \ the \ aviation \ assessment \ aviation \ assessment \ (lable 1) \ and \ a \ shape file \ from \ the \ aviation \$ proponent (which was previously requested by the local landscape board).

s47F Team Leade Environmental Impact Assessment

Planning and Land Use Services | Department for Trade and Investment

L10, 83 Pirie Street, Adelaide SA 5000 • GPO Box 1815 Adelaide SA 5001

Es47F

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Good morning s47F

A spreadsheet with (his information would be sufficient. Please also attach a KMZ file if available.

Thanks and Regards,

s47F

Airport Devalopment Airservices Australia

Phone: 347F Email:s47F

Website

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Thanks for the response.

Would you prefer a data (mapping) file or a spreadsheet with this information?

s47F

eam Leader – Environmental Impact Assessment

Joseph maintained or

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Joseph March 2025 10:21 AM

To: S47F

Co: Vertical Obstruction Data < VOD@AirservicesAustralia.com>

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Airport Development & Protection

Email: airport.developments@airservicesaustralia.com

Phone: 0436 325 205 Website

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To: Airport Developments Airport,Developments@AirservicesAustralia.com Cc: Vertical Obstruction Data VOD@AirservicesAustralia.com

Subject: FW: DA 313/V039/23 - REFE \ 2 - TWIN CREEK WINDFARM + BESS - north-west of Truro, South Australia

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Hi team.

For your review.

Kind regards,

s47F

Aeronautical Information Specialist

Directs47F

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rom:s47F

Sent: 13. marts 2025 15:24

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To whom it may concern - Twin Creek Windfarm

The South Australia State Planning Commission has recently received updated documentation for the Twin Creek Windfarm and Energy Storage Project For windfarm developments, we have generally sought CASA/ASA's views on similar applications across the state, as they relate to aviation safety and facility

The development comprises: the installation of up to 42 wind turbine generators (WTG) with an individual capacity of up to 7.2MW (for a total project capacity of up to 270MW). The maximum tip height of each WTG will be up to 220m. Ancillary elements include a Battery Energy Storage System (with an indicative storage capacity

of 215MW), two substations, connecting 275kV transmission lines, control and maintenance buildings, related civil and earthworks. Temporary construction facilities will also be established.

Planning documentation can be publicly downloaded from the Plan SA website - https://plan.sa.gov.au/have_your_say/notified_developments/state_developments SPC is now seeking your department's advice on the development – however I also appreciate the time taken to review and comment on such proposals. It is noted, however, that the Aviation Assessment accompanying the planning application, does not identify any operational or facility impacts. An except of the Aviation Projects report is below:

Citable any comments to provided not later than 11 April 2029.

Happy to discuss.

Kind Regards
Wife
een Leader — Environmental impact Accessment

7 who give the data Use Services (Department by Traits or

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Grid LSALT Assessment

Task ID	SA-WF-031 -	Twin Creek Windfarm
Date	18/03/2025	
Operator	s47F	

Task ID	SA-WF-	031 - Twin Creek	Windfarm		-0
Date	18/03/2	2025			201
Operator	s47F				V 22
					xct 1987
Summary					
A Grid LSALT as: Nurioopta	sessment has bee	en completed on t	he Twin Creek W	indfarm located north of	
Findings					
Assessment of t	he wind farm sho	ows no obstacles	will penetrate the	published Grid LSALT.	
Structure	Structure Height(m) (AMSL)	LSALT height	Penetration	Remark	
WTG 7	702	1037	N	Due to the number of	
WTG 12	679	1037	N	obstacles, only the two with highest AMSL values have been included in this report. All obstacles have been assessed.	
Actions	ices Aus	Hall			

Actions

Digitally signed by s47F Date: 2025.03.19 08:53:57

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Document	cument Title: Twin Creek Wind Farm - Aviation Impact Assessment							
Reference	e: 101808-04							
Release D	ate:				DC.			
Prepared b	oy: s47F				6,			
Reviewed	by: s47F			Sille				
Released I	by:			ollu,				
REVIS	DOCUMENT CONTROL Document Title: Twin Creek Wind Farm - Aviation Impact Assessment Reference: 101808-04 Release Date: Prepared by: \$47F Reviewed by: \$47F Released by: REVISION HISTORY							
Version	Description	Transmitted	Reviewed by	Date				
0.1	First draft	09 October 2023	MasterPlan/RES	13 October 2023				
0.2	Second draft	"Ve						
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ACRONYMS

AAAA Aerial Agricultural Association of Australia

AC Advisory Circular

under the Freedom of Information Act. 1982 **AFAC** Australasian Fire and Emergency Services Council

AGL above ground level

AHD Australian Height Datum

AIA aviation impact assessment

AIP Aeronautical Information Package

AIS aviation impact statement

ALA aircraft landing area

ALARP as low as reasonably practicable

AMSL above mean sea level

ARP Aerodrome Reference Point

AS Australian Standards

AsA Airservices Australia

Australian Transport Safety Bureau **ATSB**

BoM Bureau of Meteorology

Civil Aviation Advisory Publications CAAP

CAO Civil Aviation Orders

Civil Aviation Regulation (1988) CAR

CASA Civil Aviation Safety Authority

Civil Aviation Safety Regulation (1998) **CASR**

CFIT controlled flight into terrain

communications, navigation and surveillance **CNS**

CTAF common traffic advisory frequency

Designated Airspace Handbook DAH

environmental impact statement

en-route chart high

ERC-L en-route chart low

ERSA En Route Supplement Australia

GΑ general aviation

ICAO

IFR

IMC

LGA

LSALT

MOC

MOS

MSA

NASAG

NASF

NDB

OLS

PANS-OPS

PSR

RAAF

RFDS

RPT

RSR

SSR

TIFP

VFR

VFRG visual flight rules guide

visual meteorological conditions VMC

WMTs wind monitoring towers

Released by WTGs wind turbine generators



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101808-04_TWIN CREEK WIND FARM - AVIATION IMPACT ASSESSMENT

Filon Act 1987



EXECUTIVE SUMMARY

Introduction

Res Australia Pty Ltd (RES – the Proponent) is proposing to develop the Twin Creek Wind Farm, located approximately 9 km east-northeast of the town of Kapunda, 14.5 km northeast of the town of Nuriootpa and 77 km northeast of the City of Adelaide, in the Mid-North region of South Australia.

RES obtained planning consent in 2019 for a 3.6MW wind farm consisting of up to 51 wind turbine generators (WTGs) with a tip height of 180 m above ground level (AGL), as well as associated energy storage and transmission infrastructure (the approved Project). Since consent was granted, RES have developed an optimised configuration (the Project), consisting of up to 42 wind turbine generators, (WTG) each with a proposed nominal capacity of 7.2MW, and height of 220m AGL, a Battery Energy Storage System (BESS) with 215MW indicative storage capacity and associated transmission and connection infrastructure. MasterPlan is assisting RES with town planning advice and technical studies and has requested Aviation Projects to provide an aviation impact assessment of the Project.

This report, Aviation Impact Assessment (AIA), has been prepared to support a new development application by the Proponent for the optimised Project.

The AIA will be prepared in response to the Civil Aviation Safety Regulations 1998, associated Manuals of Standards and other guidance material provided by CASA, the National Arrords Safeguarding Framework (NASF) Guideline D: Managing the Risk to aviation safety of wind turbine installations (wind farms)/Wind Monitoring Towers, and specific requirements as advised by Airservices Australia.

This AIA assesses the potential aviation impacts associated with the Project and provides aviation safety advice in respect of relevant requirements of air safety regulations and procedures and informs and documents consultation with relevant aviation agencies.

This AIA report includes an Aviation Impact Statement (AIS) and a qualitative risk assessment to determine the need for obstacle lighting and marking for client review and acceptance before submission to external aviation regulators.

Project description

The Twin Creek wind farm will comprise the following infrastructure relevant to this aviation impact assessment:

- up to 42 wind turbines with a maximum overall height (tip height) of up to 220 m above ground level (AGL)
- the highest proposed wind turbine is WTG7 with a ground elevation of 486.1 m Australian Height Da'um (AHD) (with 5 m buffer) and overall height of 706.1 m AHD (2317 ft AMSL)

Associated power storage and transmission infrastructure, including an overhead transmission line connecting to the existing grid via a cut-in terminal substation, east of Truro.



Conclusions

Based on a comprehensive analysis and assessment detailed in this report, the following conclusions were made:

Certified airports

1. The Project is not located within 30 nm of any certified aerodrome, and therefore will not affect any Procedures for Air Navigation Services - Aircraft Operations PANS-OPS surfaces or obstacle limitation surfaces.

Aircraft Landing Areas (ALAs)

2. There are no active verified or unverified ALAs located within 3 nm of the Project, including the transmission line

Air Routes and Lowest Safe Altitude

3. The Project will not affect any route or grid lowest safe altitude

Aviation Facilities

4. The Project will not penetrate any protection areas associated with aviation facilities.

Radar

5. Due to the distance and intervening terrain between the Project and the primary and secondary radar facilities located at Adelaide airport, it is anticipated the extill be no impact to radar facilities.

Airservices Australia may conduct a simple assessment on the potential impact of the Project on the Adelaide airport primary radar facility.

Aviation Impact Statement (AIS)

- **6.** Based on the Project WTG layout and maximum blade tip height of up to 220 m AGL, the blade tip elevation of the highest WTG will not exceed 706.1 m AHD (2317 ft AMSL), and:
 - a) Is not located within 30 nm of any certified aerodrome and will not affect any terminal instrument flight procedures
 - b) will not peretrate any OLS surfaces
 - c) will not have an impact on nearby designated air routes
 - d) will not have an impact on the grid LSALT of 3400 ft established in ERC Low and 3800 ft established in ERC High
 - e) will not have an impact on operational airspace
 - f) is wholly contained within Class G airspace
 - g) is outside the clearance zones associated with civil aviation navigation aids and communication facilities.

Obstacle lighting risk assessment

Aviation Projects has undertaken a safety risk assessment of the Project and concludes that the proposed WTGs will not require obstacle lighting to maintain an acceptable level of safety to aircraft

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101808-04_TWIN CREEK WIND FARM - AVIATION IMPACT ASSESSMENT



Summary of key recommendations

A summary of the key recommendations of this AIA is set out below.

nation Act 1982 The full list of recommendations and associated details are provided in Section 11 'Recommendations' at the end of this report.

- 1. 'As constructed' details of the coordinates and elevations of the WTGs should be provided to Airservices Australia, using the Vertical Obstruction Data form (https://www.airservicesaustralia.com/wp-content/uploads/ATS-FORM-0085 Vertical Obstruction Data Form.pdf to the following email address: vod@airservicesaustralia.com
- 2. The Proponent should consider engaging with local aerial agricultural operators and aerial fire in hting operators in developing procedures for such aircraft operations in the vicinity of the Project site.
- 3. Details of the final wind farm layout should be provided to local and regional aircraft operators prior to construction so they can plan their operations accordingly.
- 4. Overhead transmission lines and/or supporting poles associated with the Project that are located where they could adversely affect aerial application operations should be identified in consultation and on 8.11 on 8.11 and artifices Australia under the Released by Airsenices Australia under the Released by Ai with local aerial agriculture operators and marked in accordance with Fig. 139 Manual of Standards (MOS) Chapter 8 Division 10 section 8.110 (7) and section 8.110 (3) where applicable.

ijon Acit 1087

A- AVIATION PROJECTS

1. INTRODUCTION

1.1. Situation

RES is planning the development of the optimised Twin Creek Wind Farm (the Project) in the Mid-North region of South Australia, approximately 77 km northeast of the City of Adelaide. The Project is proposed to consist of up to 42 wind turbine generators (WTGs) with a maximum tip height of up to 220 m above ground level (AGL).

This AIA assesses the potential aviation impacts, provides aviation safety advice in respect of relevant requirements of air safety regulations and procedures, and informs and documents consultation with relevant aviation agencies.

This AIA report includes an Aviation Impact Statement (AIS) and a qualitative risk assessment to determine the need for obstacle lighting and other applicable mitigation for client review and acceptance before submission to external aviation agencies.

The AIA and supporting technical data will provide evidence and analysis supporting the development application to demonstrate that appropriate risk mitigation strategies have been identified.

1.2. Purpose and Scope

The purpose and scope of work is to prepare an AIA for consideration by Ai services Australia, CASA and Department of Defence and support a development application to be a bmitted to the State Commission Assessment Panel under the Planning, Development and Infrastructure Act 2016.

The AIA specifically responds to the following key legislation, approvals, and guidance material:

- Government of South Australia, PlanSA, Planning and Design Code, Version 2023.13
- Civil Aviation Safety Authority, Civil Aviation Sarety Regulations 1998 (CASR) and associated material
- NASF Guideline D: Managing the Rish to aviation safety of wind turbine installations (wind farms)/Wind Monitoring Towers
- Other specific requirements as advised by Airservices Australia.

Assistance will be provided in support of stakeholder consultation and engagement in preparing the assessment and negotiating acceptable mitigation to identified impacts.

1.3. Methodology

Aviation Project's conducted the task in accordance with the following methodology:

- 1. Confirm the scope and deliverables with the Proponent (or representative)
- Review client material
- 3. Review relevant regulatory requirements and information sources
- 4. Prepare a draft AIA and supporting technical data that provides evidence and analysis for the planning application to demonstrate that appropriate risk mitigation strategies have been identified
- 5. Prepare an AIS and a qualitative risk assessment to determine need for obstacle lighting and marking

- 6. Identify risk mitigation strategies that provide an acceptable alternative to night lighting. The risk assessment was completed following the guidelines in ISO 31000:2018 Risk Management -Guidelines
- nt ation Act 1987 7. Consult with relevant Councils (if required), Part 173 procedure designers (if required) and aerodrome operators of the nearest aerodrome/s to seek endorsement of the proposal to change instrument procedures (if applicable)
- 8. Consult/engage with stakeholders to negotiate acceptable outcomes (if required)
- Finalise the AIA report for client acceptance when responses received from stakeholders for client review and acceptance.

Aviation Impact Statement (AIS)

The AIS included in this report (see Section 6) includes the following specific requirements as a dvised by Airservices Australia:

Aerodromes:

- Specify all certified aerodromes that are located within 30 nm (55.56 km) or the project site
- Nominate all instrument approach and landing procedures at these aerodromes
- Review the potential effect of the Project operations on the operational airspace of the aerodrome(s)

Air Routes:

- Nominate air routes published in ERC-L & ERC-H which are located near/over the project site and review potential impacts of Project operations on aircraft using those air routes
- Specify two waypoint names located on the routes which are located before and after the obstacles

Airspace:

Nominate the airspace classification - A, B, C, D, E, G etc where the project site is located

Navigation/Radar:

Nominate radar navigation systems with coverage overlapping the site.

