

# Chapter 23

## Aviation

### 23.1 Overview

This chapter is based on the findings of the aviation impact assessment report prepared by Chiron Aviation Consultants (provided in Appendix O). While potential impacts to aeronautical licences used for aircraft navigation have been considered as part of the aviation impact assessment, the findings of this assessment are contained within Chapter 22 – *Electromagnetic interference*.

The aviation impact assessment identified existing aviation operations and activities within 30 nautical miles (or about 56 kilometres) of the project site to determine the potential impact to aviation safety. To maintain aircraft safety, design and management measures are proposed.

There are three regulated aerodromes within 30 nautical miles of the project site: Portland, Hamilton and Warrnambool. Nine unregulated private airstrips are on properties within or close to the project site, with these airstrips either decommissioned or unused, or used infrequently for activities like aerial agricultural operations (spraying and spreading).

The project has the potential to impact on the operation of aerodromes and local airstrips due to the introduction of new obstacles, including wind turbines and meteorological masts. In particular, there is a potential safety risk relating to Visual Flight Rules for aircraft operating at low levels, including for aerial agricultural operations and aerial firefighting. Wind turbines can also impact communications, navigation, and surveillance (radar systems) used for air traffic control due to electromagnetic interference. The aviation impact assessment concludes the project would not impact on the performance of navigation aids and communication facilities or the performance of any surveillance radars and satellite facilities. This is further discussed in Chapter 22 – *Electromagnetic interference*.

Avoidance by design has been the primary measure to limit aviation impacts. This has included establishing buffers around local airstrips in the concept design, incorporating the recommendations of the Country Fire Authority (2022) *Design Guidelines and Model Requirements Renewable Energy Facilities* in the project design and management measures, and committing to marking the meteorological monitoring masts in accordance with the *National Airports Safeguarding Framework Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation* to improve visibility of these structures for pilots of low-flying aircraft.

The project would not impact the Obstacle Limitation Surface for the Portland, Hamilton or Warrnambool Aerodromes. Similarly, the project would not impact the Procedures for Air Navigation Services – Aircraft Operations surfaces prescribed airspace of the Instrument Approach Procedures for the Portland or Hamilton Aerodromes.

Whilst the proposed turbines are beyond the 10 nautical mile Minimum Safe Altitude of the Warrnambool Aerodrome, there are several turbines within the 5 nautical mile buffer zone used to calculate this Minimum Safe Altitude. To enable the proposed maximum wind turbine tip height to be accommodated, the 10 nautical mile Minimum Safe Altitude would need to be raised by 100 feet (or 30.5 metres) from 2,100 feet to 2,200 feet to satisfy the requirements of ICAO PANS-OPS document 9905 to ensure minimum factors of safety are maintained. The same modification is also required for the Procedures for Air Navigation Services – Aircraft Operations surface for the Warrnambool aerodrome (YWBL RNAV-Z RWY 13) non-precision approach. This change would only affect Instrument Flight Rules aircraft, with the change predicted to have a minimal impact to their pilots. Agreement with the Warrnambool Aerodrome and the Instrument Approach Procedure designer (Airservices Australia) is required to have the recommended amendments made to the Instrument Approach Procedure. If agreement to these changes cannot be reached with the aerodrome operator, the blade tip heights of

five wind turbines would need to be reduced by between 1.5 and 14 metres to avoid modifying the Procedures for Air Navigation Services – Aircraft Operations.

The project would result in some limitations on aerial agricultural operations immediately surrounding wind turbines and meteorological monitoring masts, however, these limitations would largely be experienced by stakeholder (participating) landowners. Wind turbines are not expected to pose unacceptable risks to aerial firefighting.

Overall, the impact assessment concluded the potential risk to aviation in the project region is low and does not pose a hazard to aircraft safety.

## 23.2 EES objectives and key issues

The EES scoping requirements specify the draft evaluation objective and key issues, outlined in Table 23.1, relevant to aviation that have guided this assessment.

**Table 23.1 EES draft evaluation objective and key issues**

<b>Draft evaluation objective</b>	
<i>Land use and socio-economic: To avoid and minimise adverse effects on land use (including agricultural and residential), social fabric of the community (with regard to wellbeing, community cohesion), local infrastructure, electromagnetic interference, aviation safety and to neighbouring landowners during construction, operation and decommissioning of the project.</i>	
<b>Key issues</b>	<ul style="list-style-type: none"> <li>Potential adverse effects of wind turbines and associated infrastructure from an <b>aviation</b> perspective, including but not limited to impacts on aerial safety, air traffic control equipment, obstruction and turbulence.</li> </ul>

## 23.3 Legislation, policy and guidelines

Key legislation, policies and guidelines relevant to the aviation impact assessment are summarised in Table 23.2.

**Table 23.2 Relevant legislation, policies and guidelines**

Legislation, policies and guidelines	Description	Relevance to project
<b>Commonwealth</b>		
<i>Civil Aviation Act 1988</i>	<p>The primary aim of the <i>Civil Aviation Act 1988</i> is to establish a regulatory framework for maintaining, enhancing and promoting the safety of civil aviation.</p> <p>This Act establishes the Civil Aviation Safety Authority (CASA) and CASA's functions, including conducting safety regulation relating to civil aviation.</p>	The aviation impact assessment included a review against relevant CASA publications.

