Appendix T

Aeronautical Impact Assessment

KENTBRUCK GREEN POWER HUB

FINAL REPORT

AERONAUTICAL IMPACT ASSESSMENT

KENTBRUCK GREEN POWER HUB

Report to:

NEOEN

CCP08WF
V10

17 June 2024

Chiron Aviation Consultants
Essendon Vic 3040
Australia

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ABBREVIATIONS

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

Abbreviation	Meaning
AC	Advisory Circular (document support CASR 1998)
ACFT	Aircraft
AD	Aerodrome
ADS-B	Automatic Dependent Surveillance - Broadcast
AHD	Australian Height Datum
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
Airports Act	Airports Act 1996, as amended
AIS	Aeronautical Information Service
ALA	Aircraft Landing Area – uncertified aerodrome
Alt	Altitude
AMSL	Above Minimum Sea Level
A(PofA)R	Airports (Protection of Airspace) Regulations, 1996 as amended
APARs	Airports (Protection of Airspace) Regulations, 1996 as amended
ARP	Aerodrome Reference Point
AsA	Airservices Australia
ATC	Air Traffic Control(ler)
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation 1988
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation 1998
Cat	Category
CNS	Communications, Navigation and Surveillance
DAP	Departure and Approach Procedures (charts published by AsA)
DME	Distance Measuring Equipment
Doc nn	ICAO Document Number nn
ELEV	Elevation (above mean sea level)
ENE	East Northeast
ERSA	Enroute Supplement Australia
FAF	Final Approach Fix
FAP	Final Approach Point
ft	feet
GA	General Aviation
GNSS	Global Navigation Satellite System
GP	Glide Path
IAS	Indicated Airspeed
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IHS	Inner Horizontal Surface, an Obstacle Limitation Surface

Abbreviation	Meaning
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
ISA	International Standard Atmosphere
km	kilometres
kt	Knot (one nautical mile per hour)
LAT	Latitude
LLZ	Localizer
LONG	Longitude
LSALT	Lowest Safe Altitude
m	Metres – 3.28084 feet.
MAPt	Missed Approach Point
MDA	Minimum Descent Altitude
MOC	Minimum Obstacle Clearance
MOS	Manual of Standards, published by CASA
MSA	Minimum Sector Altitude
SSR	Monopulse Secondary Surveillance Radar
NASAG	National Airports Safeguarding Advisory Group
NASF	National Airports Safeguarding Framework
NAVAID	Navigation Aid – usually ground based and interrogated by aircraft
NDB	Non Directional Beacon
NE	Northeast
NM or nm	Nautical Mile (= 1.852 km)
nnDME	Distance from the DME (in nautical miles)
NNE	North Northeast
NOTAM	NOtice To AirMen
OHS	Outer Horizontal Surface
OLS	Obstacle Limitation Surface
PANS-OPS	Procedures for Air Navigation Services – Aircraft Operations, ICAO Doc 8168
PRM	Precision Runway Monitor
PROC	Procedure
PSR	Primary Surveillance Radar
QNH	An altimeter setting relative to height above mean sea level
Rnnn	Restricted Airspace – promulgated in AIP as R with 3 numbers
REF	Reference
RL	Relative Level
RNAV	aRea NAVigation
RNP	Required Navigation Performance
RPT	Regular Public Transport
RWY	Runway
SFC	Surface
SID	Standard Instrument Departure
SOC	Start Of Climb
SSR	Secondary Surveillance Radar

Abbreviation	Meaning
STAR	Standard ARrival
TAR	Terminal Area Radar
TAS	True Air Speed
THR	Threshold (Runway)
TODA	Take-Off Distance Available
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VOR	Very high frequency Omni directional Range – ground base NAVAID
YPOD	Portland Aerodrome
YMTG	Mount Gambier Aerodrome

AERONAUTICAL STUDY GLOSSARY

To facilitate the understanding of aviation terminology used in this report, the following is a glossary of terms and acronyms that are commonly used in aeronautical impact assessments and similar aeronautical studies

Aviation measures position as latitude and longitude, distance in nautical miles, altitude & height in feet, speed in knots and time as Universal Time Coordinated (UTC). These are part of the *International System of Units (SI).*

AC (Advisory Circulars) are issued by CASA and are intended to provide recommendations and guidance to illustrate a means, but not necessarily the only means, of complying with the *Regulations*.

Aeronautical study is a tool used to review aerodrome and airspace processes and procedures to ensure that safety criteria are appropriate.

AHD (Australian Height Datum) is the datum to which all vertical control for mapping is to be referred. The datum surface is that which passes through mean sea level at the 30 tide gauges and through points at zero AHD height vertically below the other basic junction points.

AIP (Aeronautical Information Publication) is a publication promulgated to provide operators with aeronautical information of a lasting character essential to air navigation. It contains details of regulations, procedures and other information pertinent to flying and operation of aircraft. In Australia, the AIP may be issued by CASA or Airservices Australia.

Air routes exist between navigation aid equipped aerodromes or waypoints to facilitate the regular and safe flow of aircraft operating under Instrument Flight Rules (IFR).

Airservices Australia is the Australian government-owned corporation providing safe and environmentally sound air traffic management and related airside services to the aviation industry.

Altitude is the vertical distance of a level, a point or an object, considered as a point, measured from mean sea level.

AMSL (Above Mean Sea Level) is the elevation (on the ground) or altitude (in the air) of any object, relative to the average sea level datum. In aviation, the ellipsoid known as World Geodetic System 84 (WGS 84) is the datum used to define mean sea level.

ATC (Air Traffic Control) service is a service provided for the purpose of:

a. preventing collisions:

    1. between aircraft; and

    2. on the manoeuvring area between aircraft, vehicles and obstructions; and

b. expediting and maintaining an orderly flow of air traffic.

CASA (Civil Aviation Safety Authority) is the Australian government authority responsible under the *Civil Aviation Act 1988* for developing and promulgating appropriate, clear and concise aviation safety standards. As Australia is a signatory to the ICAO *Chicago Convention,* CASA adopts the standards and recommended practices established by ICAO, except where a difference has been notified.

CASR (Civil Aviation Safety Regulations) are promulgated by CASA and establish the regulatory framework *(Regulations)* within which all service providers must operate.

Civil Aviation Act 1988 (the Act) establishes the CASA with functions relating to civil aviation, in particular the safety of civil aviation and for related purposes.

ICAO (International Civil Aviation Organization) is an agency of the United Nations which codifies the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth. The ICAO Council adopts standards and recommended practices concerning air navigation, its infrastructure, flight inspection, prevention of unlawful interference, and facilitation of border-crossing procedures for international civil aviation. In addition, the ICAO defines the protocols for air accident investigation followed by transport safety authorities in countries signatory to the Convention on International Civil Aviation, commonly known as the *Chicago Convention*. Australia is a signatory to the *Chicago Convention.*

IFR (Instrument Flight Rules) are rules applicable to the conduct of flight under IMC. IFR are established to govern flight under conditions in which flight by outside visual reference is not safe. IFR flight depends upon flying by reference to instruments in the flight deck, and navigation is accomplished by reference to electronic signals. It is also referred to as, “a term used by pilots and controllers to indicate the type of flight plan an aircraft is flying,” such as an IFR or VFR flight plan.