1.5. Material reviews

Material provided by the Proponent for preparation of this assessment include:

- Project GIS, Twin Creek Preliminary Site Layout 20231011.kmz, received by email 13 October 2023
- TG location and elevation, Turbine Layout PAUStwc060 (Coordinates, Elevation & Dimensions).xlsx, received by email 06 September 2023

BACKGROUND

2.1. Site overview

Pation Act 1982 The closest townships to the wind farm include Truro, located approximately 10 km southeast of the nearest proposed WTG location, Eudunda, approximately 11 km north of the nearest WTG, and Kapunda, approximately 12 km west of the nearest proposed WTG location. The City of Adelaide is located approximately 77 km southwest of the Project Area.

The Project is located across three Local Government Areas, the Regional Council of Goyder, Light Regional Council and Mid-Murray Council.

An overview of the Project Area relative to nearby townships, as well the Sturt and Thiele highways is provided in Figure 1 (source: RES, Google Earth).

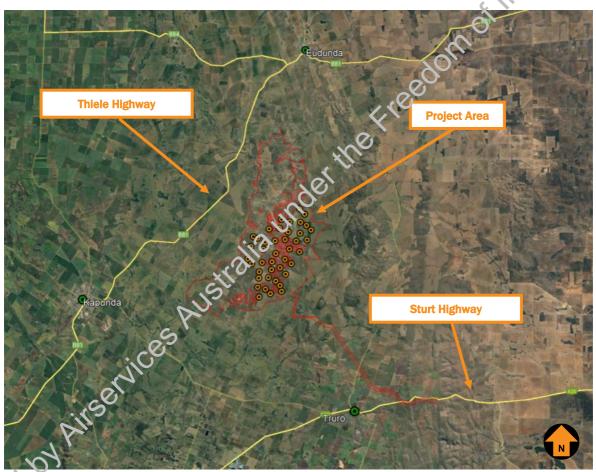


Figure 1 Project Site Overview

2.2. **Project description**

The Twin Creek wind farm is proposed to include the development of wind turbines with a tip height of up to 220 m AGL. The Project also includes 1 substation within the Project boundary, an overhead transmission line

connecting to the existing grid via cut-in substation east of Truro, and up to 215MW indicative Battery Energy Storage System (BESS).

The layout of WTGs and the transmission line route is shown in Figure 2 (Source, RES, Google Earth).

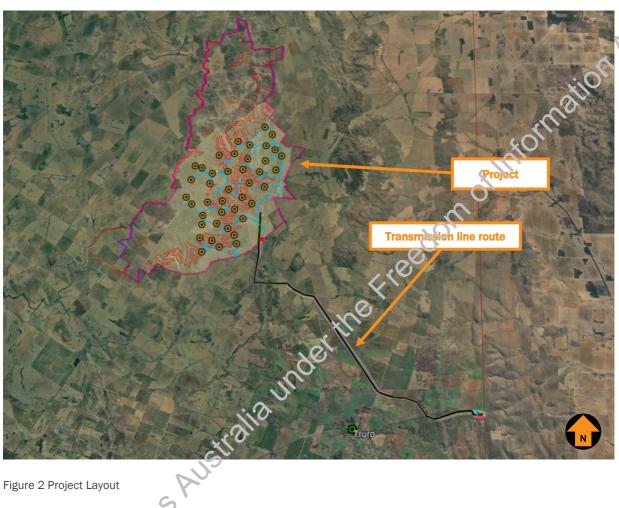


Figure 2 Project Layout

A description of the Project of pared with the approved project is provided in Table 1 (Source, RES).

Table 1 Approved Project and optimised Project description

Element	Approved Project	Optimised Project (the Project)
Number of WTGs	Up to 51	Up to 42
WTG individual Generating Capacity	3.6MW	Up to 7.2MW
Overall Generating Capacity	185MW	Up to 270MW
Height of WTG	180 m tip height	Up to 220 m tip height

Element	Approved Project	Optimised Project (the Project)
Battery Energy Storage Capacity	215MW indicative storage capacity	215MW indicative storage capacity
Substation(s)	2 Substations (1 project substation within the windfarm boundary and 1 cut-in terminal substation)	2 Substations (1 project substation within the windfarm boundary and 1 cut-in terminal substation)
Point of Connection	ElectraNet 275kV powerline (Robertstown to Tungkillo) via a cut-in terminal substation	ElectraNet 275kV powerline (Robertstown to Tungkillo) via a cut-in terminal substation, east of Truro.
Land Ownership	17 involved landowners over 22 landholdings	17 involved landowners over 22 landholdings

Table 2 shows the location(s) and site elevation(s) for each proposed WTG site. Site elevation for each WTG site has been provided by RES, with a 5 m buffer applied to each WTG site for this assessment. The WTG location responsible for the maximum Project height is highlighted.

Table 2 WTG location and elevation

	has been provided by RES, with a 5 m buffer applied to each WTG site for this assessment. The WTG location responsible for the maximum Project height is highlighted.								
The maxi	The maximum Project height is identified as:								
•	WTG7, with a maximum tip height of 706.1 m AHD (2317 ft AMSL)								
Table 2 V	Table 2 WTG location and elevation								
WTG Easting (m) Northing (m) Site elevation (m AHD) Site m buffer m AGL Height m AHD							Maximum Height (ft AMSL)		
1	323482	6205173	447.6	452.6	220	672.6	2207		
2	323844	6204801	439	444	220	664	2179		
3	322201	6204396	448.4	453.4	220	673.4	2209		
4	322781	6204223	442.3	447.3	220	667.3	2189		
5	323566	6204209	424.1	429.1	220	649.1	2130		
6	324007	6203993	441.4	446.4	220	666.4	2186		
7	324334	6203665	481.1	486.1	220	706.1	2317		
8	321322	6203691	384.6	389.6	220	609.6	2000		
9	322058	6203763	412.3	417.3	220	637.3	2091		
20	322708	6203496	444.7	449.7	220	669.7	2197		
11	323556	6203423	412.4	417.4	220	637.4	2091		
12	324074	6202948	458.2	463.2	220	683.2	2242		
13	320069	6203120	335.4	340.4	220	560.4	1839		
14	320581	6202968	348.9	353.9	220	573.9	1883		

WTG ID	Easting (m)	Northing (m)	Site elevation (m AHD)	+ 5 m buffer	Tip height m AGL	Maximum Height m AHD	Maximum Height (ft AMSL)
15	321043	6202736	361.4	366.4	220	586.4	1924
16	321778	6202844	392.6	397.6	220	617.6	2026
17	322495	6202951	417.7	422.7	220	642.7	2109
18	323294	6202849	412.7	417.7	220	637.7	2092
19	320050	6202407	338.8	343.8	220	563.8	1850
20	320949	6202223	349.5	354.5	220	574.5	1885
21	321858	6201934	402.2	407.2	220	627.2	2058
22	322825	6202282	411.9	416.9	220	636.9	2090
23	323676	6202324	438.7	443.7	220	663.7	2178
24	319861	6201508	344.5	349.5	220	569.5	1869
25	320144	6201172	338	343	220	563	1847
26	320893	6201273	372	377	220	597	1959
27	321600	6201336	414.8	419.3	220	639.8	2099
28	322524	6201525	435.6	<i>4</i> ,40.6	220	660.6	2167
29	322988	6201226	430.3	435.3	220	655.3	2150
30	320706	6200640	351.9	356.9	220	576.9	1893
31	321451	6200769	384.4	389.4	220	609.4	1999
32	322195	6200924	440	445	220	665	2182
33	322603	6200463	423.4	428.4	220	648.4	2127
34	320685	6200154	367.1	372.1	220	592.1	1943
35	321376	6200207	386.6	391.6	220	611.6	2007
36	321917	6199967	418.3	423.3	220	643.3	2111
37	322128	6199655	410.6	415.6	220	635.6	2085
38	3.22352	6199232	407.6	412.6	220	632.6	2076
39	320630	6199500	386.5	391.5	220	611.5	2006
40	321197	6199375	391.7	396.7	220	616.7	2023
41	321557	6199056	408.4	413.4	220	633.4	2078
42	320763	6198805	408.9	413.9	220	633.9	2080



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A- AVIATION PROJECTS

3. EXTERNAL CONTEXT

This chapter explores the federal, state, and local planning context that may impact the Project. Each section will explore and respond to the planning context to identify any conflict between the Project and applicable planning requirements.

3.1. South Australian Government - planning context

Development consent was provided in October 2019 for the Twin Creek Wind Farm and Energy Storage Project consisting of 51 WTGs up to 180 m AGL tip height. RES intends to submit a new development application to the State Commission Assessment Panel for the (optimised) Project under the Planning, Development and Infrastructure Act 2016.

Crown Sponsorship has been granted by the Department for Energy and Mining for the development of the Twin Creek Wind Farm and Energy Storage Project to occur as essential infrastructure.

The Project will be subject to the South Australian Planning and Design Code, made under the Planning, Development and Infrastructure Act 2016.

The Code divides development into categories based on its classification under the Code as either:

- a) accepted development
- b) deemed-to-satisfy development
- c) restricted development
- d) performance assessed

Relevant to the development of renewable energy facilities is the performance outcome specified in the Infrastructure and Renewable Energy Facilities General Development Policy PO 4.1:

Infrastructure and renewable energy taxilities and ancillary development located and operated to not adversely impact maritime or air t.a. sport safety, including the operation of ports, airfields and landing strips.

This aviation assessment will examine the impact of the Project on air transport safety. There are no Airport-related overlays applicable to the Project Area.

3.2. National Airports Safeguarding Framework

The National Aircorts Safeguarding Advisory Group (NASAG) was established by Commonwealth Department of Infrastructure and Transport to develop a national land use planning framework called the National Airports Safeguarding Framework (NASF). The purpose of the NASF is to enhance the current and future safety, viability, and growth of aviation operations at Australian airports through:

- the implementation of best practice in relation to land use assessment and decision making in the vicinity of airports
- assurance of community safety and amenity near airports
- better understanding and recognition of aviation safety requirements and aircraft noise impacts in land use and related planning decisions
- the provision of greater certainty and clarity for developers and landowners

- improvements to regulatory certainty and efficiency

or Wind Turbine Installations (Wind Farms)/Wind work to State/Territory and local government decision makers, airport accepts of wind farms to jointly address the risk to civil aviation arising from the sevenopment, presence and use of wind farms and WMTs.

The methodology for preparing the risk assessment is contained in the NASF Guideline D Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation.

The risk assessment will have regard to all potential aviation activities within the vicinity of the princluding recreation, commercial, civil (including for agricultural purposes) and will be strongly encourages consultational directions and Airsenvices.

and Airservices.

3.3. Aircraft operations at non-controlled aerodromes

Advisory Circulars (ACs) provide advice and guidance from CASA to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements. Advisory Circular (AC) 91-10 v1.1 Operations in the vicinity of non-controlled aerodromes provides guidance for pilots flying at or in the vicinity of non-controlled aerodromes, with respect to CASR 31.

A conventional circuit pattern and heights are provided in AC 11-10 v1.1. The standard circuit consists of a series of flight paths known as legs when departing, arrive or when conducting circuit practice. Illustrations of the standard aerodrome traffic circuit procedures provided in AC 91-10 v1.1. are shown in Figure 3 and Figure

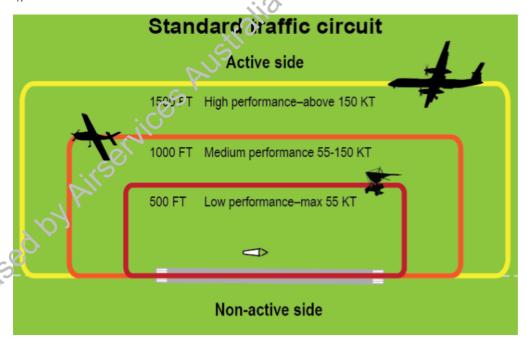


Figure 3 Lateral and vertical separation in the standard aerodrome traffic circuit

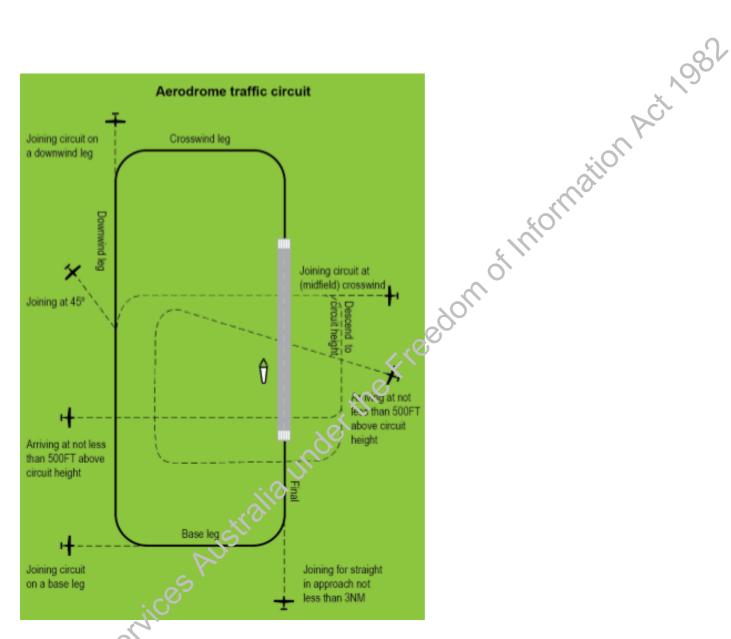


Figure 4 Aerodrome standard traffic circuit, showing arrival and joining procedures

AC 91-10 v1.... paragraph 7.10 makes reference to a distance that is "normally" well outside the circuit area and wher $\frac{1}{2}$ no traffic conflict exists, which is at least 3 nm (5556 m). The paragraph is copied below:

7.10 Departing the circuit area

7.10.1 Aircraft should depart the aerodrome circuit area by extending one of the standard circuit legs or climbing to depart overhead. However, the aircraft should not execute a turn to fly against the circuit direction unless the aircraft is well outside the circuit area and no traffic conflict exists. This will normally be at least 3 NM from the departure end of the runway, but may be less for aircraft with high climb performance. In all cases, the distance should be based on the pilot's awareness of traffic and the ability of the aircraft to climb above and clear of the circuit area.