Legislation, policies and guidelines	Description	Relevance to project
Civil Aviation Regulations 1988 and Civil Aviation Safety Regulations 1998	The Civil Aviation Regulations 1988 and Civil Aviation Safety Regulations 1998 are made under the <i>Civil Aviation Act 1988</i> and provide general aviation safety regulatory controls, including the required safety standards in relation to air traffic control and rules of the air.	<p>The Civil Aviation Safety Regulations 1998 Part 175.E requires that obstacles with a height above 100 metres at ground level (turbines and meteorological monitoring masts) are reported as tall structures for inclusion in the vertical obstacle database and on appropriate aeronautical charts.</p> <p>Part 139 – Aerodromes, Section E of the Civil Aviation Safety Regulations 1998 contains the regulations governing obstacles. These regulations are applicable to the protection of airspace and aircraft operations in the vicinity of regulated (certified) or military aerodromes.</p> <p>As the wind turbines have a tip height of up to 250 metres (820 feet) above ground level, they must be reported as per the Civil Aviation Safety Regulations 1998 Part 175.E.</p>
<b>Victorian</b>		
<i>Planning and Environment Act 1987</i>	The Moyne Planning Scheme contains Victoria Planning Provisions within the Particular Provisions relevant to aviation.	<p>The aim of Particular Provision Clause 52.32 Wind Energy Facility is “<i>to facilitate the establishment and expansion of wind energy facilities, in appropriate locations, with minimal impact on the amenity of the area.</i>”</p> <p>52.32-5 Decision Guidelines of this Clause states that “<i>Before deciding on an application, in addition to the decision guidelines of Clause 65, the responsible authority must consider, as appropriate:</i></p> <ul style="list-style-type: none"> <li>- <i>The impact of the facility on aircraft safety</i>”.</li> </ul>
<b>Guidelines</b>		
<i>Advisory Circular AC 139.E-05 v1.0: Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome (CASA, 2021)</i>	<p>The CASA (2021) Advisory Circular provides guidance on matters to be considered in the assessment of a wind farm development and mitigation measures to manage potential safety risks to aviation.</p> <p>The Advisory Circular recommends that an aeronautical study be conducted by the wind farm proponent, including a risk analysis using <i>AS/NZS ISO 31000:2018 Risk Management – Guidelines</i>.</p>	The aeronautical impact risk assessment was done in accordance with the risk standard and process outlined in the Advisory Circular.
<i>National Airports Safeguarding Framework Guideline D: Managing the risk to aviation safety of wind turbine installations (wind farms)/wind monitoring towers</i>	The <i>National Airports Safeguarding Framework</i> seeks to enhance the safety, viability and development of aviation operations in Australia. This Framework contains various guidelines relating to the regulation and management of airports, including the risk of wind farms as physical obstacles to air navigation.	<p>Guideline D of the <i>National Airports Safeguarding Framework</i> contains guidance for the siting and marking of turbines and meteorological monitoring towers associated with wind farms.</p> <p>The aviation impact assessment was done in accordance with <i>National Airports Safeguarding Framework Guideline D</i>.</p>

Legislation, policies and guidelines	Description	Relevance to project
<i>Design Guidelines and Model Requirements Renewable Energy Facilities</i> (Country Fire Authority, 2022)	The <i>Design Guidelines and Model Requirements Renewable Energy Facilities</i> outline fire safety, risk and emergency management measures and processes to be considered in the design, construction and operation of renewable energy facilities. These guidelines contain specific conditions to be complied with for the siting, and operation and maintenance of wind energy facilities.	The project design has incorporated the design conditions outlined in Section 6.2.5, Design Specific to Facility Type.  The conditions relating to the operation and maintenance of the wind farm have been included as management measures (refer to Section 23.7.3)
<i>Policy and planning guidelines for the development of wind energy facilities in Victoria</i> (Policy and Planning Guidelines) (DELWP, 2021f)	The Policy and Planning Guidelines provide a set of consistent operational performance standards to inform the assessment and operation of a wind energy facility project, as well as guidance as to how planning permit application requirements might be met.	The Policy and Planning Guidelines recommend that aircraft safety issues should be addressed when developing a wind farm, including considering the proximity of the proposed site to airports, aerodromes or landing strips.  The aviation impact assessment has included an assessment of all regulated (certified) and unregulated aerodromes within 30 nautical miles (55.6 kilometres) of the project to determine potential aviation safety issues during project operation.
Aeronautical Information Publication Australia (Airservices Australia, 2021)	Aeronautical Information Publication is a mandatory worldwide distribution system for the communication of aviation rules, procedures, and information.	Aeronautical Information Publication Australia contains documents relating to the safe and efficient operation of national and international air navigation within Australia. It is updated every three months.