IMC (Instrument Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, less than the minimum specified for visual meteorological conditions.

LSALT (Lowest Safe Altitudes) are published for each low level air route segment. Their purpose is to allow pilots of aircraft that suffer a system failure to descend to the LSALT to ensure terrain or obstacle clearance in IMC where the pilot cannot see the terrain or obstacles due to cloud or poor visibility conditions. It is an altitude that is at least 1,000 feet above any obstacle or terrain within a defined safety buffer region around a particular route that a pilot might fly.

MOS (Manual of Standards) comprises specifications *(Standards)* prescribed by CASA, of uniform application, determined to be necessary for the safety of air navigation.

NASAG (National Airports Safeguarding Advisory Group) set up in May 2010 to implement the Australian Government’s National Aviation Policy White Paper, *Flight Path to the Future* initiatives relating to safeguarding airports and surrounding communities from inappropriate development. NASAG comprises representatives from state and territory planning and transport departments, the Civil Aviation Safety Authority (CASA), Airservices Australia, the Department of Defence and the Australian Local Government Association (ALGA) and is chaired by the Department of Infrastructure and Transport (DoIT).

NASF (National Airports Safeguarding Framework) is the published guidelines from the NASAG.

NOTAMs (Notices to Airmen) are notices issued by the NOTAM office containing information or instruction concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to persons concerned with flight operations.

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.

OLS (Obstacle Limitation Surfaces) are a series of planes associated with each runway at an aerodrome that defines the desirable limits to which objects may project into the airspace around the aerodrome so that aircraft operations may be conducted safely.

PANS-OPS (Procedures for Air Navigation Services - Aircraft Operations) is an Air Traffic Control term denominating rules for designing instrument approach and departure procedures. Such procedures are used to allow aircraft to land and take off under Instrument Meteorological Conditions (IMC) or Instrument Flight Rules (IFR). ICAO document 8168-OPS/611 (volumes 1 and 2) outlines the principles for airspace protection and procedure design which all ICAO signatory states must adhere to. The regulatory material surrounding PANS-OPS may vary from country to country.

PANS OPS Surfaces. Like an Obstacle Limitation Surface, the PANS-OPS protection surfaces are imaginary surfaces in space which guarantee the aircraft a certain minimum obstacle clearance. These surfaces may be used as a tool for local governments in assessing building development. Where buildings may (under certain circumstances) be permitted to penetrate the OLS, they cannot be permitted to penetrate any PANS-OPS surface, because the purpose of these surfaces is to guarantee pilots operating under IMC an obstacle free descent path for a given approach.

Protected airspace is an airspace specified in, or ascertained in accordance with, the Regulations, where it is in the interests of the safety, efficiency or regularity of existing or future air transport operations into or out of an airport for the airspace to be protected. The prescribed airspace for an airport is the airspace above any part of either an OLS or a PANS OPS surface for the airport and airspace declared in a declaration relating to the airport.

Regulations (Civil Aviation Safety Regulations and Civil Aviation Regulations)

VFR (Visual Flight Rules) are rules applicable to the conduct of flight under VMC. VFR allow a pilot to operate an aircraft in weather conditions generally clear enough to allow the pilot to maintain visual contact with the terrain and to see where the aircraft is going. Specifically, the weather must be better than basic VFR weather minima. If the weather is worse than VFR minima, pilots are required to use instrument flight rules.

VMC (Visual Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, equal or better than specified minima.

EXECUTIVE SUMMARY

Neoen Australia has requested Chiron Aviation Consultants undertake an Aeronautical Impact Assessment, including a Qualitative Risk Assessment and Obstacle Lighting Review for the proposed Kentbruck Green Power Hub.

The Kentbruck Green Power Hub (KGPH) located on the coast between Portland and Nelson, approximately 27km (14.5nm) northwest of Portland, will comprise up to 105 wind turbines with a tip height of up to 270m above ground level, associated internal transmission lines, internal sub-stations and an underground transmission line connecting to the existing Heywood terminal station.

The KGPH turbine layout has changed since the original Aeronautical Impact Assessment was conducted in 2020. Airservices Australia responded to the original assessment on 16 June 2020. The current layout utilises turbines of the same size and contained within the boundary originally assessed. Thus, the volume of airspace occupied by the new 105 turbine layout is contained with that originally assessed, therefore the original results remain valid.

The tallest turbine is now 412m (1352ft) not 456m (1483ft) above the Australian Height Datum (AHD). This reduces the Lowest Safe Altitude (LSALT) over the KGPH from 2500ft to 2400ft. The reduced LSALT still requires the amendment of the instrument approach procedures at Portland aerodrome and the LSALT for air route W519.

There are two certified aerodromes, Mount Gambier (YMTG) and Portland (YPOD) within 30nm (56km) of the wind farm boundary as well as known uncertified airstrips at Nelson and Kentbruck.

The KGPH wind turbines will not impact on the operation of YMTG or the airstrips at Nelson and Kentbruck. The height of the wind turbines will require Lowest Safe Altitudes (LSALT) for both the GRID and air route W519 to be raised to 2400ft. The height of the wind turbines will impact on the non-precision Required Navigation Performance (RNP) instrument approach procedures at YPOD. These procedures will require amendment to the 25nm and 10nm Minimum Safe Altitudes (MSA) as well as a redesign of the instrument approach paths. Consultation with Glenelg Shire Council and Airservices Australia is being undertaken to have these changes implemented prior to construction of the KGPH commencing.

The Glenelg Shire Council supports the required changes to the airspace at Portland and has advised Airservices Australia accordingly.

The meteorological monitoring masts and wind turbines are tall structures and must be reported in accordance with CASA Advisory Circular AC 139.E-01 v1.0 *Reporting Tall Structures* to ensure they are appropriately marked on aeronautical charts and publications.

The Qualitative Risk Assessment demonstrates that the KGPH poses a low risk to aviation and is therefore not a hazard to aircraft safety. Consequently, aviation obstacle lighting is not required.

The KGPH transmission line option (Heywood underground) connecting to the grid at the Heywood interconnector is clear of the Portland aerodrome, does not infringe protected airspace, and is not a hazard to aviation safety.

Previously considered transmission line alignment options connecting at Portland, were close to Portland aerodrome and height limited by the Obstacle Limitation Surfaces (OLS) and the Procedures for Aircraft Navigation – Aircraft Operations (PANS-OPS) protected airspace at Portland aerodrome (YPOD) and therefore were unacceptable.