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AUDITION PROJECTS

3.4. Rules of flight

3.4.1. Flight under Day Visual Flight Rules (VFR)

According to Aeronautical Information Publication (AIP) the meteorological conditions required for visual flight in the applicable (Class G) airspace at or below 3000 ft AMSL or 1000 ft AGL whichever is the higher are: 5000 m visibility, clear of clouds and in sight of ground or water.

Civil Aviation Safety Regulation (1998) 91.267 (Minimum height rules—other areas) prescribes the minimum height for flight. Generally speaking, and unless otherwise approved, aircraft are restricted to a minimum height of 500 ft AGL above the highest point of the terrain and any object on it within a radius of 300 m in visual flight during the day when not in the vicinity of built-up areas, and 1000 ft.^GL over built up areas (within a horizontal radius of 600 m of the point on the ground or water immed ately below the aeroplane).

These height restrictions do not apply if through stress of weather or any other unavoidable cause it is essential that a lower height be maintained.

Flight below these height restrictions is also permitted in certain other circumstances

3.4.2. Night VFR

With respect to flight under the VFR at night, Civil Aviation Safety Regulations (1998) 91.277 requires that the pilot in command of an aircraft flying VFR at night must not fly below the following heights (unless during take-off and landing operations, within 3 nm of an aerodrome, or with an air traffic control clearance):

- a) the published lowest safe altitude for the review or route segment (if any);
- b) the minimum sector altitude published in the authorised aeronautical information for the flight (if any);
- c) the lowest safe altitude for the loute or route segment;
- d) 1,000 ft above the highest obstacle on the ground or water within 10 nautical miles ahead of, and to either side of, the aircraft at that point on the route or route segment;
- e) the lowest altitude for the route or route segment calculated in accordance with a method prescribed by the Part 91 Manual of Standards for the purposes of this paragraph.

3.4.3. Instrument Flight Rules (Day or night) (IFR

According to CASR 91, flight under the instrument flight rules (IFR) requires an aircraft to be operated at a height clear of obstacles that is calculated according to an approved method.

3.5. Aircraft operator characteristics

Fire aft operations in the vicinity of the Project area are likely to be mostly private and recreational aircraft including powered and glider aircraft associated with the Adelaide Soaring club at Gawler aerodrome and Adelaide University Gliding Club at Stonefield gliding aerodrome, aerial application aircraft and military aircraft operating in designated restricted airspace overhead and adjacent the Project Area.

Air transport operations are generally conducted under the instrument flying rules (IFR), while aerial work and private and recreational activities are likely to be conducted under visual flying rules (VFR).



Military operations

There may be some high-speed low-level military jet aircraft and helicopter operations conducted in the area. In restricted airspace overhead the Project Area, at a minimum height of 3500 ft AMSL.

Refer to Section 5 for Department of Defence consultation.

3.7. Aerial application operations

erial application operations included onducted under deal? Operations conducted under VFR are required to remain in visual meteorological conditions (VMC) (at least

The standard response from the Aerial Application Association of Australia in relation to wind farms has been included in Section 3.8 (below) for reference. Objections to windfarms are generally related to large scale wind farm projects in active areas of agriculture located in the vicinity of active agriculture operations.

There may be aerial application operations associated with ferti iser, pest and crop spraying in the area.

3.8. Aerial Application Association of Australia (AA.A.)

In previous consultation with the AAAA, Aviation Projects has been directed to the AAAA Windfarm Policy (dated March 2011) which states in part:

As a result of the overwhelming safety and economic impact of wind farms and supporting infrastructure on the sector, A.V.A opposes all wind farm developments in areas of agricultural production or elevated bus fire risk.

In other areas, AAAA salso opposed to wind farm developments unless the developer is able to clearly demonstrate they have:

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

AAAA had developed National Windfarm Operating Protocols (adopted May 2014). These protocols note the following comments:



At the development stage, AAAA remains strongly opposed to all windfarms that are proposed to be built on agricultural land or land that is likely to be affected by bushfire. These areas are of critical safety importance to legitimate and legal low-level operations, such as those encountered during crop protection, pasture fertilisation or firebombing operations.

However, AAAA realises that some wind farm proposals may be approved in areas where aerial application takes place. In those circumstances, AAAA has developed the following national operational protocols to support a consistent approach to aerial application where windfarms are in the operational vicinity.

The protocols list considerations for developers during the design/build stage and the operational stage, for pilots/aircraft operators during aircraft operations and discusses economic compensation. NASF Guideline 2 is included in the Protocols document as Appendix 1, and AAAA Aerial Application Pilots Manual – excerpts on planning are provided as Appendix II.

This AIA has been prepared in consideration of the National Windfarm Operating Protocols, noting there are no known aerial application operations associated with fertiliser, pest and crop spraying in the area.

3.9. Local aerial application operators

Aerial application operators consulted in previous studies undertaken by Aviation. Projects have stated that a wind farm would, in all likelihood, prevent aerial agricultural operations in that particular area, but that properties adjacent to the wind farm would have to be assessed on an individual basis.

Aerial application operators generally align their positions with the 'A'A policies.

Based on previous studies undertaken by Aviation Projects, and subject to the results of consultation with AAAA and any further consultation with local aerial application one ators, it is reasonable to conclude that safe aerial application operations would still be possible on propert es within the Project site and neighbouring the Project site, by implementing recommendations provided in this report.

The use of helicopters enables aerial application operations to be conducted in closer proximity to obstacles than would be possible with fixed wing aircraft due to their greater manoeuvrability.

It is possible that fixed wing aerial agricular operations will be conducted in the vicinity of the Project.

3.10. Aeromedical services Coyal Flying Doctor Service

Royal Flying Doctor Service (F.FDS) and other emergency services operations are generally conducted under the IFR, except when arriving departing a destination that is not serviced by instrument approach aids or procedures.

Most emergency aviation services organisations have formal risk management programs to assess the risks associated vith their operations and implement applicable treatments to ensure an acceptable level of safety can be no intained.

Refer to Section 5 for Royal Flying Doctor Service consultation.

3.11. Aerial firefighting

Aerial firefighting operations (firebombing in particular) are conducted under Day VFR, sometimes below 500 ft AGL. Under certain conditions visibility may be reduced/limited by smoke/haze.



ation Act 1982 Most aerial firefighting organisations have formal risk management programs to assess the risks associated with their operations and implement applicable treatments to ensure an acceptable level of safety can be maintained. For example, pilots require specific training and approvals, additional equipment is installed in the aircraft, and special procedures are developed.

The Australasian Fire and Emergency Services Council (AFAC) has developed a national position on wind farms, their development and operations in relation to bushfire prevention, preparedness, response and recovery, set out in the document titled Wind Farms and Bushfire Operations, version 3.0, dated 25 October 2018.

Of specific interest in this document is the section extracted verbatim from under the 'Response' heading, copied below:

Wind farm operators should be responsible for ensuring that the relevant emergency protocols and plans are properly executed in an emergency event. During an emergency, operators need to react quickly to ensure they can assist and intervene in accordance with their planned procedures

The developer or operator should ensure that:

- liaison with the relevant fire and land management agencies is ongoing and effective
- access is available to the wind farm site by emergency services response for on-ground firefighting operations
- wind turbines are shut down immediately during eme gency operations where possible, blades should be stopped in the 'Y' or 'rabbit ear' position, as this positioning allows for the maximum airspace for aircraft to manoeuvre underneath the blades and removes one of the blades as a potential obstacle.

Aerial personnel should assess risks posed by aeria, obstacles, wake turbulence and moving blades in accordance with routine procedures.

ay be Allestral Fixed wing aerial firefighting operations may be conducted in the vicinity of the Project.

INTERNAL CONTEXT

4.1. Wind farm description

John of Information Act Aggs?

John of Information Act Aggs?

John of Information Act Aggs? The Twin Creek wind farm will comprise of up to 42 WTGs with a maximum height of up to 220 m AGL tip height, together with associated infrastructure.

The Project will be located on rural cropping and pastoral land.

The main permanent wind farm components of the proposed Project will include the following:

- A maximum of 42 WTGs with a maximum tip height of up to 220 m AGL
- hard standing areas for WTG construction
- access tracks
- Battery Energy Storage System (BESS)
- On-site substation and terminal substation located east of Truro
- overhead cabling and unground cabling as required (linking WTGs to signal-station)

Design elements are subject to detailed design over the course of development.

Figure 5 and Figure 6 shows the general nature of the Project area. These locations are generally representative of the nature of Project area for all proposed WTG Lites.



Figure 5 Southern Project Area



Figure 6 Photo facing southeast towards northwest Project Area.

Wind turbine generator (WTG) description

The maximum blade tip height of the proposed wind turbines will be up to 220 m AGL.

ayout it have have a seed to white the services have a seed to seed to seed to seed the services have a seed to seed to seed to seed the services have a seed to seed to seed to seed the services have a seed to seed to seed the services have a seed to seed to seed the services have a seed to seed the services have a seed to seed the seed to seed Figure 7 demonstrates the Project layout identifying the highest proposed wind turbine WTG-7 (source: RES,

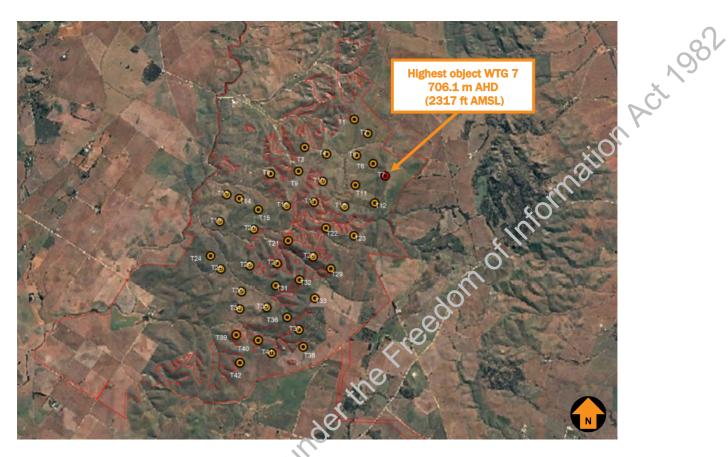


Figure 7 Proposed WTG locations and highest elevation WTG (WTG-7)

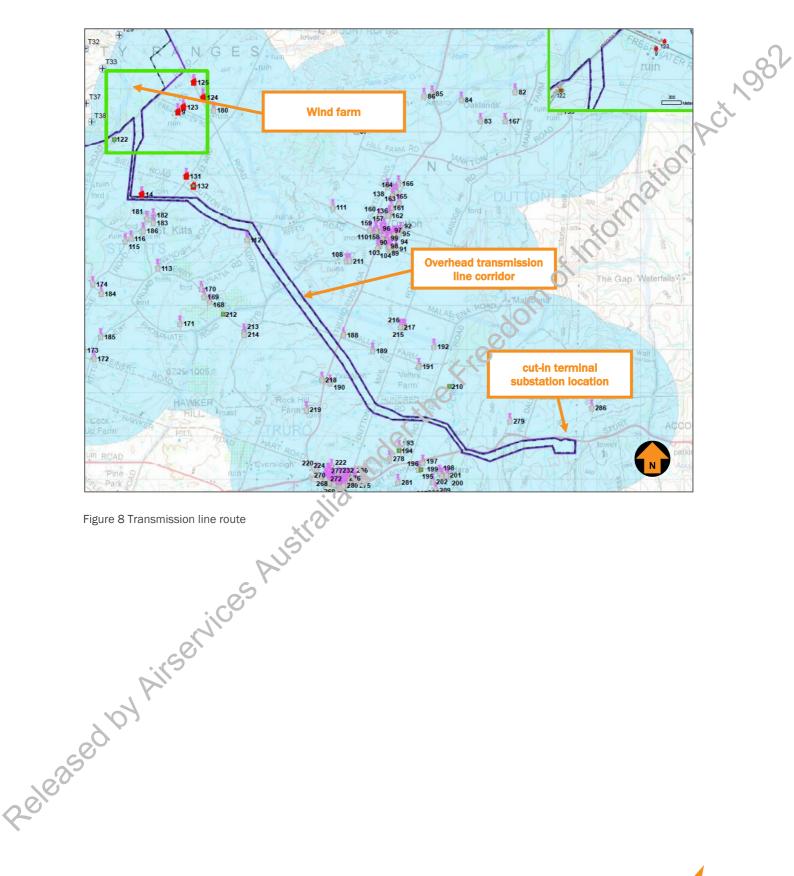
4.3. Grid transmission

The Project will connect to the ElectraNet 275kV powerline via a cut-in terminal substation east of the town of Truro.

It is understood the WTGs will be connected via underground cables, with an overhead transmission line connecting the wind farm from the on-site substation to the ElectraNet 275kV powerline.

Figure 8 shows the configuration of the grid transmission infrastructure (Source, RES, Drawing No. 03498-RES-MAP-DR-TE-004)

MAP-DR-TE-004)



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Table 3 Stakeholder consultation details

Agency/Contact	Activity/Date	Response/ Date	Issues Raised During Consultation	Action Proposed
Airservices Australia				
Royal Flying Doctor Service				10
Department of Defence				0,0
Adelaide Soaring Club				2.50
Stonefield Gliding aerodrome				21
Regional aircraft operators			18	

AVIATION IMPACT STATEMENT

Nearby certified aerodromes

The area of 30 nm (56 km) from a certifier airport's aerodrome reference point (ARP) is used to identify possible constraints from the Project.

The 30 nm radius represents the 25 nm minimum sector altitude (MSA) for aerodromes with terminal instrument flight procedures. TIG- 25 nm MSA minimum altitude is determined by assessing obstacles within 30 nm of the reference point.

There are no proposed WTG sites located within 30 nm (55.56 km) of any certified aerodrome. Edinburgh airfield (YPED) is located approximately 30.6 nm from the nearest proposed WTG to the aerodrome reference point (ARP).

The nearest certified aerodromes to the Project (from the closest WTG) are:

Edinburgh (YPED) – 30.6 nm southwest

- Parafield (YPPF) 35 nm southwest
- Adelaide (YPAD) 45 nm southwest

The location of the Project Area relative to the nearest certified aerodromes shown in Figure 9 (Source: RES, Google Earth).