## 23.4 Method

The aviation impact assessment and airstrip review included the following scope of works:

- Review of the *Airservices Australia Aeronautical Information Publication Australia* and CASA publications to identify physical and operational aviation issues that may impact on the requirement for lighting of the wind farm.
- Review of topographical maps and Google Earth to assess the local terrain and identify local certified aerodromes and uncertified airstrips.
- Consultation with relevant stakeholders including:
  - Airservices Australia
  - State Government Police Air Wing
  - Air Ambulance
  - Fire Services
  - Department of Defence
  - Warrnambool Airport and Warrnambool Airport Reference Group
  - Warrnambool City Council
  - other local operators and recreational aviation groups.
- Preparation of an Aviation Impact Statement, as per the requirements outlined by Airservices Australia in the *Airservices Aviation Assessment for Wind Farm Developments* (October 2019). The Aviation Impact Statement includes:
  - identification of all regulated (certified) and known unregulated aerodromes within 30 nautical miles of the project site
  - identification of any published air routes over or near the project site
  - identification of airspace classification over or near the project site.

- Obstacle lighting review in accordance with the *National Airports Safeguarding Framework Guideline D: Managing the risk to aviation safety of wind turbine installations (wind farms)/wind monitoring towers*. This guideline provides guidance for the siting and marking of the wind turbines and associated meteorological monitoring towers.
- Identification and assessment of potential impacts to flying training areas, recreational aviation, approved low-flying activities (including aerial agricultural operations), emergency services (Police Air Wing, Helicopter Emergency Medical Services, fixed-wing air ambulance) and aerial firefighting operations.

## 23.5 Investigation area

The aviation impact assessment investigation area included the project site and a buffer of 30 nautical miles (or 55.6 kilometres) of the project site to encompass all regulated (certified) aerodromes within this area, as per the Airservices Australia requirements for an Aviation Impact Statement. The aviation impact assessment investigation area is shown in Figure 23.1.

## 23.6 Existing conditions

### 23.6.1 Aerodromes

There are three regulated aerodromes within 30 nautical miles of the project site:

- Warrnambool, about 12 nautical miles (or about 23 kilometres) south-east of the project site.
- Hamilton, about 29 nautical miles (or about 56 kilometres) north-north-west of the project site.
- Portland, about 31 nautical miles (or about 57 kilometres) west-south-west of the project site.

There is an unregulated aircraft landing area at Port Fairy, about 11 nautical miles (or 21 kilometres) from the project site. There are no military aerodromes within 30 nautical miles of the project site.

### 23.6.2 Airstrips

There are nine uncertified private airstrips on properties within and close to the project site. As indicated in Table 23.3, four of these airstrips are decommissioned or unused, while the others are used infrequently for aerial agricultural operations.

**Table 23.3** Uncertified airstrips within the project investigation area

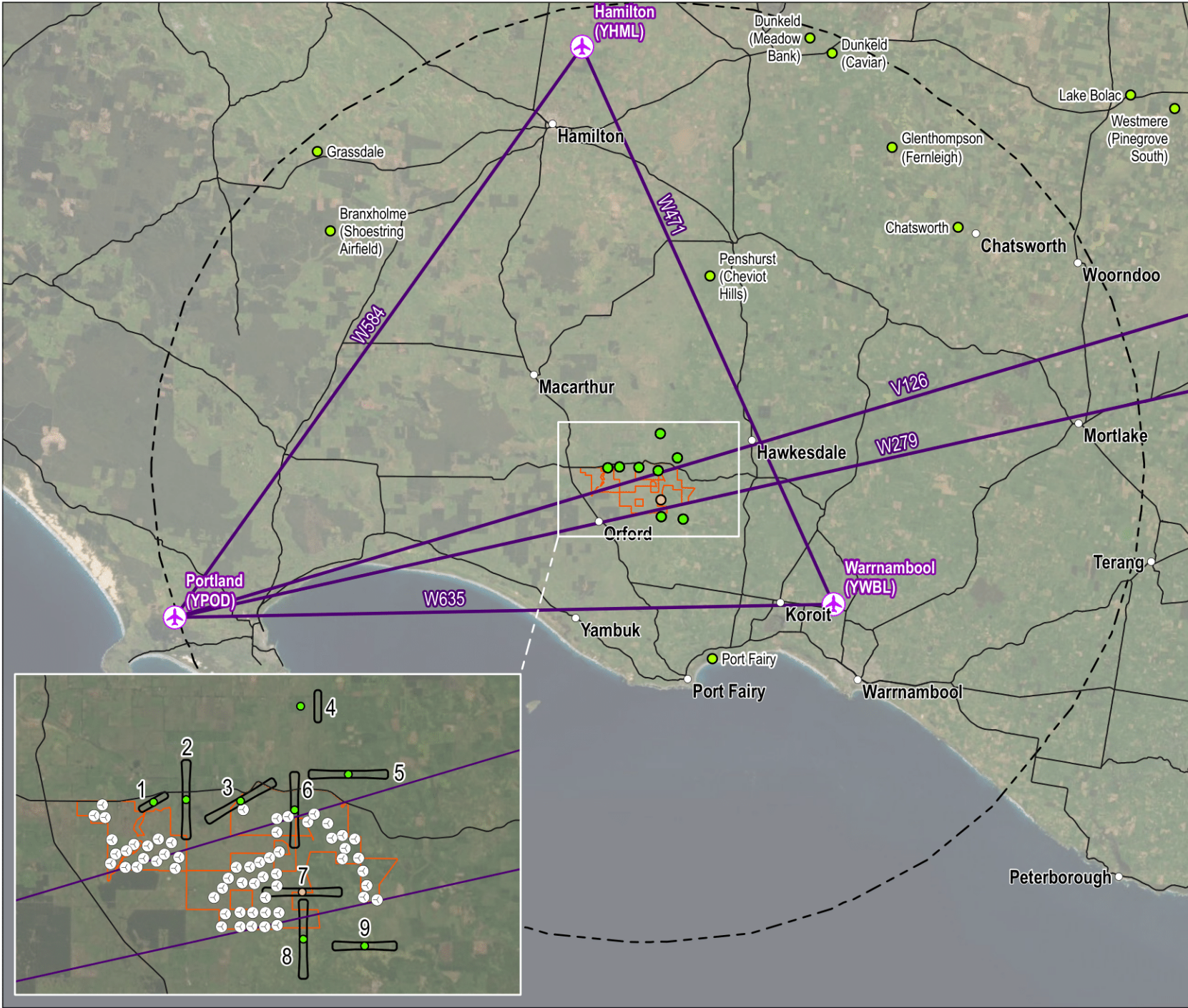
Uncertified airstrip identifier no.	Usage	Approximate distance from nearest wind turbine
1	Not used	1,450 metres
2	Infrequent use	1,900 metres
3	Twice a year	350 metres
4	Not used	3,700 metres
5	Not used	2,100 metres
6	2–3 times per year	300 metres
7	Decommissioned	1,200 metres
8	5–10 times per year	2,250 metres
9	Twice a year	1,200 metres