The Victorian Policy and Planning guidelines note various points to be considered for the planning permit process. Each of these requirements has been addressed in the Aeronautical Impact Assessment.

The Victorian Minister for Planning makes the final decision through the issue of a Planning Permit. CASA is not a formal referral authority and only provides recommendations if requested. Refer to AC139.E-05 v1.0 *Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome.*

The aviation related items raised in the *Scoping Requirements for Kentbruck Green Power Hub* document have been addressed in detail throughout this report.

The KGPH is a low risk to aviation and is therefore not a hazard to aircraft safety.

1. INTRODUCTION

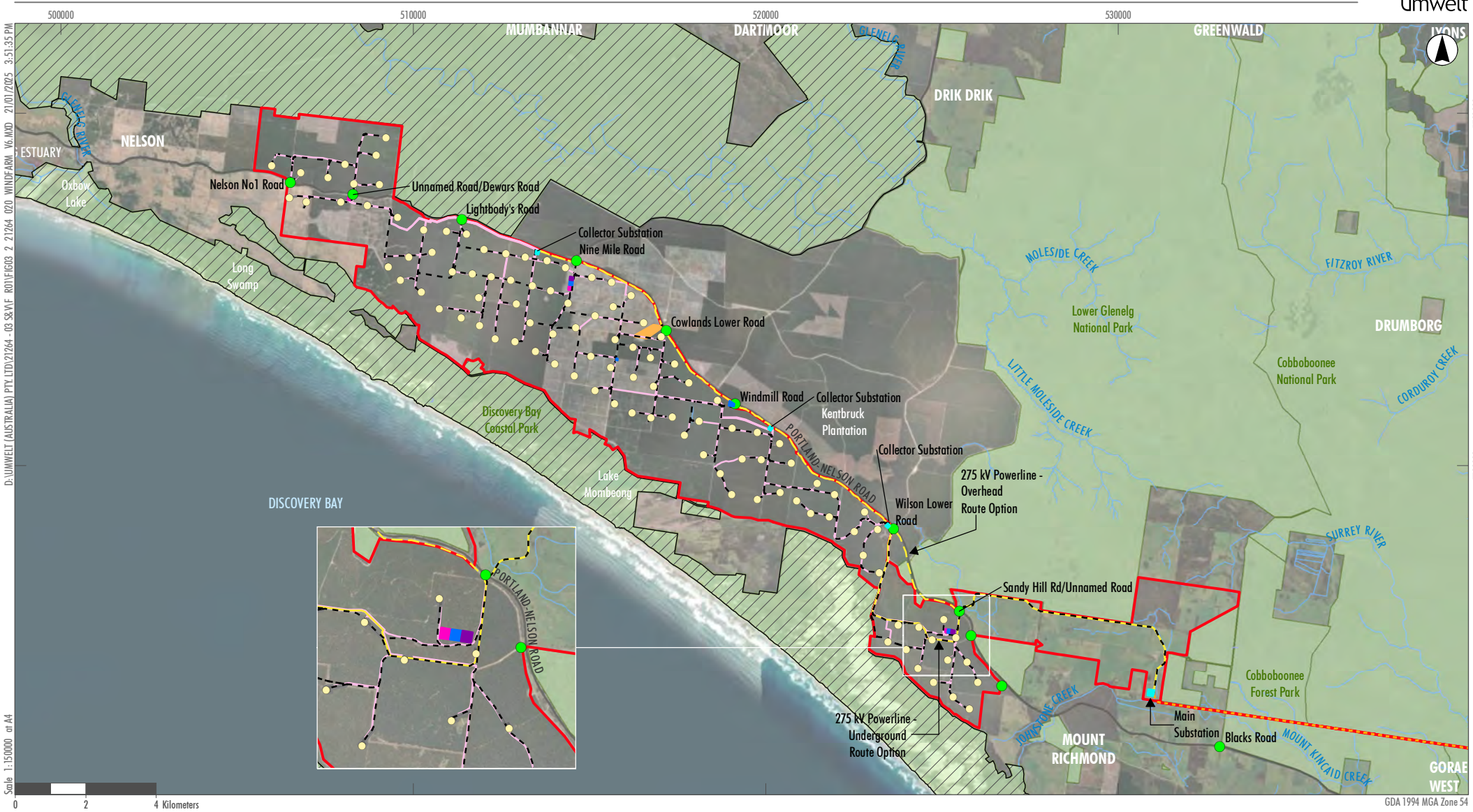
Neoen Australia has requested Chiron Aviation Consultants undertake an Aeronautical Impact Assessment, including a Qualitative Risk Assessment and Obstacle Lighting Review for the proposed Kentbruck Green Power Hub in southwestern Victoria.

1.1 Location

The Kentbruck Green Power Hub (KGPH) is located on the coast between Portland and Nelson, approximately 27km (14.5nm) northwest of Portland.

The proposed wind farm will comprise up to 105 turbines with a tip height of up to 270m Above Ground Level (AGL). Additional infrastructure includes internal sub-stations and transmission lines. The meteorological monitoring masts, with heights up to 130m AGL, associated with the project are subject to separate aviation impact statements and reporting requirements. The proposed external transmission lines have been the subject of separate assessments. The current proposed transmission line connects the KGPH via an underground route to the existing Heywood interconnector station.

Until the turbines are constructed, the meteorological monitoring masts are the tallest structures. When the turbines are constructed, they become the tallest structures that aviation activity is required to avoid. Other associated structures such as sub-stations and above ground transmission lines are all shorter than the 270m AGL turbines.



Legend

- Project Area
- Glenelg Estuary and Discovery Bay Ramsar Wetland
- Roads
- Watercourses
- Site Access Points

Permanent Wind Farm Infrastructure

- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- Underground Transmission Line
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure

- Concrete Batch Plant
- Laydown Areas
- Site Compounds

FIGURE 1 **Wind Farm Details**

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Geoscience Australia (2021); Aurecon (2021)

Figure 2 – Kentbruck Green Power Hub Transmission Line Location

1.2 Aerodromes and Airstrips

Aerodromes fall into three categories:

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

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

A Certified Aerodrome is regulated under Civil Aviation Safety Regulation (CASR) 139.030. An aerodrome with a published instrument flight procedure must be regulated.

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

Military, Joint and Certified aerodromes are listed in the Aeronautical Information Publication[1] (AIP) and are subject to a NOTAM[2] service that provides the aviation industry with current information on the status of the aerodrome facilities. This information is held in the public domain, is available through aeronautical publications and charts and is kept current by mandatory reporting requirements.

Uncertified aerodromes are not required to be listed in the AIP, although many are, so information about them is not necessarily held in the public domain, may not be available through aeronautical publications and charts and is not required to be reported. Where Uncertified aerodrome information is published in the AIP EnRoute Supplement Australia (ERSA)[3] it is clearly annotated that a *full NOTAM service is not available*.