Figure 9 Project location in relation o certified aerodromes

The WTGs are not located within 30 nm of any certified aerodrome and therefore will not affect any certified aerodrome's terminal instrument flight procedures or obstacle limitation surface.

6.3. Nearby and aft landing areas (ALAs)

As a guide, an area of interest within a 3 nm radius of an aircraft landing area (ALA – uncertified aerodrome) is used to assess potential impacts of proposed developments on aircraft operations at or within the vicinity of the ALA.

Research of various aviation datasets was undertaken to identify ALAs in the vicinity of the Project. The aviation datasets used are:

- OzRunways which sources its data from Airservices Australia (AIP). The aeronautical data provided by OzRunways is approved under CASA CASR Part 175.
- Australian Government National Map online.

As a guide, an area of interest within a 3 nm radius of an ALA is used to assess the potential impacts of proposed developments on aircraft operations at or within the vicinity of the ALA. There are no specified obstacle protection surfaces established for ALAs, and a 3 nm radius from an ALA generally represents the distance beyond which normal aircraft operations that are anticipated to occur at ALAs would not be adversely affected.

An ALA (YVAF) was previously located in the vicinity of the Project transmission line corridor. The ALA is still currently identified in OzRunways, with a note attached to the published information stating the property has been sold and the ALA is closed. This ALA is not considered in this assessment.

Figure 10 shows the location of the nearest ALAs in relation to the Project. A 3nm radius from each ALA is shown. (Source, RES, Google Earth, OzRunways)

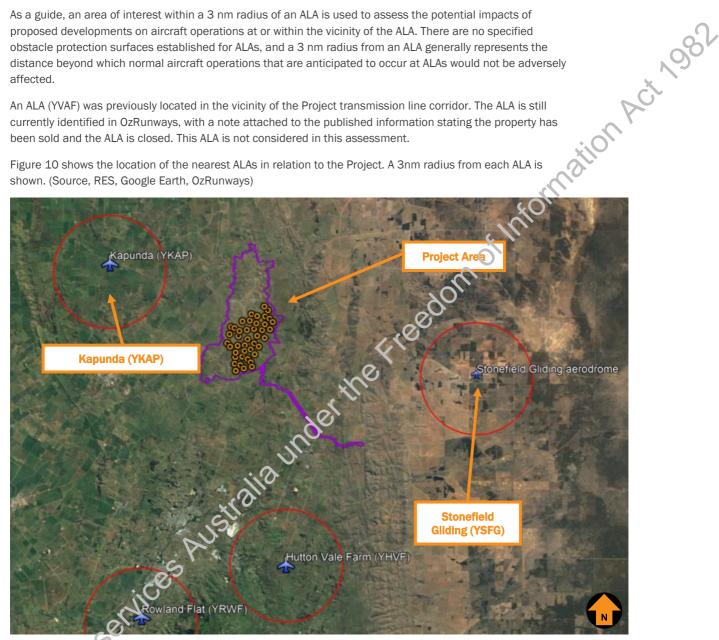


Figure 10 A sin relation to Project Area

Air routes and LSALT

MOS 173 requires that the published lowest safe altitude (LSALT), for a particular airspace grid or air route, provides a minimum of 1000 ft clearance above the controlling (highest) obstacle within the relevant airspace grid or air route tolerances.

Grid LSALTs are specified for grid squares formed by the parallels and meridians at 1° intervals for low-level charts and 2° intervals for the high-level chart applicable to the Project Area.

The proposed WTGs are located in a grid identified in the EnRoute Chart - Low. (ERCL 7) The grid LSALT applicable to the proposed WTG locations is 3400 ft AMSL. The Project is located in the vicinity of one low-level air route, W325, between the VOR located at Adelaide airport (AD VOR) and waypoint RUSSL.

Figure 11 provides the low-level air routes and grid LSALTs in proximity to the Project site (source: ERC Low National, RES).

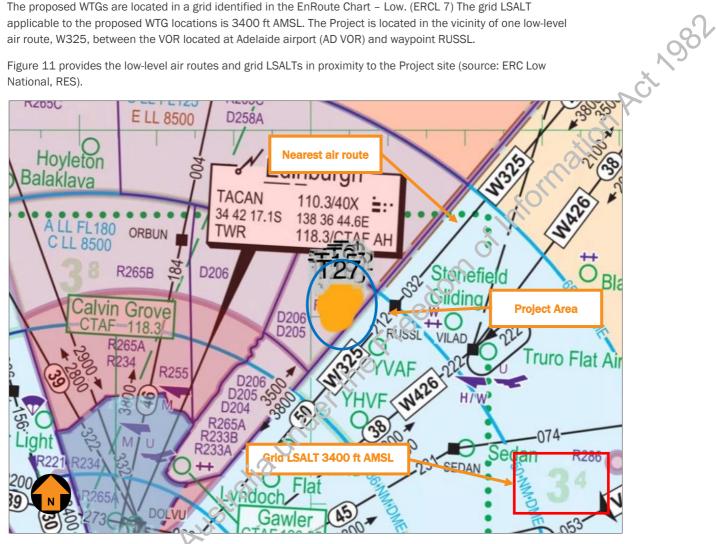


Figure 11 Low-level air routes and Grid LSALT in relation to the Project site

The Project is identified in a grid in the EnRoute Chart - High (ERC H3 South). The applicable grid LSALT is 3800 ft AMSL. The Project is in the vicinity of one high-level air route, Q32, between waypoints BORLI and KAMBI. There is no loute LSALT specified for Q32, meaning the grid LSALT of 3800 ft AMSL applies.

Figure 12 provides the high-level air routes and grid LSALT in proximity to the Project site (source: ERC High 3, Releasedidy

AUDITION PROJECTS

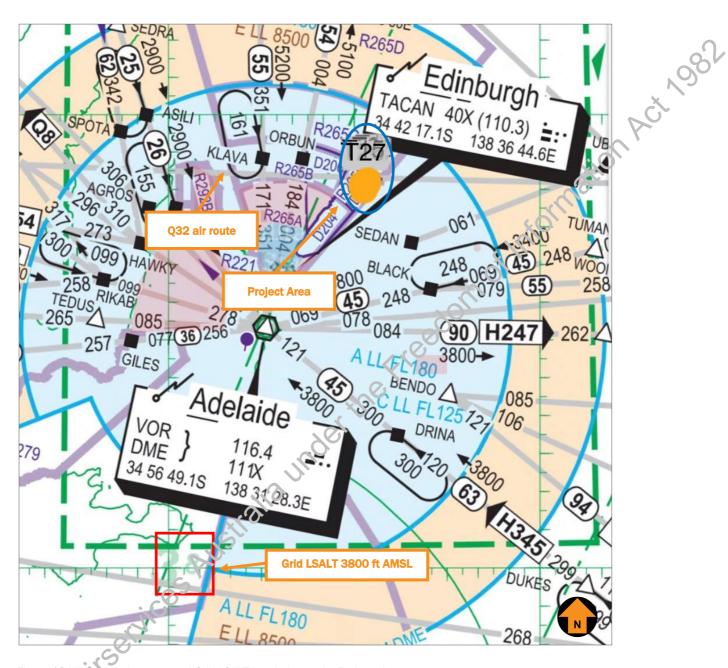


Figure 12 High level air routes and Grid LSALT in relation to the Project site

An impact analysis of the LSALTs applicable to the Project Area is provided in Table 4, based on the maximum Project Height of 706.1 m AHD (2317 ft AMSL).

AUDITION PROJECTS

Table 4 LSALT analysis

Table 4 LSALT an	alysis						- 0
Air route	Waypoint pair	LSALT (ft AMSL)	Protection surface (ft AMSL)	Impact on airspace design	Potential solution	Impact on aircraft ops	~ CX /08 1
W325 (ERCL)	AD VOR - RUSSL	3500/3800	2500/2800	Nil – maximum Project height below surface by 183 ft/483 ft	N/A	N/A	ation Act 1987
Q32	BORLI- KAMBI	Grid – 3800	2800	Nil – maximum Project height below surface by 483 ft	N/A	N/A	
Grid (ERCL)	N/A	3400	2400	Nil – maximum Project height below surface by 83 ft	N/A	N/A	
Grid (ERCH)	N/A	3800	2800	Nil - maximun Project height below surface by 483 ft	N/A	N/A	

There will be no impact to any grid or route LSALT caused by the Project, based on the proposed WTG configuration.

6.5. **Airspace Protection**

The Project site is located outside controlled airspace (wholly within Class G uncontrolled airspace). The Project is located within the lateral limits of the following Restricted Areas associated with military flying activities from Edinburgh air base:

- R265E Edinburgh Military Flying (3500 4500 ft AMSL) NOTAM activation (Controlling authority FLTCDR 453SQN Etinburgh
- R265F Edinburgh Military Flying (lower limit 4500 ft AMSL) NOTAM activation (Controlling authority FITCDR 453SQN Edinburgh

The Project is also located within the lateral limits of Danger Areas 205 and 206, associated with gliding operations by the Adelaide Soaring Club from Gawler aerodrome. The Danger Areas are activated by NOTAM (likely associated with gliding events).

Figure 13 shows the Project site in relation to the lateral limits of the restricted and danger Areas (Source, RES, Czrkunways)



Figure 13 Project in relation to Danger and Restricted Areas

A restricted area prohibits the $\alpha_{\rm P}$ ration of aircraft in the airspace unless the pilot in command has an approval for the flight from the Controlling Authority of the restricted area. Danger areas are established around areas where hazardous operations are likely to take place, however aircraft are not specifically prohibited from operating in that area.

The maximum Project height will be below the minimum height of the restricted areas. The Project is not anticipated to effect the function of the restricted and danger areas.

6.6. Aviation facilities – Communication, Navigation and Surveillance Systems (CNS)

WSF Guideline G (Protection Aviation Facilities - Communication, Navigation and Surveillance (CNS)) and Part 139 MOS 2019 specify the area where development of buildings and structures has the potential to cause unacceptable interference to CNS facilities.

There are no aviation CNS located in the vicinity of any WTGs, and the Project will not penetrate any protection areas associated with CNS facilities as specified in Part 139 MOS 2019 and the National Airports Safeguarding Framework.



6.7. Radar

Airservices Australia currently requires an assessment of the potential for wind turbine generators to affect radar line of sight.

With respect to aviation radar facilities, the closest radar to the Project Area is the Adelaide Primary Surveillance Radar (PSR) and Secondary Surveillance Radar (SSR) which are located at Adelaide Airport approximately 45 nm (83 km) southwest of the nearest proposed WTG.

EUROCONTROL guidelines for assessing the potential impact on wind turbines and WMTs on radar surveillance sensors stipulate the following assessment requirements:

Primary Surveillance Radar (PSR)

Zone 1 0-500 m: Not permitted

Zone 2 500 m - 15 km: Detailed assessment

Zone 3: Further than 15 km but within maximum instrumented range and in radar line of sight: Simple assessment

Zone 4: Anywhere within maximum instrumented range but not in radar line of sight or outside the maximum instrumented range: No assessment

Secondary Surveillance Radar (SSR)

Zone 1: 0-500 m: Not permitted

Zone 2 500 m – 16 km but within maximum instrumented range and in radar line of sight: Detailed assessment

Zone 4: Further than 16 km or not in radar line of Sight: No assessment

(Zone 3 is not established for secondary surveillance radar)

Due to the distance and terrain profile of the Project Area from the facilities, it is anticipated that the Project will not impact the Adelaide Primary and Secondary Surveillance Radar facilities.

Airservices Australia will review the potential impact of the Project on these radar facilities once notified of the Project.

 $Note: Route\ Surveillance\ Radar\ (RSR)\ and\ Secondary\ Surveillance\ Radar\ (SSR)\ is\ the\ same\ radar\ system.$

6.8. Consultation

An appropriate and justified level of consultation was undertaken with relevant parties. Refer to **Section 5** for details of the stakeholders and a summary of the consultation.

6.9. AIS Summary

Based on the Project WTG layout and maximum blade tip height of up to 220 m AGL, the blade tip elevation of the highest WTG associated with both proposed WTG configurations, will not exceed 706.1 m AHD (2317 ft AMSL) and:

will not penetrate any certified aerodrome's obstacle limitation surfaces

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- or mation Act 1987 is not located within 30 nm of and will not affect any certified aerodrome's terminal instrument flight procedures
- will not have an impact on nearby designated air routes
- will not have an impact on the grid LSALT established in ERC High and ERC Low
- will not have an impact on operational airspace
- is wholly contained within Class G airspace
- is outside the clearance zones associated with civil aviation navigation aids and communication facilities.

6.10. ALA analysis summary

There are no verified active ALAs located within 3 nm of the Project and there is no impact anticipated to any ALA caused by the Project.

6.11. Assessment recommendations

Based on the information contained within this section and the analysis conducted, the following recommendations are made:

- Consultation should be undertaken with Airservices Australia of assess potential impacts of the Project (undertaken during this assessment)
- Consult with Adelaide University Gliding Club and Adelaide Soaring Club at Stonefield gliding and Gawler aerodromes to determine if there will be botential safety issues for aircraft operations to the aerodromes if the Project was developed (uncleitaken during this assessment)
- Department of Defence should be consulted to identify any potential impacts from the Project on military operations.

An appropriate and justified level of convertation was undertaken with relevant parties. Refer to Section 5 for Released by Airservices

Released by Airservices details of the stakeholders and a summary of the consultation.



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101808-04_TWIN CREEK WIND FARM - AVIATION IMPACT ASSESSMENT



8. ACCIDENT STATISTICS

This section establishes the external context to ensure that stakeholders and their objectives are considered when developing risk management criteria, and that externally generated threats and opportunities are properly taken into account.

8.1. General aviation operations

The general aviation (GA) activity group is considered by the Australian Transport Safety Bureau (ATSB) to be all flying activities that do not involve commercial air transport (activity group), which includes scheduled (RPT) and non-scheduled (charter) passenger and freight type. It may involve Australian civil (VH–) registered airc aft, or aircraft registered outside of Australia. General aviation/recreational encompasses:

- Aerial work (activity type). Includes activity subtypes: agricultural mustering, agricultural spreading/spraying, other agricultural flying, photography, policing, firefighting, cor. struction – sling loads, other construction, search and rescue, observation and patrol, power/pipeline surveying, other surveying, advertising, and other aerial work.
- Own business travel (activity type).
- Instructional flying (activity type). Includes activity subtypes: solo and dual flying training, and other instructional flying.
- Sport and pleasure flying (activity type). Includes activity subtypes: pleasure and personal
 transport, glider towing, aerobatics, community service flights, parachute dropping, and other sport
 and pleasure flying.
- Other general aviation flying (activity type). Includes activity subtypes: test flights, ferry flights and other flying.