The location of regulated and unregulated aerodromes and uncertified airstrips within and close to the project site are shown in Figure 23.1.

### Aerodromes

Aerodromes fall into three categories:

- **Military (or combined military and civilian)**: operated by the Department of Defence, suitable for the operation of military aircraft.
- **Regulated (certified)**: regulated under Civil Aviation Safety Regulations 1998.
- **Unregulated (uncertified)**: any other aerodrome or airstrip, which can range in capability and size (e.g., sealed runway or grass paddock).




**LEGEND**

- Local airports
- Turbine location
- Locality
- Unregulated aircraft landing areas
- Decommissioned unregistered aircraft landing area
- Published flight routes
- Major road
- Aviation safety buffer
- Aviation impact assessment investigation area (30nm / 55.56km)
- Willatook Wind Farm boundary

SOURCE:  
 Willatook Wind Farm boundary, turbine locations and aviation data Wind Prospect.  
 Roads from Vicmap.  
 Imagery from ArcGIS Online (various capture dates).

0 5 10 15 20 km  
 SCALE 1:700,000  
 PAGE SIZE: A4  
 PROJECTION: GDA 1994 MGA Zone 54

WIND PROSPECT  
 WILLATOOK WIND FARM  
**FIGURE 23.1**  
 Aviation assessment investigation area



### 23.6.3 Airspace and air routes

The project is within Class G airspace, which is beneath Class E airspace. Class G airspace refers to airspace that is uncontrolled (i.e., does not require air traffic control clearance), while Class E airspace is a mid-level en-route controlled airspace with a lower limit of 18,000 feet.

The lowest safe altitude is defined for each air route segment to ensure terrain and obstacle clearance. This altitude is 1,000 feet (304 metres) above any obstacle or terrain within a defined safety buffer region around an air route. Currently the published lowest safe altitude of the closest flight route (from Portland to Warrnambool W635) is 2,200 feet.

For flights operating under Visual Flight Rules, must not fly lower than 500 feet (or 152 metres) above the highest obstacle on the terrain in accordance with Civil Aviation Safety Regulations, Part 91D, regulation 91.267 *Minimum Height Rules – other areas*. For this project, with a tip height of 250 metres (820 feet), this equates to 1,320 feet above ground level.

Four air routes pass over or nearby the project site. The origin/destination of these air routes and their lowest safe altitudes are:

- one-way overhead Portland Aerodrome/east of the township of Darlington, (V279), with published lowest safe altitude of 2,500 feet
- one-way south-west of the township of Enfield/overhead Portland Aerodrome (V126), with published lowest safe altitude of 2,500 feet
- Hamilton/Warrnambool (W741), with published lowest safe altitude of 2,900 feet
- overhead Portland Aerodrome/overhead Warrnambool Aerodrome (W635), with published lowest safe altitude of 2,200 feet.

### 23.6.4 Existing aviation operations

There are four known aerial applications operators, used for spraying and spreading in less accessible areas, that work in the general area of south-western Victoria.

Other aviation activities in the project investigation area include recreational aviation and aerial emergency services. Recreational Aviation Australia registered recreational and sport aircraft are limited to daytime flight in accordance with the Visual Flight Rules. Police Air Wing, Helicopter Emergency Medical Service, and fixed-wing air ambulance are capable of Instrument Flight Rules flight, with the Police Air Wing and Helicopter Emergency Medical Service also able to fly in low level (reduced light) night operations as they are equipped with Night Vision Imaging Systems.