The AIP Designated Airspace Handbook (DAH)[4], at Section 20, lists *Aircraft Landing Areas (ALA) without an ERSA entry – verified*. This listing of verified ALA indicates that Airservices Australia have registered a responsible person who provides verified information about the ALA. These verified ALA are also depicted on AIP Charts.

ALA can come into use and fall out of use without any formal notification to CASA or any other authority. Airstrips that appear on survey maps often no longer exist; others exist but do not feature on maps. Similarly, a grass paddock used as an ALA is not usually discernable on satellite mapping services such as Google Earth.

[1] AIP; a mandatory worldwide distribution system for the promulgation of aviation rules, procedures and information
[2] NOTAM (Notice to Airmen); a mandatory reporting service to keep aerodrome and airways information current and available to the aviation industry worldwide
[3] ERSA, part of the AIP that lists aerodrome information in accordance with standards and legislative requirements to ensure integrity.
[4] DAH, part of the AIP that lists the pertinent details of Australian airspace

Military, Joint and Certified aerodromes have Obstacle Limitation Surfaces (OLS) and Procedures for Air Navigation – Operations (PANS-OPS) surfaces prescribed to protect the airspace associated with the published instrument approach and landing procedures.

An Uncertified aerodrome or ALA is not subject to Civil Aviation Safety Regulations (CASR) Part 139 *Aerodromes* and therefore does not have an OLS. An Uncertified aerodrome cannot have a published instrument approach and landing procedure so does not have associated airspace protected by PANS-OPS.

All operations into ALA, therefore, must be conducted in accordance with the Visual Flight Rules (VFR) and in Visual Meteorological Conditions (VMC).

1.3 Aerodromes within 30nm (56km) of KGPH boundary

The following aerodromes have been identified as being within 30nm (56.6km) of the wind farm boundary.

Certified Aerodromes at: -

- Portland (YPOD) situated 11.36nm (21.04km) Southeast of turbine #37; and
- Mount Gambier (YMTG) situated 22.75nm (42.13km) Northwest of turbine #24.

Known Uncertified Aerodromes (ALA) at: -

- Nelson situated 2.21nm (4.1km) West of turbine #24; and
- Kentbruck situated 1.54nm (2.85km) North northeast of turbine #18.

The distances are from the nearest KGPH turbine.

1.4 Air Routes in the Area

Figure 3 shows the air route, W519 – NOGIP to MTG (LSALT 2200), which passes over the wind farm.

Figure 3 – Nearby Air Routes[5]

1.5 Airspace in the Area

The KGPH is in Class G airspace below Class E airspace with a lower limit of 12,500ft.

Class G airspace is non-controlled airspace where aircraft may operate without an Air Traffic Control (ATC) clearance. Aircraft may operate in accordance with either Instrument Flight Rules (IFR) or Visual Flight Rules (VFR) within Class G airspace.

Class E airspace is controlled airspace open to both IFR and VFR flights. IFR aircraft must have an ATC clearance and communicate with the ATC Centre.

A Control Area (CTA) is defined as a "controlled airspace extending upwards from a specified limit above the earth.[6]"

Within Class G airspace an aircraft flying in accordance with the Visual Flight Rules (VFR) away from a populous area is, when flying below 3000ft, required by Civil Aviation

[5] AIP ERC L2, dated 15 June 2023
[6] AIP Enroute, ENR 1.4 – 3, dated 15 June 2023.

Safety Regulation (CASR) 91.267 to remain at 500ft above the highest point of the terrain and any obstacle on it within a radius of 300m from a point on the terrain directly below the aircraft. For a wind farm this equates to 500ft above the tallest turbine tip height. For the KGPH this is 886 + 500 = 1386ft Above Ground Level (AGL).

There are no Prohibited, Restricted or Danger (PRD) areas, nor published flying training areas in the vicinity of the KGPH.

2. SCOPE

2.1 Aviation Impact Statement

Airservices Australia (AsA) require all developers of proposed wind farms to prepare an Aviation Impact Statement and submit this to AsA for evaluation and consideration.

The AIS required the following tasks to be undertaken: -

- Provide the coordinates and elevations of the Obstacles and associated topographical drawings;
- Specify all certified aerodromes within 30nm (56.6km):
  - Nominate all instrument approach and landing procedures;
  - Confirm that the obstacles do not penetrate the Annex 14 OLS;
  - Confirm that the obstacles do not penetrate the PANS-OPS;
- Specify any published air routes over or near the obstacles
- Specify the airspace classification of the airspace surrounding the development
- Investigate any impact on aviation Communications, Navigation and Surveillance (CNS) facilities

Details of Aerodromes, OLS, PANS-OPS procedures, Lowest Safe Altitudes, Communications, Navigation and Airspace Surveillance facilities were obtained from the Australian Aeronautical Information Publications (AIP), AsA sources and CASA publications.

2.2 Qualitative Risk Assessment

The QRA has been conducted as recommended in the NASF Guideline D *Managing the risk to aviation safety of wind turbine installations (wind farms)/wind monitoring towers.*

The Qualitative Risk Assessment (QRA) required the following tasks to be undertaken:

- The identification and assessment of potential aviation risk elements through:
  - Reference to CASA publications;
  - Reference to the AIP;
  - Reference to the National Airports Safeguarding Framework (NASF) guidelines;
  - Consultations with key relevant stakeholders;
- Assessment of the perceived impacts of the turbines on the operation of aerodromes and airstrips in the immediate vicinity of the wind farm;
- Assessment of the perceived impacts of the turbines on aviation activity including:

- General Aviation training;
- Recreational/Commercial flying activity;
- Air Ambulance Operations;
- Police Aviation Operations;
- Aerial Fire Fighting Operations;
- Aerial Agricultural Operations;
- Known highly trafficked VFR routes;
- Night flying for light aircraft;

- Assessment of any implications for the above from topographical, weather and visibility issues;
- Assessment of other issues as identified through stakeholder consultations and the assessment process;
- Conclusions on the degree of aviation risk posed by the above described issues with commensurate recommendations on any mitigating actions; and

An assessment of the need, against the outcomes of the Qualitative Risk Assessment, for obstacle lighting of the wind farm.

2.3 Obstacle Lighting Review

The Obstacle Lighting Review (OLR) reviews the outcome of the QRA to determine the need or otherwise for risk mitigation by the lighting of turbines in the wind farm with aviation obstruction lighting.

2.4 Environment Effects Statement

The aviation related impacts noted in the *Scoping Requirements for Kentbruck Green Power Hub* are addressed in the Aviation Impact Statement and the Qualitative Risk Assessment parts of the Aeronautical Impact Statement.

3. METHODOLOGY

The following methodology was used to complete the tasks outlined in the scope.