8.2. ATSB occurrence taxonomy

The ATSB uses a taxonomy of occurrence sub-type. Of specific relevance to the subject assessment are terms associated with **terrain collision**. Definitions sourced from the ATSB website are provided below:

- Collision with terrain: O currences involving a collision between an airborne aircraft and the ground or water, where the ulight crew were aware of the terrain prior to the collision.
- Controlled flight into terrain (CFIT): Occurrences where a serviceable aircraft, under flight crew control, is inadvertently flown into terrain, obstacles, or water without either sufficient or timely awarences by the flight crew to prevent the event.
- Ground strike: Occurrences where a part of the aircraft drags on, or strikes, the ground or water while the aircraft is in flight, or during take-off or landing.

Wirestrike: Occurrences where an aircraft strikes a wire, such as a powerline, telephone wire, or guy wire, during normal operations.

8.3. National aviation occurrence statistics 2010-2019

The Australian Transport Safety Bureau (ATSB) recently published a summary of aviation occurrence statistics for the period 2010-2019 (AR-2020-014, Final - 29 April 2020).



According to the report, there were no fatalities in high or low capacity RPT operations during the period 2010-

Sub-category	Aircraft assoc. with fatality	Fatalities	Fatalities to air raft ratio
Aerial work	37	44	1.18:1
Instructional flying	11	19	1.727
Own business travel	3	5	1.6:1
Sport and pleasure flying	53	94	1.77:1
Other general aviation flying	11	1.2	1.09:1
Totals	115	174	1.51:1

Figure 14 refers to Fatal Accident Rate by operation type per million departures over the 6-year period (source: ATSB). Note the rates presented are not the full year range of the study (2010-2019). This was due to the availability of exposure data (departures and nours flown) which was only available between these years. According to the ATSB report, the number of fatal accidents per million departures for GA aircraft over the 6year reporting period ranged between 6 6 in 2014 and 4.9 in 2019.

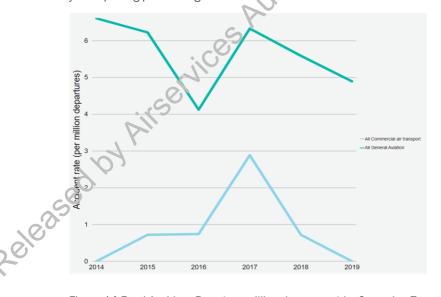


Figure 14 Fatal Accident Rate (per million departures) by Operation Type



In 2018, there were 9 fatal accidents and 9 fatalities involving GA aircraft, resulting in a rate of 5.6 fatal accidents per million departures and 7.7 fatal accidents per million hours flown.

the Freedom of Information Act 1982 In 2019, there were 1,760,000 landings, and 1,320,000 hours flown by VH-registered general aviation aircraft in Australia, with 8 fatal accidents and 17 fatalities. Based on these results, in 2019 there were 4.9 fatal accidents per million departures and 6.4 fatal accidents per million hours flown. A summary of fatal accidents from 2010-2019 by GA sub-category is provided in Table 6 (source: ATSB).

Table 6 Fatal accidents by GA sub-category - 2010 -2019

Sub-category	Fatal accidents	Fatalities
Agricultural spreading/spraying	13	13
Agricultural mustering	11	12
Other agricultural	1	1
Survey and photographic	5	10
Search and rescue	2	2
Firefighting	2	2
Other aerial work	3	4
Instructional flying	11	19
Own business travel	3	5
Sport and pleasure flying	53	94
Other general aviation flying	11	12
Total	115	174

Over the 10-year period, no aircraft collided with a WTG or a WMT in Australia.

Of the 20,529 incidents, serious in idents and accidents in GA operations in the 10-year period, 1,404 (6.83%) were terrain collisions.

The underlying fatality rate for GA operations discussed above is considered tolerable within Australia's regulatory and social context.

Worldwide accidents involving wind farms

Worldwide since aviation accident statistics have been recorded, there have been a total of 4 aviation accidents involving a wind farm (i.e. where WTGs were erected). To provide some perspective on the likelihood of a VFR aircraft colliding with a WTG, a summary of the 4 accidents and the relevant factors applicable to this assessment is incorporated in this section.

Based on the statistics set out in the Global Wind Energy Council (GWEC) report 2016, there were 341,320 WTGs operating around the world at the end of 2016. In 2019, approximately 60.4 GW of wind power had been installed worldwide.

Based on the Australia's Clean Energy Council statistics there were 102 wind farms in Australia at the end of 2019. Aviation Projects has researched public sources of information, accessible via the world wide web,

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regarding aviation safety occurrences associated with wind farms. Occurrence information published by Australia, Canada, Europe (Belgium, Denmark, France, Germany, Norway, Sweden and The Netherlands), New Zealand, the United Kingdom and the United States of America was reviewed.

The 4 recorded aviation accidents involving a wind farm are summarised as follows:

- One accident, which resulted in 2 fatalities, occurred in Palm Springs in 2001. This accident involved a wind farm but was not caused by the wind farm. The cause of the accident was the inflight separation of the majority of the right canard and all of the right elevator resulting from a failure of the builder to balance the elevators per the kit manufacturer's instructions. The accident occurred above a wind farm, and the aircraft struck a WTG on its descent and therefore the cause of the accident was not attributable to the wind farm and not applicable to this AIA.
- Two accidents involving collision with a WTG were during the day, as follows:
 - One accident occurred in Melle, Germany in 2017 as the result of a collision with a WTG mounted on a steel lattice tower at a very low altitude during the day with good visibility and no cloud. The accident resulted in one fatality. If the tower was solid and painted white, as is standard on contemporary wind farms, then it more than likely would have been more visible than if it were to be equipped with an obstacle light which in all likelihood would not have been operating during daylight with good visibility conditions.
 - One accident occurred in Plouguin, France in 2008 when the pilot decided to descend below cloud in an attempt to find the destination aerodrome. The aircraft was flying in conditions of significantly reduced horizontal visibility in fog where the top of the WTGs were obscured by cloud. The WTGs became visible too late for avoidance manoeuvring and the aircraft made contact with two WTGs. The aircraft was damaged but landed safely. No fatalities were recorded.
 - In both of the above cases, it is difficult to conclude that obstacle lighting would have prevented the accidents.
- One fatal accident, near Highmore South Dakota in 2014 occurred at night in Instrument Meteorological Conditions (IMS).

There is one other accident mentioned in a database compiled by an anti-wind farm lobby group (windwatch.org), which suggests a Cessna 182 collided with a WTG near Baraboo, Wisconsin, on 29 July 2000. The NTSB database records details of an accident involving a Cessna 182 that occurred on 28 July 2000 in the same area. For this particular accident, NTSB found that the probable cause of the accident was VFR flight into IMC encountered by the pilot and exceeding the design limits of the aircraft. A factor was flight to a destination alternate not performed by the pilot. No mention in the NTSB database is made of WTGs or a wind farm.

A summary of the 4 accidents is provided in Table 7.

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Table 7 Summary of accidents involving collision with a WTG

ID	Description	Date	Location	Fatalities	Flight rules	WTG height	Obstacle lighting	Cruse of accident	Relevant to obstacle lighting at night
1	Diamond DA320-A1 D-EJAR Collided with a WTG approximately 20 m above the ground, during the day in good visibility. The mast was grey steel lattice, rather than white, although the blades were painted in white and red bands.	02 Feb 2017	Melle, Germany	1	Day VFR No cloud and good visibility	Not specified	Not specified	Not specified	Not applicable

ID	Description	Date	Location	Fatalities	Flight rules	WTG height	Obstacle lighting	Cause of accident	Relevant to obstacle lighting at night
2	The Piper PA-32R-300, N8700E, was destroyed during an impact with the blades of a WTG, at night in IMC. The wind farm was not marked on either sectional chart covering the accident location; however, the pilot was reportedly aware of the presence of the wind farm.	27 Apr 2014	10 miles south of Highmore, South Dakota	4	Night IMC Low cloud and rain	420 ft AGL overall	Fitted but reportedly not operational on the VTG that was struck	The NTSB determined the probable cause(s) of this accident to be the pilot's decision to continue the flight into known deteriorating weather conditions at a low altitude and his subsequent failure to remain clear of an unlit WTG. Contributing to the accident was the inoperative obstacle light on the WTG, which prevented the pilot from visually identifying the WTG.	An operational obstacle light may have prevented the accident.

ID	Description	Date	Location	Fatalities	Flight rules	WTG height	Obstacle lighting	Cause of accident	Relevant to obstacle lighting at night
3	Beechcraft B55 The pilot was attempting to remain in VMC by descending the aircraft through a break in the clouds. The pilot, distracted by trying to visually locate the aerodrome, flew into an area of known presence of WTGs. After sighting the WTGs he was unable to avoid them. The tip of the left wing struck the first WTG blade, followed by the tip of the right wing striking the blade of a second WTG. The pilot was able to maintain control of the aircraft and landed safely.	04 Apr 2008	Plouguin, France	OSA	Day VFR The weather in the area of the WTGs had deteriorated to an overcast of stratus cloud, with a base between 100 ft to 350 ft and tops of 500 ft.	328 ft AGL hub height, 393 ft AGL overall	Not specified	This pilot reported having been distracted by a troubling personal matter which he had learned of before departing for the flight. The wind farm was annotated on aeronautical charts.	Not applicable

ID	Description	Date	Location	Fatalities	Flight rules	WTG height	Obstacle lighting	Cause of actident	Relevant to obstacle lighting at night
4	VariEze N25063 The aircraft collided with a WTG following in-flight separation of the majority of the right canard and all of the right elevator.	20 July 2001	Palm Springs, USA	2	Day VFR	N/A	N/A eedoin	The failure of the builder to balance the elevators per the kit manufacturer's instructions. The cause of this accident is not attributable to the wind farm.	Not applicable



RISK ASSESSMENT

Pation Act 1987 A risk management framework is comprised of likelihood and consequence descriptors, a matrix used to derive a level of risk, and actions required of management according to the level of risk.

The risk assessment framework used by Aviation Projects and risk event description is provided in Annexure 4.

9.1. **Risk Identification**

The primary risk being assessed is that of aviation safety associated with the height and location of WTGs proposed by the Project.

Based on an extensive review of accident statistics data (see summary in Section 8 above) and stake holders who were consulted during the preparation of this AIA (see Section 5), 5 identified risk events associated with WTGs relate to aviation safety or potential visual impact, and are listed as follows:

- potential for an aircraft to collide with a WTG, controlled flight into terrain (CFIT) (related to aviation safety).
- potential for a pilot to initiate manoeuvring in order to avoid colliding with a VTG resulting in collision with terrain (related to aviation safety).
- potential for the hazards associated with the Project to invoke cognitional limitations or procedures on operating crew (related to aviation safety).
- Potential effect of obstacle lighting on neighbours (related to potential visual impact).

It should be noted that according to guidance provided by the Commonwealth Department of Infrastructure Transport, Regional Development, Communications and the Arts (Airspace and Air Traffic Management Risk Management Policy Statement). and in line with generally accepted practice, the risk to be assessed should primarily be associated with passenger transport services. The risk being assessed herein is primarily associated with smaller aircraft likely to be flying under the VFR, and so the maximum number of passengers exposed to the nominated consequences is like y to be limited.

The four risk events identified here are assessed in detail in the following section.

Risk Analysis, Evaluation and Treatment 9.2.

For the purpose of considering applicable consequences, the concept of worst credible effect has been used. Untreated risk is first evaluated, then, if the resulting level of risk is unacceptable, further treatments are identified to reduce the residual level of risk to an acceptable level.

A summary of the level of risk associated with the Project, under the proposed treatment regime, with specific consideration of the effect of obstacle lighting, is provided in Table 8 through to Table 10.

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Table 8 Aircraft collision with wind turbine generator (WTG)

Risk ID:

1. Aircraft collision with wind turbine generator (WTG) (CFIT)

Discussion

An aircraft collision with a WTG would result in harm to people and damage to property. Property could include the aircraft itself, as well as the WTG.

There have been 4 reported occurrences worldwide of aircraft collisions with a component of a WTG structure since the year 2000 as discussed in Section 8. These reports show a range of situations where pilots were conducting various flying operations at low level and in the vicinity of wind farms in both IMC and VMC. No reports of aircraft collisions with wind farms in Australia have been found.

In consideration of the circumstances that would lead to a collision with a WTG:

- 1. GA VFR aircraft operators generally don't individually fly a significant number of hours in total, let alone in the area in question
- 2. Military aircraft are likely to operate overhead the Project Area within the designed airspace of Restricted Areas R265E and R265F. These restricted areas have a minimum vertical limit of 3500 ft and 4500 ft AMSL respectively
- 3. There is a very small chance that a pilot, suffering the stress of weather, will continue into poor weather conditions (contrary to the rules of flight) rather than divert away from it, is not aware of the wind farm, will not consider it or will not be able to accuracy navigate around it.
- 4. If the aircraft was flown through the wind farm, there is still a very small chance that it would hit a WTG.

Refer to the discussion of worldwide accidents in Section 8.

There may be aerial application operations during the day in the vicinity of the Project site.

There are no known aerial application operations conducted at night in the vicinity of the Project site.

If a proposed object or structure will be 100 m or more AGL, details of the relevant proposal must be referred to CASA for CASA to determine, in writing:

- (a) whether the object or structure will be a hazard to aircraft operations
- (b) whether it requires an obstacle light that is essential for the safety of aircraft operations.

CASA don't have the regularity authority to mandate obstacle lighting as the Project is clear of the obstacle limitation surfaces (OLS) or any aerodrome.

CASA generally mey ecommend obstacle lighting for objects over 200 m AGL.

Consequence

If an air raft collided with a WTG, the worst credible effect would be multiple fatalities and damage beyond repair. This would be a Catastrophic consequence.

Consequence

Catastrophic

Untreated Likelihood

There have been 4 reports of aircraft collisions with WTGs worldwide, which have resulted in a range of consequences, where aircraft occupants sustained minor injury in some cases and fatal injuries in others (see Section 8). Similarly, aircraft damage sustained ranged from minor to catastrophic. One of these accidents

nation Act 1987 resulted from structural failure of the aircraft before the collision with the WTG. Only two relevant accidents occurred during the day, and only one resulted in a single fatality. It is assessed that collision with a WTG resulting in multiple fatalities and damage beyond repair is unlikely to occur, but possible (has occurred rarely), which is classified as Possible.