Aerial firefighting is conducted at low level using specialist aircraft flown in accordance with the Visual Flight Rules. As such, aerial firefighting can only operate during daylight hours and aircraft must remain clear of smoke to maintain visibility of the ground and obstacles. The use of aerial firefighting can also be restricted by turbulence, smoke, strong wind, fire induced thunderstorm cloud (pyrocumulonimbus) or erratic fire behaviour. Through engagement with the Country Fire Authority, no concerns were raised about potential impacts of the project on firefighting operations.

There are no published flying training areas in the investigation area. There are also no 'prohibited', 'restricted' or 'danger' airspace areas, identified in the Australian Aeronautical Information Publications, in the project investigation area.

#### Flight rules

**Visual Flight Rules:** rules applicable to flight under visual meteorological conditions. That is, rules that allow a pilot to operate an aircraft in weather conditions clear enough the pilot can remain clear of cloud and see the terrain and where the aircraft is going. If the weather is worse than the Visual Flight Rules minimum criteria, pilots are required to revert to instrument flight rules or land.

**Instrument Flight Rules:** rules applicable to the conduct of flight under instrument meteorological conditions and where flight by visual reference is not possible. Flying by Instrument Flight Rules relies on instruments in the flight deck and navigation by electronic signals.

## 23.7 Impact assessment

### 23.7.1 Impact pathways

Wind turbines have the potential to impact on the operation of aerodromes and local airstrips due to the introduction of new obstacles. For aerodromes, this can result in impacts to Obstacle Limitation Surfaces and surfaces associated with Instrument Approach Procedures. A schematic of the potential obstacles to aircraft flight paths (take-off climb and approach descent) surrounding an aerodrome is shown in Figure 23.2.

There is a potential safety risk to Visual Flight Rules for aircraft operating at low levels in the vicinity of project wind turbines, including aerial agriculture operations and firefighting. This is particularly the case for wind monitoring towers, which can be difficult to see from the air due to their slender construction and use of guy wires. Feedback received from some local aerial applications operators is they are concerned about the potential impact on their ability to apply fertiliser and weed and pest control via aerial application.

In accordance with Civil Aviation Safety Regulations, Part 91D, regulation 91.267 *Minimum Height Rules – other areas*, Visual Flight Rules aircraft must not fly lower than 500 feet (or 152 metres) above the highest obstacle on the terrain (i.e., for the project, the lowest safe altitude is 500 feet above the height of the wind turbines). This limits the area in which aerial agriculture and firefighting operations can operate.

Wind turbines can also impact communications, navigation and surveillance (radar systems) used for air traffic control due to electromagnetic interference. The project has been assessed by Airservices Australia and would not impact any air traffic control systems. This is further discussed in Chapter 22 – *Electromagnetic interference*.

Warrnambool City Council and Warrnambool Airport Reference Group have been engaged about the proposed changes to the Minimum Safe Altitude for the instrument approach to the Warrnambool Aerodrome. Two key issues were raised about the proposed changes:

1. Raising the Minimum Safe Altitude could change the ability to use an unpublished GPS arrival approach.
2. The project could impact future expansion to the Warrnambool Aerodrome Runway 13.

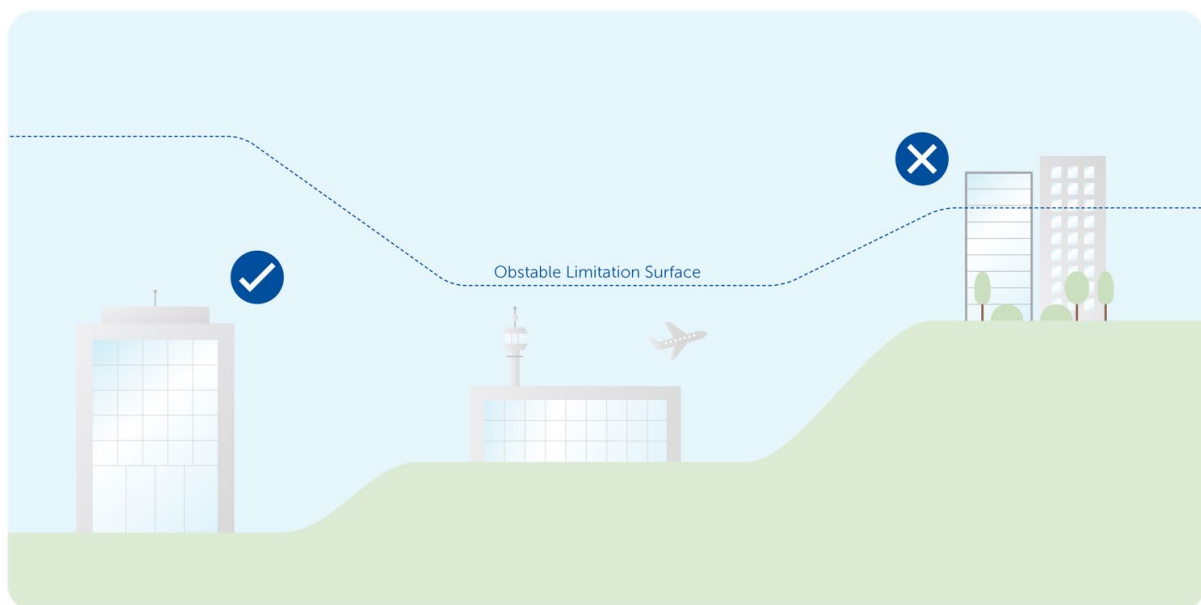


Figure 23.2 Aircraft obstacle limitation surface



## 23.7.2 Design mitigation

Avoidance by design has been the primary measure to limit aviation impacts. This has been an iterative process whereby the specialist aviation consultant assessed potential impacts related to aviation based on the concept design and provided recommendations in relation to position of local airstrips and required changes to Instrument Approach Procedures. These recommendations were incorporated into the reference design.