3.1 Aviation Impact Statement

To meet Airservices Australia requirements for an Aviation Impact Statement the following methodology was used: -

- The obstacle (turbines and meteorological masts) coordinates and elevations were listed to the requisite accuracy and associated drawings and charts were obtained;
- The AIP was reviewed to determine;
  - All registered/certified and military/joint aerodromes located within 30nm (55.6km) of the wind farm
  - Any associated Instrument Departure and Approach Procedures (DAP);
  - The extent of the OLS and PANS-OPS surfaces for the identified DAP;
  - Published air routes located over or near the wind farm;
  - The classification of the airspace surrounding the wind farm;
- Ascertain the locations of CNS facilities that may be impacted and analyse the impact on;
  - Communications facilities;
  - Navigation facilities;
  - Surveillance facilities (in accordance with EUROCONTROL Guidelines); and

Compile a report for review by Airservices Australia and Department of Defence.

3.2 Qualitative Risk Assessment

A Qualitative Risk Assessment is the analysis for risks, through facilitated interviews or meetings with stakeholders and outside experts, as to their probability of occurrence and impact expressed using non-numerical terminology; for example, low, medium and high. The basis for the QRA is ASNZS ISO 31000-2018 *Risk Management –Guidelines.*

The methodology for the Qualitative Risk Assessment was as follows:

- The Australian AIP and CASA documents were reviewed to identify relevant physical and operational aviation issues that may impact on the requirement for lighting of the wind farm;
- Current topographical maps were studied to assess the local terrain and identify any local airstrips and any other relevant features;

- Key stakeholders, including local operators, recreational aviation groups and State Government Police Air Wing, Air Ambulance and Fire Services, were identified, contacted and interviewed to ascertain the extent of local aviation activity in the vicinity of the proposed wind farm. See Appendix H for a Stakeholder List. This included any informal low flying areas and highly trafficked unpublished air routes that may exist within the vicinity of the proposed wind farm;

- Based on the above, the nature of any impacts as a consequence of the operation of the wind farm was considered and discussed regarding;

  - General Aviation training;
  - Recreational and sport aviation activities;
  - Approved low flying activities (including aerial agricultural applications)
  - Any known highly trafficked VFR routes; and
  - Emergency Services (air ambulance, police and fire service);

- In addition, further consideration was given to the consequences (for the above elements) of the potential influence of topography and poor weather;
- Consideration of CASA Advisory Circular AC139.E-05 *Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome;* and
- Consideration of the NASF, Guideline D *Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms)/Wind Monitoring Towers* in relation to the QRA findings.

3.3 Obstacle Lighting Review

The Obstacle Lighting Review investigates the current Australian standards and regulatory requirements for obstacle lighting of wind farms. From this review an assessment of the need or otherwise for aviation obstruction lighting is made.

The methodology for the Obstacle Lighting Review was as follows: -

- Review the Australian regulatory requirements and standards;
- Review of CASA Advisory Circular AC139.E-05 v1.0; and
- Review the NASF Guidelines for wind farms;

From the QRA, assess the need for aviation obstruction lighting as a risk mitigator.

3.4 Environment Effects Statement

The matters to be investigated and documented in the Environment Effects Statement (EES) are set out in the Scoping Requirements for Kentbruck Green Power Hub Environment Effects Statement (Scoping Requirements). The Scoping Requirements provide evaluation objectives that describe the desired outcomes to be achieved for each of the matters being addressed in the EES, and the specific requirements for the assessment of effects (referred to as scoping requirements). The draft evaluation objective and scoping requirements that relate to aviation are described below.

3.4.1 Draft Evaluation Objective

The following draft evaluation objective describes the desired land use and socio-economic outcomes to be achieved in relation to aviation safety:

To avoid and minimise adverse effects on land use, social fabric of the community, local infrastructure, aviation safety and to neighbouring landowners during construction, operation and decommissioning of the project.

3.4.2 Scoping requirements

The table below provides the land use and socio-economic scoping requirements that relate to aviation safety.

Category	Scoping Requirement	Response
Key Issues	Potential adverse effects of wind turbines and associated infrastructure from an aviation perspective, including but not limited to impacts on aerial safety, air traffic control equipment, obstruction and turbulence	Section 4, Aviation Impact Statement.
Existing Environment	Identify and describe the nearest aerodromes, air navigation and air traffic management services, transiting air routes, and designated airspace.	Section 4, Aviation Impact Statement.
Likely effects	Identify the potential effects and risks to aviation operations and safety from the project.	Section 5 Qualitative Risk Assessment
Mitigation Measures	Describe proposed mitigation or management measures to reduce potential effects on aviation operations and safety with regard to advice from Civil Aviation Safety Authority and emergency services.	Sections: - 4.7, 5.16, 6.2, 7.3, 8.2 and 10
Performance Objectives	Describe and evaluate proposed measures to manage and monitor residual electromagnetic interference and effects to aviation operations and safety and describe contingency measures for responding to unexpected impacts.	Sections 4.6 and 4.8

The Aviation Impact Statement – Section 4 deals with the key issues relating to aerodrome and airspace use as well as existing conditions. The items relating to air traffic control facilities and electromagnetic interference are dealt with in the analysis of Communications, Navigation and Surveillance (CNS) as required by Airservices Australia.

The Qualitative Risk Assessment – Section 5 deals with likely effects and mitigation measures.

A summary of the investigation of these items is compiled in the Aeronautical Impact Assessment Conclusions – Section 9.

4. AVIATION IMPACT STATEMENT

Airservices Australia requires an Aviation Impact Statement[7], written by an aviation consultant, that addresses Airservices Australia requirements of for assessment of the KGPH potential impact on the items listed in Section 3.1. The AIS is submitted electronically to both Airservices Australia and the Department of Defence for their assessment in relation to civil and military facilities.

4.1 Location

The Kentbruck Green Power Hub (KGPH) is located on the coast between Portland and Nelson, approximately 27km (14.5nm) northwest of Portland.

The proposed wind farm will comprise up to 105 turbines with a tip height of up to 270m Above Ground Level (AGL).

4.2 Obstacles

The 105 turbines will have a tip height of up to 270m AGL. The tallest turbine is #34 at 412m (1351.36ft) AHD. Add the PANS-OPS Minimum Obstacle Clearance (MOC) of 1000ft gives a LSALT of 2351.36ft. Rounded up to the nearest 100ft the LSALT over the KGPH is 2400ft.

A previous turbine layout (June 2020) required an LSALT of 2500ft. The turbines requiring this LSALT, which were on higher ground have been removed.

The current turbine locations and elevations are shown at Appendix A.

4.3 Aerodromes with 30nm of KGPH boundary

There are two Certified Aerodromes within 30nm (56km) of the KGPH boundary as detailed below.