Untreated Likelihood

Possible

Current Treatments (without lighting)

- The Project site is not located within 30 nm of any certified aerodrome
- The Project site is clear of the obstacle limitation surfaces (OLS) of any certified aerodrome.
- There are no WTGs proposed to be located within 3 nm of any active aircraft landing area (ALA)
- Aircraft flying at night are required to maintain at least the established LSALT with at least 1000 ft clearance over the highest obstacle except within 3 nm of the aerodrome during landing and take-off operations.
- Aircraft are restricted to a minimum height of 500 ft (152.4 m) AGL above the highest point of the terrain and any object on it within a radius of 300 m in visual flight during the day when not in the vicinity of built-up areas. The proposed WTGs will be a maximum of 220 m (723 ft) at the top of the blade tip. The rotor blade at its maximum height will be approximately 67.6 m (223 ft) above aircraft flying at the minimum altitude of 152.4 m AGL (500 ft).
- In the event that descending cloud forces an aircraft lower than 500 ft (152.4 m) AGL, the minimum visibility of 5,000 m required for visual flight during the day should provide adequate time for pilots to observe and manoeuvre their aircraft clear of WTCs.
- The WTGs will be coloured light grey which should be visible to pilots during the day.
- The 'as constructed' details of WTGs are required to be notified to Airservices Australia so that the location and height of all WTGs can be noted on aeronautical maps and charts.
- Because the Project WTGs are proposed to be above 100 m AGL, there is a statutory requirement to report the WTGs to CASA and notified to Airservices Australia prior to construction. CASA will review the Project for potential hazards to aircraft operations.

Level of Risk

The level of risk associated with a Possible likelihood of a Catastrophic consequence is 8 (Unacceptable).

Current Level of Risk

8 - Unacceptable

Risk Decision

A risk level of 8 is classified as Unacceptable: Immediate action required by either treating or avoiding risk. Refer to executive management.

Risk Decision

Unacceptable

Recommended Treatments

The following treatments which can be implemented which will provide an acceptable level of safety:

on Act 1982 Details of the Project should be communicated to local and regional aircraft operators (refer to Section 5) prior to construction to heighten their awareness of its location and so that they can plan their operations accordingly (regional aircraft operators will be consulted with during this aviation impact assessment).

Residual Risk

With the implementation of the Recommended Treatments listed above, the likelihood of an aircraft collision with a WTG resulting in multiple fatalities and damage beyond repair will be Unlikely, and the consequence remains Catastrophic, resulting in an overall risk level of 7 - Tolerable.

The level of risk with the implementation of the Recommended Treatments is considered As Low As Reasonably Practicable (ALARP).

It is our assessment that there will be an acceptable level of aviation safety risk associated with the potential for an aircraft collision with a Project WTG without obstacle lighting on the WTGs.

Resident Process Australia under the Freedo Residual Risk

7 - Tolerable

Table 9 Harsh manoeuvring leading to controlled flight into terrain

Risk ID:

2. Harsh manoeuvring leads to controlled flight into terrain (CFIT)

Discussion

An aircraft colliding with terrain as a result of manoeuvring to avoid colliding with a WTG would result in harm to people and damage to property.

There are a few ground collision accidents resulting from manoeuvring to avoid wind farms, but none in Australia, and all were during the day.

The Project is clear of the OLS of any aerodrome.

Aircraft are restricted to a minimum height of 152.4 m (500 ft) above the highest point of the terrain and any object on it within a radius of 300 m in visual flight during the day when not in the vicinity of built up areas.

The proposed WTGs will be a maximum of 220 m (723 ft) at the top of the blade tip. The rotor blade at its maximum height will be approximately 67.6 m (223 ft) above aircraft flying at the minimum altitude of 152.4 m AGL (500 ft).

Nevertheless, the minimum visibility of 5000 m required for visual flight during the day should provide adequate time for pilots to observe and manoeuvre their aircraft clear of WTGs.

Aircraft are restricted to a minimum height of 304.8 m (1000 ft) above obstacles within 10 nm of the aircraft in visual flight at night and potentially even higher during instrument flight (day or night).

Aircraft authorised to intentionally fly below 152.4 m (500 ft) AGL (day) or below safety height (night) are operated in accordance with procedures developed as an outcome of thorough risk management activities.

Assumed risk treatments

- The WTGs will be coloured light grey and should be visible during the day.
- The 'as constructed' details of WTGs are required to be notified to Airservices Australia so that the location and height of WTGs can be noted on aeronautical maps and charts.
- Since the WTGs will be higher than 100 m AGL, there is a statutory requirement to report the WTG to CASA.

Consequence

If an aircraft collided with terrain, the worst credible effect would be multiple fatalities and damage beyond repair. This would be a Catastrophic consequence.

Consequence

Catastrophic

Untreated Likelihood

There are a few ground collision accidents resulting from manoeuvring to avoid WTGs, but none in Australia, and all were during the day (see Section 8). It is assessed that a ground collision accident following manoeuvring to avoid a WTG is unlikely to occur, but possible (has occurred rarely), which is classified as Possible.

Untreated Likelihood

Possible

Current Treatments (without lighting)

AUDITION PROJECTS

- The Project site is clear of the obstacle limitation surfaces (OLS) of any aerodrome.
- Aircraft are restricted to a minimum height of 152.4 m (500 ft) above the highest point of the terrain
 and any object on it within a radius of 300 m in visual flight during the day when not in the vicinity of
 built-up areas.
- Aircraft flying at night are required to maintain at least the established LSALT with at least 1000 ft clearance over the highest obstacle except within 3 nm of the aerodrome during landing and take-off operations
- The proposed WTGs will be a maximum of 220 m (723 ft) at the top of the blade tip. The rotor blade ctits maximum height will be approximately 67.6 m (223 ft) above aircraft flying at the minimum altitude of 152.4 m AGL (500 ft). Nevertheless, the minimum visibility of 5000 m required for visual flight during the day should provide adequate time for pilots to observe and manoeuvre their aircraft clear of WTGs.
- Aircraft authorised to intentionally fly below 152.4 m AGL (500 ft) (day) or below safety height (night)
 are operated in accordance with procedures developed as an outcome of thorough risk management
 activities.
- The WTGs are typically coloured white, typical of most WTGs operational in Australia, so they should be visible during the day.
- The 'as constructed' details of WTGs are required to be notified to Airservices Australia so that the location and height of wind farms can be noted on aeronautical maps and charts.
- Since the WTGs will be higher than 100 m AGL, there is a statutory requirement to report the WTGs to CASA.

Level of Risk

The level of risk associated with a Possible likelihood of a Catastrophic consequence is 8.

Current Level of Risk

8 - Unacceptable

Risk Decision

A risk level of 8 is classified as Unacceptable: Immediate action required by either treating or avoiding risk. Refer to executive management.

Risk Decision

Unacceptable

Recommended Treatments

The following treatments which can be implemented which will provide an acceptable level of safety:

- Details of the Project should be communicated to local and regional aircraft operators (refer to Section 5) prior to construction to heighten their awareness of its location and so that they can plan their operations accordingly (regional aircraft operators will be consulted with during this aviation impact assessment).
- Ensure details of the Project WTGs have been communicated to Airservices Australia prior to construction, for publication in relevant aeronautical publications.

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Residual Risk

With the implementation of the Recommended Treatments listed above, the likelihood of an aircraft collision with a WTG resulting in multiple fatalities and damage beyond repair will be Unlikely, and the consequence remains Catastrophic, resulting in an overall risk level of 7 - Tolerable.

The level of risk with the implementation of the Recommended Treatments is considered As Low As Reasonably Practicable (ALARP).

It is our assessment that there will be an acceptable level of aviation safety risk associated with the potential for an aircraft collision with a Project WTG without obstacle lighting on the WTGs.

Raleased by Airservices Australia under the Freedom of I **Residual Risk**

7 - Tolerable

AUDITION PROJECTS

Table 10 Effect of the Project on operating crew

Risk ID:

3. Effect of the Project on operating crew

Discussion

ation Act 1987 Introduction or imposition of additional operating procedures or limitations can affect an aircraft's operating

There are no known aerial application operations conducted at night in the vicinity of the Project site.

Consequence

The worst credible effect a wind farm could have on flight crew would be the imposition of operational limitations, and in some cases, the potential for use of emergency procedures. This would be a Minor consequence.

Minor

Untreated Likelihood

The imposition of operational limitations is unlikely to occur, but possible (has occurred rarely), which is classified as Possible.

Untreated Likelihood

Possible

Current Treatments (without lighting)

- The Project site is clear of the obstacle limitation surfaces (OLS) of any certified aerodrome.
- Aircraft flying at night are required to maintain at least the established LSALT with at least 1000 ft clearance over the highest obstacle except within 3 nm of the aerodrome during landing and take-off operations
- Aircraft are restricted to a minimum height of 500 ft (152.4 m) AGL above the highest point of the terrain and any object on it within a radius of 300 m in visual flight during the day when not in the vicinity of built-up a eas. The proposed WTGs will be a maximum of 220 m (723 ft) at the top of the blade tip. The otor blade at its maximum height will be approximately 67.6 m (223 ft) above aircraft flying at the minimum altitude of 152.4 m AGL (500 ft).
- In the event that descending cloud forces an aircraft lower than 500 ft (152.4 m) AGL, the minimum visibility of 5,000 m required for visual flight during the day should provide adequate time for pilots to observe and manoeuvre their aircraft clear of WTGs.
- The WTGs will be coloured light grey and should be visible to pilots during the day.
- The 'as constructed' details of WTGs are required to be notified to Airservices Australia so that the location and height of all WTGs can be noted on aeronautical maps and charts.
- Because the Project WTGs are proposed to be above 100 m AGL, there is a statutory requirement to report the WTGs to CASA and notified to Airservices Australia prior to construction. CASA will review the Project for potential hazards to aircraft operations and may recommend the use of obstacle lighting, however this will not be mandatory.

AUDITION PROJECTS

Level of Risk

The level of risk associated with a Possible likelihood of a Minor consequence is 5.

Current Level of Risk

5 - Tolerable

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Risk Decision

A risk level of 5 is classified as Tolerable: Treatment action possibly required to achieve ALARP - conduct cost/benefit analysis. Relevant manager to consider for appropriate action.

Risk Decision

Accept, conduct cost benefit analysis

Recommended Treatments

Given the current treatments and the limited scale and scope of flying operations conducted within the immediate vicinity of the Project, there is likely to be little additional safety benefit to be gained by installing obstacle lighting. The following treatment, which can be implemented at little cost, will provide an additional margin of safety:

Ensure details of the Project WTGs have been communicated to Airse vices Australia, and local and regional aerodrome and aircraft operators prior to construction.

Residual Risk

Notwithstanding the current level of risk is considered Tolerable, the additional Recommended Treatments listed above will enhance aviation safety. The likelihood remains Fossible, and consequence remains Minor. In the circumstances, the risk level of 5 is considered ALARP.

It is our assessment that there is an acceptable level of aviation safety risk associated with the potential for operational limitations to affect aircraft operating crew, without obstacle lighting on the Project WTGs. Released by Airsenices Australia Released by Airsenices Australia

Residual Risk

5 - Tolerable



Table 11 Effect of obstacle lighting on neighbours

Risk ID:

4. Effect of obstacle lighting on neighbours

Discussion

This scenario discusses the consequential impact of a decision to install obstacle lighting on the wind farm.

Installation and operation of obstacle lighting on WTGs can have an effect on neighbours' visual amenity and enjoyment, specifically at night and in good visibility conditions.

Details of the relevant proposal (for objects 100 m AGL or above) must be referred to CASA for CASA to determine, in writing:

- (a) whether the object or structure will be a hazard to aircraft operations
- (b) whether it should be lit with obstacle light(s) that is essential for the safety of air raft operations.

In general, objects outside an OLS and above 200 m would be recommended by CASA to have obstacle lighting unless CASA, in an aeronautical study, assesses it is shielded by another lit object or it is of no operational significance.

The Project is not located within the River Murray International Dark Sky Reserve.

Consequence

The worst credible effect of obstacle lighting specifically at night in good visibility conditions would be:

 Moderate site impact, minimal local impact, important consideration at local or regional level, possible long-term cumulative effect. Not likely to be decision making issues. Design and mitigation measures may ameliorate some consequences.

This would be a Moderate consequence.

Consequence

Moderate

Untreated Likelihood

The likelihood of moderate site in pact, minimal local impact is Almost certain - the event is likely to occur many times (has occurred frequently).

Untreated Likelihood

Almost certain

Current Treatmen §

If the WTGs will be higher than 150 m (492 ft) AGL, they must be regarded as obstacles unless CASA assess otherwise. In general, objects outside an OLS and above 200 m may be recommended by CASA to have obstacle lighting unless CASA, in an aeronautical study, assesses it is shielded by another lit object or it is of no operational significance.

Level of Risk

The level of risk associated with an Almost certain likelihood of a Moderate consequence is 8.

Current Level of Risk

8 - Unacceptable



Risk Decision

ALION ACT 1987 A risk level of 8 is classified as Unacceptable: Immediate action required by either treating or avoiding risk. Refer to executive management.

Risk Decision

Unacceptable

Recommended Treatments

Not installing obstacle lighting would completely remove the source of the impact.

As per the above safety risk assessment, the provision of lighting for the WTGs and WMTs is not considered necessary to provide an acceptable level of safety.

If CASA or a planning authority decide that obstacle lighting is required there are impact reduction measures that can be implemented to reduce the impact of lighting on surrounding neighbours, including

- reducing the number of WTGs with obstacle lights
- specifying an obstacle light that minimises light intensity at ground level
- specifying an obstacle light that matches light intensity to meteorological visibility
- mitigating light glare from obstacle lighting through measures such as baffling.

These measures are designed to optimise the benefit of the obstacle lights to pilots while minimising the visual impact to residents within and around the Project site.

Consideration may be given to activating the obstacle lighting via a pilot activated lighting system.

An option is to consider using Aircraft Detection Lighting Systems (referred in the United States Federal Aviation Administration Advisory Circular AC70/7460-1L CHG1 - Obstruction Marking and Lighting). Such a system would only activate the lights when an aircraft is detected in the near vicinity and deactivate the lighting once the aircraft has passed. This technology reduces to e impact of night lighting on nearby communities and migratory birds and extends the life expectancy of obstruction lights.