Key measures that have been incorporated into the project design to minimise or avoid impacts to aviation operations area outlined in Table 23.4 below.

**Table 23.4 Aviation design control measures**

Potential aviation impact	Design controls
Airstrips	Buffers were applied around local airstrips to avoid impacts based on the Civil Aviation Authority (1992) <i>Civil Aviation Advisory Publication No. 92-1(1): Guidelines for aeroplane landing areas</i> , as well as advice received from the aviation consultant [AVID01].
Firefighting	<p>The project design has incorporated the following recommendations outlined in the Country Fire Authority (2022) <i>Design Guidelines and Model Requirements Renewable Energy Facilities</i> [AVID02]:</p> <ul style="list-style-type: none"> <li>• for aerial firefighting, a minimum distance of 300 metres between turbines has been applied to allow for adequate distance for the operation of aircraft around the project wind turbines</li> <li>• wind turbines will be provided with automatic shut-down, and the ability to be completely disconnected from the power supply in the event of fire</li> <li>• for ground-based firefighting, the access tracks have been designed to the following specifications: <ul style="list-style-type: none"> <li>- minimum of 4 metres in trafficable width</li> <li>- 4 metre vertical clearance</li> <li>- all-weather surface</li> <li>- capable of accommodating a 15-tonne vehicle</li> <li>- provision of multiple access points, to ensure safe and efficient access to and egress.</li> </ul> </li> </ul>

## 23.7.3 Management controls

Where possible, design measures have been included to avoid potential impacts to aviation operations. To further minimise potential impacts to aviation operations in the investigation area, management controls would be carried out during construction and operation of the project. Committed management measures are outlined in Table 23.5.

**Table 23.5 Aviation management measures**

Aviation impact	Project phase	Management measures	Number
Potential to impact <b>local aerial operations</b> (including aerial agricultural operations and emergency services)	Construction and operation	Maintain marking of meteorological monitoring masts in accordance with the <i>National Airports Safeguarding Framework Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation</i> and marking on the base around the outer guy wires to improve visibility of these structures for low-flying aircraft such as aerial agricultural operations.	AVI01

Aviation impact	Project phase	Management measures	Number
	Construction	<p>Notification to relevant stakeholders about the location and heights of wind turbines and meteorological monitoring masts, including:</p> <ul style="list-style-type: none"> <li>Vertical Obstacle Database, managed by Airservices Australia, as per the procedure for reporting tall structures contained in CASA (2018) <i>Advisory Circular: Reporting of tall structure and hazardous plume sources</i> (AC 139-08 V2.0).</li> <li>Ensure a Notice to Airmen (NOTAM) that provides the height and location of the turbines and meteorological monitoring masts, is issued.</li> </ul>	AVI02
Potential to impact firefighting operations	Operation	<p>As per the Country Fire Authority (2022) <i>Design Guidelines and Model Requirements Renewable Energy Facilities</i>, the following would apply for the operation of the wind farm to manage potential impacts to firefighting operations:</p> <ul style="list-style-type: none"> <li>Fuel management measures during the Fire Danger Period, including maintaining grass levels at or below 100 millimetres in height and maintaining a fire break area of at least ten metre width around electricity compounds and substations.</li> <li>A fire break of 10 metres around the base of wind turbines has been incorporated into the design.</li> <li>Constructed roads developed during construction of the facility must be maintained post-commissioning and throughout the operational life of the facility to allow access to each turbine for maintenance and emergency purposes. These access tracks must be maintained as described in Part 6.2.1 of the Country Fire Authority Guidelines (2022).</li> <li>A fire protection system to allow adequate response to the risks and hazards at the facility, in consultation with the Country Fire Authority.</li> <li>Inclusion of a static fire water storage tank of at least 45,000L effective capacity at each site entrance.</li> <li>Wind energy facility emergency management plan, provided within the emergency information book, which includes the maximum (safe) operational wind speed and temperature conditions and operating procedures to limit fire risk.</li> </ul>	AVI03

## 23.7.4 Residual effects

After the development of design measures and management controls, an assessment of residual effects and impacts was completed describing the changes to the environment brought about by the construction, operation and eventual decommissioning of the project, and rating the significance of these effects.

### Aerodromes

The project would not impact the Obstacle Limitation Surface or the Procedures for Air Navigation Services – Aircraft Operations surfaces prescribed airspace of the Instrument Approach Procedures for the Portland or Hamilton Aerodromes. The project would also not impact the Obstacle Limitation Surface for the Warrnambool Aerodrome.