4.3.1 Mount Gambier (YMTG)

YMTG is a Certified Aerodrome located 22.75nm (42.08km) Northwest of KGPH turbine #24. The main runway, RWY 18/36 is 1644m long, sealed, equipped with low intensity runway lighting (LIRL) and a visual approach slope indicator system (PAPI). Runway 06/24 is 846m long, sealed and equipped with LIRL. The third runway 11/29 is 922m sealed but not fitted with lighting. The LIRL and PAPI are Pilot Activated Lighting (PAL). YMTG has two ground based Radio Navigation Aids (NAVAID); a Non Directional Beacon (NDB) and a VHF Omni Range (VOR).

YMTG has five published non-precision Instrument Approach Procedures (IAP). These

[7] AIS requirements are shown at https://www.airservicesaustralia.com/industry-info/airport-development-assessments/

are: -

- NDB RWY 18
- VOR RWY 18
- GNSS Arrival Procedures
- RNP RWY 18 and
- RNP RWY 36.

The KGPH is below the YMTG 25nm Minimum Safe Altitude (MSA) of 2500ft and beyond the 15km Obstacle Limitation Surface (OLS).

The KGPH **does not affect** the OLS or PANS-OPS surfaces for YMTG.

4.3.2 Portland (YPOD)

YPOD is a Certified Aerodrome located 11.36nm (21.04km) Southeast of turbine #37. The main runway, RWY 08/26 is 1616m long, sealed, equipped with low intensity runway lighting (LIRL) and a visual approach slope indicator system (PAPI). The second runway RWY 17/35 is 1180m long, unrated natural surface with the centre 23m gravel. The LIRL and PAPI are Pilot Activated Lighting (PAL).

The KGPH is 21.04km from Portland Aerodrome, therefore **does not affect** the 15km OLS.

YPOD has two published non-precision IAP. These are RNP RWY08 and RNP RWY26. The YPOD RNP RWY08 IAP plate is shown at Figure 4.

The required LSALT over the KGPH is 2400ft. The KGPH is within both the 25nm and 10nm MSA of 2000ft. Both MSA need to be raised to 2400ft.

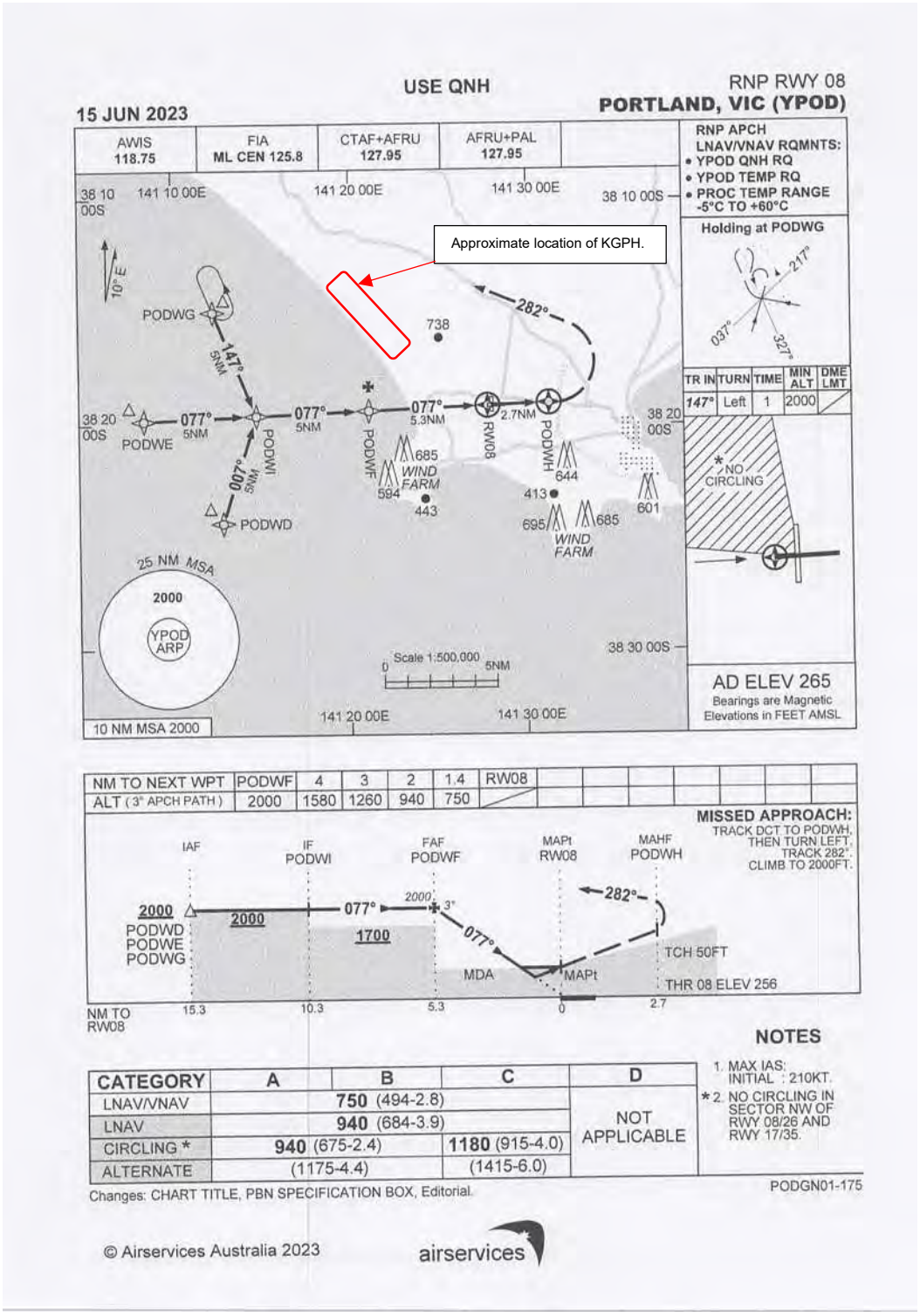


Figure 4 – Portland RWY08 Instrument Approach Procedure plate[8]

[8] AIP DAP, YPOD RNP RWY08 (PODGN01-175), dated 15 June 2023 (current as of 30 November 2023)

The RWY08 IAP has a holding pattern at the initial approach fix (IAF) point PODWG. The holding pattern altitude is 2000ft, has an inbound track of 147^0, and a left turn toward the KGPH. The KGPH will affect this holding pattern. This holding altitude will need to be raised to 2400ft.

The tolerances on the IAF (PODWG) to the intermediate fix (IF) (PODWF) tracks are clear of the KGPH boundary and are not affected. The rest of the RWY08 approach is clear of the KGPH and not affected.

The RWY08 Missed Approach procedure requires a left turn onto an outbound track of 282^0 and climb to 2000ft. This track takes the aircraft back to the holding pattern at PODWG and infringes the KGPH LSALT of 2400ft.