Residual Risk

Not installing obstacle lights would clearly be an acceptable outcome to those potentially affected by visual

If lighting is required, consideration of visual impact in the lighting design should enable installation of lighting that reduces the impact to leighbours.

The likelihood of a Noderate consequence remains Likely, with a resulting risk level of 7 - Tolerable.

It is our assessment that visual impact from obstacle lights can be negated if they are not installed. If obstacle lights are to be installed, they can be designed so that there is an acceptable risk of visual impact to neighbours.

Residual Risk

7 - Tolerable

AUDITION PROJECTS

10. CONCLUSIONS

The key conclusions of this AIA are summarised as follows:

10.1. Project description

The Project will comprise the following:

- up to a maximum of 42 WTGs with a maximum overall height (tip height) of up to 220 m AGL
- the highest WGT has a ground elevation of 486.1 m AHD (with 5 m buffer) and an overall height of 706.1 m AHD (2317 ft AMSL)
- Associated power storage and transmission infrastructure, including an overhead transmission line connecting to the existing grid via a cut-in terminal substation, east of Truro.

The Project is located within the Regional Council of Goyder, Light Regional Council and Mid-Murray Council LGA.

10.2. Aviation Impact Statement

Based on the Project WTG layout and maximum blade tip height of up to 220 m AGL, the blade tip elevation of the highest WTG will not exceed 706.1 m AHD (2317 ft AMSL) and:

- Is not located within 30 nm of any certified aerodrome and will not affect any terminal instrument flight procedures
- will not penetrate any OLS surfaces
- will not have an impact on nearby designated air routes
- will not have an impact on the grid LSALT
- will not have an impact on operational airspace
- is wholly contained within Class G airspace
- is outside the clearance zones associated with civil aviation navigation aids and communication facilities.

10.3. ALA analysis summary

There are no active verified ALAs located within 3 nm of the Project. Truro Valley farm ALA (YVAF) was located less than 1 km. From the Project transmission line corridor, however this ALA has been noted as closed on OzRunwa's and is currently being used for cropping.

Gawler and Stonefield Gliding aerodromes are not located in close proximity to the Project and there is no impact anticipated to the normal departure and arrival procedures for gliders at those aerodromes.

10.4. Aircraft operator characteristics

Aircraft operators flying in vicinity of the Project may include private and recreational (including gliding) activities. Aerial firefighting and aerial application operations may be possible in the vicinity of the Project Area. Military aircraft are likely to operate overhead the Project within restricted areas R265E and 265F, with minimum vertical limits of 3500 ft and 4500 ft AMSL respectively.



There are no regular high-capacity air transport operations that would be conducted in the immediate vicinity of the Project Area.

10.5. Hazard marking and lighting

The following conclusions apply to hazard marking and lighting:

- Description 139.E.1 Notifying potential hazards 139.165, the proposed conspired to CASA. WTGs should be marked in accordance with Part 139 MOS 2019 conspired 8 Division 10 section 8.110.

 CASA will review the proposed WTG development and may make a recommendation for obstacle lighting, however this would not be mandatory.

 With respect to marking of WTGs, a light-grey colour has been selected as the colour is considered that this will provide sufficient contrast with the surround an acceptable level of safety while lowering visual impact. e col .g environ .oouring resic .oouring resic .n. .oouring .oouring .n. .oouring .n. .oouring .oouring .n. .oouring .o



10.6. Summary of risks

Table 12 Summary of Residual Risks

Identified Risk	Consequence	Likelihood	Risk	Actions Required
Aircraft collision with wind turbine generator (WTG)	Catastrophic	Unlikely	7	Actions Required Acceptable without obstacle lighting (ALARP). Communicate details of the Project WTGs to local and regional operators.
Avoidance manoeuvring leads to ground collision	Catastrophic	Unlikely	7	Acceptable without obstacle lighting (ALARP). Communicate details of the Project WTGs to local and regional operators.
Effect on crew	Minor	Possible	5	Acceptable without obstacle lighting (ALARF) Communicate details of the Project VIGs to local and regional operators.
Effect of obstacle lighting on neighbours	Moderate	Likely	7 1	Acceptable without obstacle lighting (ALARP)
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11. RECOMMENDATIONS

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

Notification and reporting

- HION ACT 1987 Details of WTGs exceeding 100 m AGL must be reported to CASA as soon as practicable after forming the intention to construct or erect the proposed object or structure, in accordance with CASR Part 139.165(1)(2).
- 2. 'As constructed' details of WTG coordinates and elevation should be provided to Airservices Australia by submitting the form at this webpage: https://www.airservicesaustralia.com/wpcontent/uploads/ATS-FORM-0085 Vertical Obstruction Data Form.pdf to the following email address: vod@airservicesaustralia.com
- 3. Any obstacles above 100 m AGL (including temporary construction equipment) should be reported to Airservices Australia NOTAM office until they are incorporated in published operational documents. With respect to crane operations during the construction of the Project, a notification to the NOTAM office may include, for example, the following details:
 - The planned operational timeframe and maximum height of the crane; and
 - Either the general area within which the crane will operate and/or the planned route with timelines that crane operations will follow.
- 4. Details of the wind farm should be provided to local and ingineal aircraft operators prior to construction in order for them to consider the potential impact of the wind farm on their operations.
- 5. To facilitate the flight planning of aerial application operators, details of the Project, including the 'as constructed' location and height information o WIGs, WMTs and overhead transmission lines should be provided to landowners so that, when asked for hazard information on their property, the landowner may provide the aerial application pilot with all relevant information

Lighting of WTGs

Aviation Projects has assessed that installing obstacle lights on WTGs is not required to maintain an acceptable level of safety to an craft.

Micrositing

The potential micrositing of the WTGs has been considered in the assessment with the estimate of 7 the overall maximum height being based on the highest ground level within 100 m of the WTG positions. Providing the micrositing is within 100 m of the WTGs, it is likely to not result in a change in the maximon overall blade tip height of the Project. No further assessment is likely to be required from micrositing and the conclusions of this AIA would remain the same.

Overhead transmission line

Overhead transmission lines and/or supporting poles that are located where they could adversely affect aerial application operations should be identified in consultation with local aerial application operators and marked in accordance with Part 139 MOS 2019 Chapter 8 Division 10 section 8.110 (7) and section 8.110 (8).

Triggers for review

- Triggers for review of this risk assessment are provided for consideration:
 - a. prior to construction to ensure the regulatory framework has not changed

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101808-04_TWIN CREEK WIND FARM - AVIATION IMPACT ASSESSMENT

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ANNEXURE 1 – REFERENCES

References used or consulted in the preparation of this report include:

- mation Act 1982 Airservices Australia, Aeronautical Information Package; including AIP Book, Departure and Approach Procedures and En Route Supplement Australia dated 07 September 2023
- Airservices Australia, Designated Airspace Handbook, effective 15 June 2023
- Government of South Australia, PlanSA, Planning and Design Code, Version 2023.13
- Civil Aviation Safety Authority, Civil Aviation Safety Regulations 1998 (CASR)
- Civil Aviation Safety Authority, Advisory Circular (AC) 91-10 v1.1: Operations in the vicinity of non controlled aerodromes, dated November 2021
- Civil Aviation Safety Authority, Manual of Standards Part 173 Standards Applicable o Instrument Flight Procedure Design, version 1.8, dated August 2022
- Civil Aviation Safety Authority, Part 139 (Aerodromes) Manual of Standards 2019, Version F2020L00931 dated 13 August 2020
- Civil Aviation Safety Authority, Advisory Circular 139.E-01 v1.0—Reporting of Tall Structures, dated December 2021
- Civil Aviation Safety Authority, Advisory Circular (AC) 139.E-05v1.1 Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome, Octol 3, 2022
- Department of Infrastructure and Regional Development, Australian Government, National Airport Safeguarding Framework, Guideline D Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms)/Wind Monitoring Towers dated July 2012
- International Civil Aviation Organization (ICAO) Doc 8168 Procedures for Air Navigation Services— Aircraft Operations (PANS-OPS)
- ICAO Standards and Recommended Practices, Annex 14—Aerodromes
- OzRunways, aeronautical navigation charts extracts, dated September 2023
- zeleased by Airservic Standards Australia 130 31000:2018 Risk management - Guidelines



ANNEXURE 2 - DEFINITIONS

ANNEXURE 2 – DE	FINITIONS
Term	Definition
Aerial Agricultural Operator	Definition Specialist pilot and/or company who are required to have a commercial pilot's licence, an agricultural rating and a chemical distributor's licence A defined area on land or water (including any buildings, installations, and
Aerodrome	A defined area on land or water (including any buildings, installations, and equipment) intended to be used either wholly or in part for the arrival, departure, and surface movement of aircraft.
Aerodrome facilities	Physical things at an aerodrome which could include: a. the physical characteristics of any movement area including runways, taxiways, taxilanes, shoulders, aprons, primary and secondary parking positions, runway strips and taxiway strips; b. infrastructure, structures, equipment, earthing points, cables, lighting, signage, markings, visual app cach slope indicators.
Aerodrome reference point (ARP)	The designated geographical location of an aerodrome.
Aeronautical Information Publication (AIP)	Details of regulations, procedures, and other information pertinent to the operation of aircraft
Aeronautical Information Publication En-route Supplement Australia (AIP ERSA)	Contains information vital for planning a flight and for the pilot in flight as well as pictorial presentations of all licensed aerodromes
Civil Aviation Safety Regulations 1998 (CASR)	Contain the mandatory requirements in relation to airworthiness, operational, licensing, enforcement.
instrument meteorologic 11 conditions (IMC)	Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, less than the minimum specified for visual meteorological conditions.
Manual of Standards (MOS)	The means CASA uses in meeting its responsibilities under the Act for promulgating aviation safety standards
Vational Airports Safeguarding Framework (NASF)	The Framework has the objective of developing a consistent and effective national framework to safeguard both airports and communities from inappropriate on and off airport developments.
Obstacles	All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

	Definition
	A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.
Runway strip	A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft. A defined area including the runway and stopway, if provided, intended: a. to reduce the risk of damage to aircraft running off a runway; and b. to protect aircraft flying over it during take-off or landing operations.
	A systematic approach to managing safety, including organisational
	structures, accountabilities, policies and procedures.



ANNEXURE 3 - CASA REGULATORY REQUIREMENTS -

Aviation Safety Authority (CASA) regulates aviation activities in Australia. Applicable requirements include the Civil Aviation Regulations 1988 (CAR), Civil Aviation Safety Regulations 1998 (CASR) and associated Manual of Standards (MOS) and other guidance material. Relevant provisions are outlined in further detail in the following section.

Civil Aviation Safety Regulations 1998, Part 139—Aerodromes

CASR 139.165 requires the owner of a structure (or proponents of a structure) that will above ground level to inform CASA. This must be given in written past oroposal, the height and location(s) of the objection allow CASA to assess the effective hazards: be hazardous to aircraft operations.

Manual of Standards Part 139-Aerodromes

Chapter 9 sets out the standards applicable to Visual Aids Provided by Aerodrome Lighting.

Section 9.30 provides guidance on Types of Obstacle Lighting and Their Use:

- 1. The following types of obstacle lights must be used, in accordance with this MOS, to light hazardous obstacles:
 - low-intensity;
 - medium-intensity;
 - high-intensity;
 - a combination of low, madium or high-intensity.
- 2. Low-intensity obstacle lights
 - are steady rea lights; and
 - must be used on non-extensive objects or structures whose height above the surrounding ground is less than 45 m.
- Mediun Finiensity obstacle lights must be:
 - flashing white lights; or
 - flashing red lights; or
 - steady red lights.

Note CASA recommends the use of flashing red medium-intensity obstacle lights.

- Medium-intensity obstacle lights must be used if:
 - the object or structure is an extensive one; or

- the top of the object or structure is at least 45 m but not more than 150 m above the surrounding ground; or
- Ormation Act 1987 c. CASA determines in writing that early warning to pilots of the presence of the object or structure is desirable in the interests of aviation safety.

Note For example, a group of trees or buildings is regarded as an extensive object.

- For subsection (4), low-intensity and medium-intensity obstacle lights may be used in combination.
- High-intensity obstacle lights:
 - must be used on objects or structures whose height exceeds 150 m; and
 - must be flashing white lights.
- 7. Despite paragraph (6) (b), a medium-intensity flashing red light may be used if necessary, to avoid an adverse environmental impact on the local community.

Sections 9.31 (8) and (9) provide guidance on obstacle lighting specific to wind farms:

- 8. Subject to subsection (9), for wind turbines in a wind farm, medium-intensity obstacle lights must:
 - a. mark the highest point reached by the rotating blades; and
 - b. be provided on a sufficient number of individual wind turbines to indicate the general definition and extent of the wind farm, but such the intervals between lit turbines do not exceed 900 m; and
 - all be synchronised to flash simultaneous v, and
 - be seen from every angle in azimuth.

Note: This is to prevent obstacle light shielding by the rotating blades of a wind turbine and may require more than 1 obstacle light to be fitted.

- If it is physically impossible to light the rotating blades of a wind turbine:
 - the obstacle lights must be placed on top of the generator housing; and
 - a note must be published in the AIP-ERSA indicating that the obstacle lights are not at the highest position on the wind turbines.
- 10. If the top of an object or structure is more than 45 m above:
 - the surrounding ground (ground level); or
 - the top of the tallest nearby building (building level); then the top lights must be mediumintensity lights, and additional low-intensity lights must be:
 - provided at lower levels to indicate the full height of the structure; and
 - spaced as equally as possible between the top lights and the ground level or building level, but not so as to exceed 45 m between lights.

Advisory Circular 139.E-01 v1.0—Reporting of Tall Structures

In Advisory Circular (AC) 139.E-01 v1.0—Reporting of Tall Structures, CASA provides guidance to those

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authorities and persons involved in the planning, approval, erection, extension or dismantling of tall structures so that they may understand the vital nature of the information they provide.

Airservices Australia has been assigned the task of maintaining a database of tall structures. RAAF and Airservices Australia require information on structures which are:

- a) 30 metres or more above ground level—within 30 kilometres of an aerodrome; or
- b) 45 metres or more above ground level elsewhere for the RAAF, or
- c) 30 m or more above ground level elsewhere for Airservices Australia.

The purpose of notifying Airservices Australia of these structures is to enable their details to be provided in aeronautical information databases and maps/charts etc used by pilots, so that the obstacles can be avoided.