Whilst the proposed turbines are beyond the 10 nautical mile Minimum Safe Altitude for the Warrnambool Aerodrome, there are several turbines within the 5 nautical mile buffer zone used to calculate this Minimum Safe Altitude. To enable the proposed maximum blade tip height, the 10 nautical mile Minimum Safe Altitude would need to be raised by 100 feet (or 30.5 metres) from 2100 feet to 2200 feet to satisfy the requirements of ICAO PANS-OPS document 9905 (*Required Navigation Performance Authorization Required (RNP AR) Procedure Design Manual*). This would ensure minimum factors of safety are maintained. The same modification is also required for the Procedures for Air Navigation Services – Aircraft Operations surface for the Warrnambool aerodrome (YWBL RNAV-Z RWY 13) non-precision approach.

This change would only affect Instrument Flight Rules aircraft, with the change predicted to have a minimal impact to their pilots. This may impinge aircraft flying a non-published GPS arrival procedure because of this procedural change, as highlighted during consultation with the Warrnambool Airport Reference Group. However, this impact is minor and would apply to very few Instrument Flight Rules aircraft arriving at Warrnambool during periods of low cloud cover, when flying the published Instrument Approach Procedure may be preferable. The majority of Instrument Flight Rule aircraft arriving at Warrnambool will execute the relevant Instrument Approach Procedure to ensure safe descent to the lowest safe level at the Minimum Decision Altitude. As such, the impact was assessed to be low.

If a planning permit is granted, consultation with the aerodrome operator and the Instrument Approach Procedure designer (Airservices Australia) by the project team is required prior to construction to have the recommended amendments made to the Instrument Approach Procedure. If agreement to these changes cannot be reached with the aerodrome operator, the blade tip height of five turbines would need to be reduced by between 1.5 and 14 metres either by micro-siting these wind turbines or capping the blade tip heights thereby avoiding the need to modify the Minimum Safe Altitude. The project would not impact on the redesign of the instrument approach procedures for the planned (or future) expansion to Warrnambool Aerodrome Runway 13. Any expansion to Runway 13 would require the current Instrument Approach Procedures to be redesigned and the commencement reference point changed. Since the project is located more than 10 nautical miles from Runway 13, with the exception of changes to the 10 nautical mile Minimum Safe Altitude (described earlier), an approach extension of 500 metres or more, which is significantly greater than the proposed 300 metre runway extension, could be accommodated without influence from the project.

### Obstacle Limitation Surface

The Obstacle Limitation Surface is a series of planes, associated with each runway at a regulated aerodrome, that define the desirable limits to which objects or structures may project into the surrounding airspace (i.e., the aerodrome airspace to be kept free of obstacles such as vegetation, buildings, large structures or transmission lines). This surface provides airspace protection for the safe operations of aircraft at the aerodrome.

### Procedures for Air Navigation Services – Aircraft Operations surface

This surface, extends further and is higher than the Obstacle Limitation Surface, provides protection for when a pilot is flying using instruments during non-visual conditions (i.e., poor weather). In this situation, pilots use Instrument Approach Procedures for the approach and landing. These rely on ground and/or satellite navigation systems.

## Airstrips

Of the eight unregulated airstrips landing areas within proximity to the project site that are still used to some extent, the project would affect local aircraft operations of one local private airstrip (a landowner who would host wind turbines) due to its proximity to wind turbines, although being situated outside the aviation safety buffer. *Civil Aviation Advisory Publication No.92-1(1): Guidelines for aeroplane landing areas* (rescinded January 2022 and not replaced) suggested an Obstacle Free Area (i.e., area above the approach and take-off area, runways and fly-over areas) extends for 900 metres from the runway end. All wind turbines are outside the Obstacle Free Areas. Airstrip no.6 would be constrained by one wind turbine; however, the use of this airstrip could continue with caution.

## Airspace and air routes

The project would not affect the lowest safe altitude for air routes in the project investigation area.

The project is not considered to be a hazard to aircraft safety. As such, the obstacle lighting review concluded that wind turbines would not need obstacle lighting. However, the project wind turbines and meteorological monitoring masts are considered to be tall structures and therefore must be reported to the Vertical Obstacle Database, managed by Airservices Australia.

## Existing aviation operations

### *Aerial agricultural operations*

The project would result in some limitations on aerial agricultural operations immediately surrounding wind turbines and meteorological monitoring masts. These limitations, however, would largely be experienced by stakeholder landowners.

Consultation with pilots that apply fertilisers and weed and pest control via aerial application (e.g., Figure 23.3) identified that wind farms would impose some limitations on aerial applications, however, their knowledge of operating near wind farms has improved and they are aware of how to operate safely in their vicinity. The main issue is meteorological monitoring masts as they are more difficult to see. To manage this potential impact, masts would be marked in accordance with the *National Airports Safeguarding Framework Guideline D: Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation* (excluding the recommendation for a strobe light which is considered by aerial agricultural pilots to be ineffective; Appendix O), and the base around the outer guy wires would be marked in a contrasting colour to the ground.