The RWY26 IAP is clear of the KGPH. The RWY26 Missed Approach procedure requires the aircraft to track 257^0 and climb to 2000ft. This track is clear of the KGPH; however, the altitude will need to be raised to 2400ft to meet the amended MSA.

Changing the 25nm and 10nm MSA will require amending both the RWY08 and RWY26 Instrument Approach Procedures to commence at 2400ft at the IAF.

The following amendments to the RNP non-precision approaches at YPOD are required for it to remain clear of the Kentbruck Green Power Hub: -

- Raise the 10nm and 25nm Minimum Safe Altitude to 2400ft
- Raise the holding procedure altitude at PODWG and PODWB to 2400ft
- Amend the missed approach procedures to climb to 2400ft
- Amend both the RWY08 and RWY26 approach paths to commence at 2400ft

Consultation with the Portland Aerodrome operator (Glenelg Shire Council) and the Instrument Approach designer (Airservices Australia) has been undertaken to facilitate these IAP amendments. The required amendments will need to occur prior to construction of the KGPH commencing.

The Glenelg Shire supports the changes to the Instrument Approach Procedures and has advised Airservices Australia of this by letter dated 21 May 2021. (see Appendix F)

4.3.3 Other known aerodromes within 16nm (30km) of KGPH boundary

There is an Uncertified Aerodrome (ALA) at Nelson, 2,21nm (3.54km) west of turbine #24. The runway is 600m grass strip oriented 09/27 (east/west). This ALA is operated by the *Nelson Aeroplane Company* who specialise in restoring and maintaining vintage aircraft. Nelson is not listed in ERSA or DAH, nor does it appear on the relevant World Aeronautical Chart (WAC) or the 1:50,000 topographic map for the area. Given the type of aircraft, i.e. slow, light and vintage, operating from Nelson it is considered that the KGPH does not affect aircraft operations at this ALA.

There is an airstrip at Kentbruck located to the north of the Portland – Nelson Road, at Kentbruck situated 1.54nm (2.85km) north northeast of turbine #18. The runway is 950m unrated dirt, oriented 10/28. This airstrip is not listed in ERSA or DAH and does not appear on the relevant World Aeronautical Chart (WAC) or the 1:50,000 topographic chart for the area. This airstrip is owned by HVP and is used for aerial agricultural work and fire suppression associated with the adjoining forest plantation. The ALA is within the plantation and is surrounded trees, with a 500m clearway at either end. Given the type of aircraft operating from Kentbruck, and the associated obstacles (trees), it is considered that the KGPH does not affect aircraft operations at this ALA.

4.4 Air Routes and Lowest Safe Altitudes

The significant published air routes in the vicinity of the KGPH and their LSALT are shown in Table 2 and Figure 5.

Route	Segment	LSALT	Amended LSALT
Grid		2200	2400
W519	MTG/NOGIP	2200	2400
W584	HML/NOGIP	2900	No change
W584	NOGIP/HML	2500	No change

Table 2 – Published and Amended LSALT over KGPH[9]

The lowest safe altitude required over the KGPH is 2400ft.

The air route W584, at 8nm, is outside the tolerances used for calculating the LSALT for an RNP 2 air route. The KGPH does not affect W584.

The Grid LSALT and the LSALT for W519 is 2200ft. This is below the LSALT required over the KGPH. The KGPH affects both these LSALT.

An application to Airservices Australia will need to be made to raise the Grid LSALT and the W519 LSALT to 2400ft. This change will be required before construction of the KGPH begins.

[9] LSALT from AIP ERC L2, dated 15 June 2023

Figure 5 – Nearby Air Routes[10]

4.5 Airspace

The KGPH is in Class G airspace below Class E airspace with a lower limit of FL125.

There are no Prohibited, Restricted or Danger Areas (PRD) within the vicinity of the KGPH.

There are no published flying training areas in the vicinity of the KGPH.

4.6 Communications, Navigation and Surveillance

Wind turbines by their size and construction may cause interference to air traffic control communications, navigation and surveillance (CNS) facilities. Airservices Australia (AsA) recommends the use of the *EuroControl Guidelines on How to Assess the Potential Impact of Wind Turbines on Surveillance Sensors*[11].

The CASR Part 139 Manual of Standards – Aerodromes, Chapter 11, sets out the general requirements for navigation aid sites and air traffic control (ATC) facilities, including the clearance planes for planned and existing facilities.

[10] AIP ERC L2, dated 15 June 2023

[11] Available at http://www.eurocontrol.int/sites/default/files/publication/files/20140909-impact-wind-turbines-sur-sensors-guid-v1.2.pdf

4.6.1 Communications

There is an Airservices Australia ATC communications facility at Mt William, elevation 1014m AHD and 82nm to the northeast of the KGPH.

At this elevation and distance the KGPH will have no impact on the operations of these facilities.

4.6.2 Navigation

The nearest ground based navigation aids are the NDB and VOR at YMTG. This NDB has a range of 75nm. An NDB is a low frequency (266 kHz) radio transmitter and will not be affected by the KGPH turbines some 22nm distant. The VOR is a VHF (117.0mHz) facility that operates "line of site" and will not be affected by the KGPH.

The KGPH will not affect the operation of either the NDB or VOR at YMTG.

4.6.3 Surveillance

The nearest civil aviation surveillance facility is a Secondary Surveillance Radar (SSR) at Mt Macedon 296km (160nm) Northeast. The Primary Surveillance Radar (PSR) at Gellibrand Hill (Tullamarine airport) is 311km (168nm) Northeast.

The applicable document, as referred to in the Airservices letter, is the Eurocontrol Guidelines *"How to Assess the Potential Impact of Wind Turbines on Surveillance Sensors"* edition 1.2, September 2014 (EUROCONTROL-GUID-130).

This guideline nominates the following four zones (shown below) and the associated level of assessment for PSR installations.

Zone	Zone 1	Zone 2	Zone 3	Zone 4
Description	0 – 500m	500m 0 15km and in radar line of sight	Further than 15km but within maximum instrumented range and in line of sight	Anywhere within maximum instrumented range but not in line of sight or outside the maximum instrumented range
Assessment Requirements	Safeguarding	Detailed assessment	Simple assessment	No assessment

The guideline nominates the following three zones (shown below) for the assessment of SSR.

Zone	Zone 1	Zone 2	Zone 4
Description	0 – 500m	500m – 16km but within maximum instrumented range and in radar line of sight	Further than 16km or not in radar line of sight
Assessment Requirements	Safeguarding	Detailed Assessment	No assessment

Note: There is no Zone 3 for SSR

The Mt Macedon SSR, at 296km (160nm) Northeast is well beyond the 16km distance, therefore no assessment is required.

The Primary Surveillance Radar (PSR) at Gellibrand Hill (Tullamarine airport) is 311km (168nm) Northeast. The antenna height is 228m AHD. The maximum tip height of the KGPH is 412m AHD, however there is high ground of approximately 480m AHD between the PSR site and the KGPH turbines. This will put the KGPH outside the line of site of the Gellibrand Hill PSR, therefore no assessment is required.