The proposed WTGs must be reported to Airservices Australia. This action should occur once the final layout after micrositing is confirmed and prior to construction.

International Civil Aviation Organisation

Australia, as a contracting State to the International Civil Aviation Organisation (ICAO) and signatory to the Chicago Convention on International Civil Aviation (the Convention), has an obligation to implement ICAO's standards and recommended practices (SARPs) as published in the various annexes to the Convention.

Annex 14 to the Convention — Aerodromes, Volume 1, Section 6.2.4 provines SARPs for the obstacle lighting and marking of WTGs, which is copied below:

6.2.4 Wind turbines

6.2.4.1 A wind turbine shall be marked and/or light of if it is determined to be an obstacle.

Note 1. — Additional lighting or markings may be provided where in the opinion of the State such lighting or markings are deemed necessary.

Note 2. - See 4.3.1 and 4.3.2

Markings

6.2.4.2 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

6.2.4.3 Recommendation. — When lighting is deemed necessary, in the case of a wind farm, i.e. a group of two or more wind turbines, the wind farm 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 6.2.3.15, 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 throughout the wind farm:

d) so that, within a wind farm, any wind turbines of significantly higher elevation are also identified wherever they are located; and

e) at locations prescribed in a), b) and d), respecting the following criteria:

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i) for wind turbines of less than 150 m in overall height (hub height plus vertical blade height), medium-intensity lighting on the nacelle should be provided;

ii) for wind turbines from 150 m to 315 m in overall height, in addition to the medium-intensity light installed on the nacelle, a second light serving as an alternate should be provided in case of failure of the operating light. The lights should be installed to assure that the output of either light is not blocked by the other; and

iii) in addition, for wind turbines from 150 m to 315 m in overall height, an intermediate level at half the nacelle height of at least three low-intensity Type E lights, as specified in 6.2.1.3, should be provided. If an aeronautical study shows that low-intensity Type E lights are not suitable, low-intensity Type A or B lights may be used.

Note. — The above 6.2.4.3 e) does not address wind turbines of more than \$15 m of overall height. For such wind turbines, additional marking and lighting may be returned as determined by an aeronautical study.

6.2.4.4 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.

6.2.4.5 Recommendation. — Where lighting is deemed necessary for a single wind turbine or short line of wind turbines, the installation should be in accordance with 6.2.4.3 e) or as determined by an aeronautical study.

As referenced in Section 6.2.4.3(e)(iii), Section 6.2.1.3 is copied below:

6.2.1.3 The number and arrangement of low-, medium- or high-intensity obstacle lights at each level to be marked shall be such that the object is indicated from every angle in azimuth. Where a light is shielded in any direction by another part of the object, or by an adjacent object, additional lights shall be provided on that adjacent object or the part of the object that is shielding the light, in such a way as to retain the general definition of the object to be lighted. If the shielded light does not contribute to the definition of the object to be lighted, it may be omitted.

As referenced in Section 6.2.4.3(b), Section 6.2.3.15 is copied below:

6.2.3.15 Where lights are applied to display the general definition of an extensive object or a group of closely spaced o'vects, and

a) low-intensity lights are used, they shall be spaced at longitudinal intervals not exceeding 45 m;

b) medium-intensity lights are used, they shall be spaced at longitudinal intervals not exceeding 900 m.

Section 4.3 Objects outside the OLS states the following:

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

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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.

ICAO Doc 9774 Manual on Certification of Airports defines an aeronautical study as:

An aeronautical study is a study of an aeronautical problem to identify potential solutions and select a solution that is acceptable without degrading safety.

Light characteristics

If obstacle lighting is required, installed lights should be designed according to the criteria set out in the applicable regulatory material and taking CASA's recommendations into consideration in the case that CASA has reviewed this risk assessment and provided recommendations.

The characteristics of the obstacle lights should be in accordance with the applicable standa ds in Part 139 MOS 2019.

The characteristics of low and medium intensity obstacle lights specified in Part 13° MCS 2019, Chapter 9, are provided below.

Part 139 MOS 2019 Chapter 9 Division 4 – Obstacle Lighting section 9.32 outlines Characteristics of Low Intensity Obstacle Lights.

- 1. Low-intensity obstacle lights must have the following:
 - a. fixed lights showing red;
 - b. a horizontal beam spread that results in 360-degree coverage around the obstacle;
 - c. a minimum intensity of 100 cardela (cd);
 - d. a vertical beam spread (to 50% of peak intensity) of 10 degrees;
 - e. a vertical distribution with 50 cd minimum at +6 degrees and +10 degrees above the horizontal;
 - f. not less than 10 cd at all elevation angles between -3 degrees and +90 degrees above the horizontal.

Note: The intensity requirement in paragraph (c) may be met using a double-bodied light fitting. CASA recommends that double-bodied light fittings, if used, should be orientated so that they show the maximum illuminated surface towards the predominant, or more critical, direction of aircraft approach.

- 2. To indicate the following:
 - a. taxiway obstacles;
 - unserviceable areas of the movement area; low-intensity obstacle lights must have a peak intensity of at least 10 cd.

Part 139 MOS 2019 Chapter 9 Division 4 – Obstacle Lighting section 9.33 outlines Characteristics of Medium Intensity Obstacle Lights.

1. Medium-intensity obstacle lights must:

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- a. be visible in all directions in azimuth; and
- b. if flashing have a flash frequency of between 20 and 60 flashes per minute.
- 2. The peak effective intensity of medium-intensity obstacle lights must be 2 000 ☐ 25% cd with a vertical distribution as follows:
 - a. for vertical beam spread a minimum of 3 degrees;
 - at -1-degree elevation a minimum of 50% of the lower tolerance value of the peak intensity;
 - at 0 degrees elevation a minimum of 100% of the lower tolerance value of the peak intensity.
- 3. For subsection (2), vertical beam spread means the angle between 2 directions in a plane for which the intensity is equal to 50% of the lower tolerance value of the peak intensity.
- 4. If, instead of obstacle marking, a flashing white light is used during the day to indicate temporary obstacles in the vicinity of an aerodrome, the peak effective intensity of the light must be increased to $20~000 \pm 25\%$ cd when the background luminance is $50~\text{cd/m}^2$ or greater.

Visual impact of night lighting

Annex 14 Section 6.2.4 and Part 139 MOS 2019 Chapter 9.31 (8)(9) are specifically intended for WTGs and recommends that medium intensity lighting is installed.

Generally accepted considerations regarding minimisation of visual impact are provided below for consideration in this aeronautical study:

- To minimise the visual impact on the environment, some shielding of the obstacle lights is permitted, provided it does not compromise their operational effectiveness;
- Shielding may be provided to restrict the downward component of light to either, or both, of the following:
 - such that no more than 5% of the nominal intensity is emitted at or below 5 degrees below horizontal; and
 - o such that notight is emitted at or below 10 degrees below horizontal;
- If a light would be shielded in any direction by an adjacent object or structure, the light so shielded may be omitted provided that such additional lights are used as are necessary to retain the general definition of the object or structure.
- If flashing obstacle lighting is required, all obstacle lights on a wind farm should be synchronised so that they flash simultaneously; and

A relatively small area on the back of each blade near the rotor hub may be treated with a different colour or surface treatment, to reduce reflection from the rotor blades of light from the obstacle lights, without compromising the daytime visibility of the overall WTG.

Marking of WTGs

ICAO Annex 14 Vol 1 Section 6.2.4.2 recommends that the rotor blades, nacelle and upper 2/3 of the supporting mast of the WTGs should be painted a shade of white, unless otherwise indicated by an aeronautical study.



It is generally accepted that a shade of white colour will provide sufficient contrast with the surrounding environment to maintain an acceptable level of safety while lowering visual impact to the neighbouring residents.

Overhead transmission lines

are located where they could adversely affect aerial consultation with local aerial application operators and marked in 2019 Chapter 8 Division 10 section 8.110 (7) and section 8.110 (8):

5.110 Marking of hazardous obstacles

(7) Hazardous obstacles in the form of wires or cables must be marked using 3-dimensional coloured objects attached to the wire or cables. Note: Spheres and pyramids are examples of 3-dimensional objects.

(8) The objects mentioned in subsection (7) must:

(a) be approximately equivalent in size to a cube (b) be spaced 30 m apart along the ' Overhead transmission lines and/or supporting poles that are located where they could adversely affect aerial application operations should be identified in consultation with local aerial application operators and marked in accordance with Part 139 MOS 2019 Chapter 8 Division 10 section 8.110 (7) and section 8.110 (8):

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ANNEXURE 4 - RISK FRAMEWORK

tion Act 1082 A risk management framework is comprised of likelihood and consequence descriptors, a matrix used to derive a level of risk, and actions required of management according to the level of risk.

The risk assessment framework used by Aviation Projects has been developed in consideration of ISO 31000:2018 Risk management—Guidelines and the guidance provided by CASA in its Safety Management System (SMS) for Aviation guidance material, which is aligned with the guidance provided by the International Civil Aviation Organization (ICAO) in Doc 9589 Safety Management Manual, Third Edition, 2013. Doc 9589 is intended to provide States (including Australia) with guidance on the development and implementation of a State Safety Programme (SSP), in accordance with the International SARPs, and is therefore adopted as the primary reference for aviation safety risk management in the context of the subject assessment.

Section 2.1 of the ICAO Doc 9589 The concept of safety defines safety as follows [author's underlining]

2.1.1 Within the context of aviation, safety is "the state in which the possibility of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management."

Likelihood

Likelihood is defined in ISO 31000:2018 as the chance of something happening Likelihood descriptors used in this report are as indicated in Table 1.

Table 1 Likelihood Descriptors

No	Descriptor	Description
1	Rare	It is almost inconceivable that this event will occur
2	Unlikely	The event is very unlikely to occur (not known to have occurred)
3	Possible	The event is unlikely to occur, but possible (has occurred rarely)
4	Likely	The event is likely to occur sometimes (has occurred infrequently)
5	Almost certain	The event is likely to occur many times (has occurred frequently)

Consequence

Consequence is defined as the outcome of an event affecting objectives, which in this case is the safe and efficient operation of circraft, and the visual amenity and enjoyment of local residents.

Consequence descriptors used in this report are as indicated in Table 2. 20102500104

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Table 2 Consequence Descriptors

No	Descriptor	People Safety	Property/Equipment	Effect on Crew	Environment
1	Insignificant	Minor injury – first aid treatment	Superficial damage	Nuisance	No effects or effects below level of perception
2	Minor	Significant injury – outpatient treatment	Moderate repairable damage – property still performs intended functions	Operations limitation imposed. Emergency procedures used.	Minimal site impact — easily controlled. Effects raised as local issues, unlikely to influence decision making. May enhance design and mitigation measures.
3	Moderate	Serious injury - hospitalisation	Major repairable damage – property performs intended functions with some short-term rectifications	Significant reduction in safety margins. Reduced capability of aircraft/crew to cope with conditions. Fligh workload/furess on crew. Or, tical incident stress on crew.	Moderate site impact, minimal local impact, and important consideration at local or regional level, possible long-term cumulative effect. Not likely to be decision making issues. Design and mitigation measures may ameliorate some consequences.
4	Major	Permanent injury	Major damage rendering property ineffective in achieving design functions without major repairs	Large reduction in safety margins. Crew workload increased to point of performance decrement. Serious injury to small number of occupants. Intense critical incident stress.	High site impact, moderate local impact, important consideration at state level. Minor long-term cumulative effect. Design and mitigation measures unlikely to remove all effects.
5	Catastrophic	Multiple Fatalities	Damaged beyond repair	Conditions preventing continued safe flight and landing. Multiple deaths with loss of aircraft	Catastrophic site impact, high local impact, national importance. Serious longterm cumulative effect. Mitigation measures unlikely to remove effects.



Risk matrix

The risk matrix, which correlates likelihood and consequence to determine a level of risk, used in this report is shown in Table 3.

Table 3 Risk Matrix

		CONSEQUENCE				
		INSIGNIFICANT 1	MINOR 2	MODERATE 3	MAJOR 4	CATIASTROPHIC
ТІКЕГІНООБ	ALMOST CERTAIN 5	6	7	8	* 1/1/0	10
	LIKELY 4	5	9	7	(C) 8	9
	POSSIBLE 3	4	5	600	7	8
	UNLIKELY 2	3	4	© 5	6	7
	RARE 1	2	NOE!	4	5	6

Actions required

Actions required according to the derived level of risk are shown in Table 4.

Table 4 Actions Required

8-10	Unacceptable Risk	Immediate action required by either treating or avoiding risk. Refer to executive management.
5-7	Tolerable Risk	Treatment action possibly required to achieve As Low As Reasonably Practicable (ALARP) - conduct cost/benefit analysis. Relevant manager to consider for appropriate action.
0-4/5	Proadly Acceptable Risk	Managed by routine procedures, and can be accepted with no action.

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A spreadsheet with this information would be sufficient. Please also attach a KMZ file if available.

Thanks and Pegards,

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Hi team.

For your review. Kind regards,

s47F

Aeronautical Information Specialist

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We acknowled $\$ e the Traditional Owners of Country throughout Australia and recognise their contil uing connection to land, waters and culture. We pay our respects to their past, present and emerging

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To whom it may concern - Twin Creek Windfarm

The South Australia State Planning Commission has recently received updated documentation for the Twin Creek Windfarm and Energy Storage Project. For windfarm developments, we have generally sought CASA/ASA's views on similar applications across the state, as they relate to aviation safety and facility operations

The development comprises: the installation of up to 42 wind turbine generators (WTG) with an individual capacity of up to 7.2MW (for a total project capacity of up to 270MW). The maximum tip height of each WTG will be up to 220m. Ancillary elements include a Battery Energy Storage System (with an indicative storage capacity

of 215MW), two substations, connecting 275kV transmission lines, control and maintenance buildings, related civil and earthworks. Temporary construction facilities will also be established.

Planning documentation can be publicly downloaded from the Plan SA website - https://plan.sa.gov.au/have_your_say/notified_developments/state_developments SPC is now seeking your department's advice on the development – however I also appreciate the time taken to review and comment on such proposals. It is noted, however, that the Aviation Assessment accompanying the planning application, does not identify any operational or facility impacts. An except of the Aviation Projects report is below:

Craid any comments be provided not later than 11 April 20%.
Haspy to discover.
Kind Regards 13 Pile Stock, Assistant SA (200 - C) of the of 1 stock of 1

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