### *Recreational aviation*

As recreational and sport aircraft are limited to daytime flight in accordance with the Visual Flight Rules, they must remain clear of cloud and at minimum of 500 feet above the ground or highest obstacle. The cruising speed of ultralight aircraft is generally lower than for a general aviation aircraft, allowing more time to see and avoid obstacles. The project site is not known to be used by recreational pilots and therefore no impacts to recreational aviation are predicted.

### *Aerial emergency services*

As per aerial agricultural operations, aerial emergency service operators have indicated the presence of a wind farm would not stop aerial emergency service operations, with pilots aware of wind farms and how to operate safely in their vicinity. The project is not predicted to affect fixed wing air ambulance operations due to their use of Instrument Flight Rules during operations.

**Figure 23.3**  
**Aerial spraying operations**



**Figure 23.4**  
**Aerial firefighting near a wind farm**



### *Firefighting*

Firefighting aircraft (e.g., Figure 23.4) operate to the Visual Flight Rules. As such, these aircraft can only operate during daylight hours and must remain clear of smoke to maintain the required visibility of the ground and obstacles such as wind turbines, trees, power lines, radio masts and houses. The *Wind Farms and Bushfire Operations Position Paper* (Australian Fire and Emergency Service Authorities Council, 2018) identifies that wind turbines are not expected to pose unacceptable risks to aerial firefighting.

Access for fire trucks and personnel to fight a fire within a wind farm is improved by the access tracks built for the construction and maintenance of the turbines, in accordance with the Country Fire Authority Guidelines. These roads also act as fire breaks which can slow or contain the fire spread across the open ground. The area around the base of each tower is kept clear of vegetation, which offers a refuge for fire fighters and their vehicles. The project design also includes water tanks in strategic positions around the wind farm that would be designed to meet the requirements of the Country Fire Authority.

## 23.7.5 Impact assessment summary

Overall, the impact assessment concluded the potential risk to aviation in the project region is low and does not pose a hazard to aircraft safety.

A summary of the aviation impact assessment is shown in Table 23.6 below, with the full assessment presented in Appendix O – *Aviation*.

**Table 23.6 Aviation impact assessment summary**

Impact pathway	Asset, value or receptor	Project phase	Likely impact (considering magnitude, extent and duration)	Impact rating and justification
Potential for wind turbines to impact aviation operations	Aerodromes	Operation	Procedures for Air Navigation Services – Aircraft Operations surface for an Instrument Approach Procedure (10 nautical miles Minimum Safe Altitude) for Warrnambool Aerodrome is affected by the project.	<p><b>Impact not expected</b></p> <p>With an increase of the Warrnambool Instrument Approach Procedure 10 nautical miles Minimum Safe Altitude by 100 feet, no impact to aircraft safety and procedures is anticipated.</p> <p>This change would only affect Instrument Flight Rules aircraft pilots, with the change only likely to have a minor impact to these pilots.</p>
	Airstrips – take-off / landing	Operation	The project would impact the take-off/landing approach for one private airstrip without design avoidance measures.	<p><b>Impact not expected</b></p> <p>One airstrip (no.6) would be constrained by a nearby wind turbine. However, the use of this airstrip could continue with caution.</p>
	Airspace and air routes	Operation	Within project investigation area there is no impact to the lowest safe altitude for air routes, and there are no published flying training areas, or no ‘prohibited’, ‘restricted’ or ‘danger’ airspace areas.	<p><b>Impact not expected</b></p> <p>The project does not require obstacle lighting as it is not considered to be a hazard to aircraft safety.</p>
	Aerial agricultural operations	Operation	Four known aerial applications operators work in the general area of south-western Victoria. The project turbines may impact existing aerial agricultural aircraft operations within in the area immediately surrounding the project turbines.	<p><b>Low</b></p> <p>The project turbines would be appropriately painted, as per the design controls, to ensure they are visible by day.</p>
	Firefighting	Operation	Wind turbines are not expected to pose unacceptable risks to aerial firefighting. Access tracks built for the construction and maintenance of the turbines can improve ground-based firefighting access and can also act as fire breaks.	<p><b>Low</b></p> <p>With the implementation of design and management controls, impacts of the project to firefighting efforts are considered low.</p>

## 23.8 Conclusions

Wind turbines have the potential to impact on the operation of local unregulated airstrips due to the introduction of new obstacles.

The aviation impact assessment identified the project would not impact on Obstacle Limitation Surfaces for any regulated aerodrome within 30 nautical miles of the project site, or the Procedures for Air Navigation Services – Aircraft Operations surfaces associated with the Instrument Approach Procedures at Portland or Hamilton Aerodromes. However, changes to the Instrument Approach Procedure for Warrnambool Aerodrome would be required, or wind turbine heights could be reduced, to ensure clearance of the Procedures for Air Navigation Services – Aircraft Operations surfaces for this instrument approach.

Overall, the impact assessment concluded the project represents a low risk to aviation in the project region and does not pose a hazard to aircraft safety. As such, obstacle lighting is not needed. However, as wind turbines and meteorological monitoring masts are considered to be tall structures, they must be reported to the Vertical Obstacle Database managed by Airservices Australia.