The KGPH is beyond the line of site of both the Mt. Macedon and Gellibrand Hill radars and will not affect their operation.

4.7 AIS Conclusions

The AIS concludes that the proposed Kentbruck Green Power Hub will:

- Not affect the Mount Gambier Aerodrome (YMTG) OLS or PANS-OPS surfaces
- Not affect any civil ATC CNS facilities
- Affect the Grid LSALT of 2200ft
- Affect the W519 LSALT of 2200ft
- Affect the Portland Aerodrome (YPOD) 25nm and 10nm MSA of 2000ft
- Affect the holding pattern at PODWG Initial Approach Fix
- Affect the RNP RWY08 Missed Approach Path

The YPOD RNP non-precision approaches require an MSA of 2400ft. The holding pattern minimum altitudes and the RWY 08 Missed Approach altitude require amending to 2400ft. For clarity, it is recommended that both approaches be redesigned to commence at 2400ft from the IAF.

4.8 Airservices Australia Response

The Airservices Australia response is shown at Appendix E.

In summary the KGPH will not affect any CNS facilities. It will require an amendment to the LSALT for air route W519 and the GRID LSALT. This will be negotiated with Airservices Australia. The KGPH will impact on the two RNP Instrument Approach Procedures. Due to the 456m (1497ft) tallest turbine these will need to be redesigned to raise the MSA to 2500ft*. Changes to the IAP have been negotiated with the Glenelg Shire Council as the operator of Portland aerodrome

***Note** this response was to the original KGPH (June 2020) layout.

The current 105 turbine layout tallest turbine is 412m (1352ft) AHD, 147ft shorter, therefore requires a LSALT of 2400ft not 2500ft. Given that the current 105 turbine layout exists within the originally assessed volume of the KGPH and that the current tallest turbine (#34 at a tip height of 1352ft AHD) is 147ft lower, the original assessment stands except the tallest turbine now requires an LSALT of 2400ft.

4.9 Glenelg Shire Response

The Glenelg Shire, as the operator of Portland Aerodrome, have written to Airservices Australia (21 May 2021) supporting the required changes to the YPOD Instrument Approach Procedures and the GRID and W519 LSALT changes.

4.10 Department of Defence Response

The Department of Defence response is shown at Appendix F.

The Department of Defence has no objection to the KGPH. In their response Defence refer to the need to report tall structures to the Airservices Australia Vertical Obstructions Database in accordance with AC 139.E-01 v1.0 *Reporting tall structures.*

5. QUALITATIVE RISK ASSESSMENT

This qualitative risk assessment is conducted using AS.NZS ISO 31000:2018 *Risk Management and Guidelines* as recommended in CASA Advisory Circular AC 139.E-05 v1.0 *Obstacles (including wind farms) outside the vicinity of a CASA Certified Aerodrome*, dated May 2021.

The expression “in the vicinity of the aerodrome” is considered by CASA to mean within the boundary of the OLS of a certified aerodrome.

The NASF Guideline D considers 30km (16.2nm) from a certified aerodrome to be “in the vicinity.”

Within Victoria, the Planning Authority refers to aerodromes within 30km (16.2nm) of a wind farm for consideration.

More generally the impact on any Certified aerodrome within 56km (30nm) of a wind farm is considered. This distance includes the prescribed airspace associated with any published Instrument Approach Procedure at the Certified aerodrome.

5.1 Certified Aerodromes within 30nm of KGPH

As noted in Section 4.4, there are two Certified Aerodromes, Mount Gambier (YMTG) and Portland (YPOD), within 30nm (56km) of the KGPH boundary.

The KGPH does not affect the OLS or PANS-OPS airspace for YMTG.

The KGPH impacts on the following at YPOD:

- 10nm MSA
- 25nm MSA
- Runway 08 RNP Holding Pattern
- Runway 08 RNP Missed Approach

The following recommendations are made for YPOD:

- Both MSA raised to 2400ft
- RNP Approaches to commence at 2400ft at the IAF
- The lowest holding altitude raised to 2400ft

Glenelg Shire Council, as the aerodrome operator, supports the proposed changes to the YPOD RNP instrument approach procedures and has advised Airservices Australia accordingly.

5.2 Identified Uncertified Aerodromes (ALA) within 16nm(30km) of KGPH

There are two identified Uncertified Aerodromes (ALA), Nelson and Kentbruck, within 30km of the KGPH boundary. The KGPH does not affect operations at either of these ALA due to the limitation of aircraft types that can normally use them, the runway orientation, and their distance from the nearest KGPH turbine.

Neither of these airstrips are equipped with lights and cannot have published instrument approach procedures. This limits aircraft operations to VFR by day flight.

The Nelson airstrip is operated by the *Nelson Aeroplane Company* who specialise in restoration and maintenance of vintage light aircraft. Discussions with the owner indicate that these aircraft are slow by modern standards and if they take-off to the east toward the KGPH, must make either a right (toward the coast) or left turn to avoid rising ground. This manoeuvre keeps them clear of the conspicuous wind turbines. Any aircraft operation into Nelson requires prior approval from the owner, who has a duty of care to brief the pilots about the wind farm.

The Kentbruck airstrip is operated by the owners of the forest plantation and is used for aerial applications and aerial firefighting operations. The use of this airstrip requires prior approval and appropriate briefing. Operations at this airstrip will not be impacted as it is sufficiently distant from the KGPH. This ALA is surrounded by plantation trees.

5.3 Airspace

The KGPH is in Class G airspace below Class E airspace with a lower limit of FL125 (12,500ft).

There are **no Prohibited, Restricted or Danger Areas (PRD)** within the vicinity of the KGPH.

There are **no published flying training areas** in the vicinity of the KGPH.

5.3.1 High Voltage Transmission Lines

There are existing high voltage transmission lines from the Heywood terminal station running south to the Portland aluminium smelter and northwest to Lyons and Dartmoor. Consequently, pilots are aware of the existing high voltage lines and fly accordingly.

The current proposed corridor [Heywood option] for the connecting high voltage transmission line is underground and follows the *Boiler Swamp Road* from Mount Richmond to the Heywood Inter-connector terminal station.

This corridor is clear of YPOD and does not pose any additional risk to aviation activity in the area.

Previously proposed transmission line corridors [Portland Option] connected the KGPH to the Portland smelter high voltage transmission line near the Portland Airport. Each

of these proposed corridors is constrained by the OLS and PANS-OPS airspace protecting the aerodrome. The analysis of these proposed corridors is subject to a separate report *Proposed Transmission Line Corridors Portland to Kentbruck Green Power Hub, Advice regarding proximity to Portland Aerodrome, Chiron Aviation Consultants, 29 July 2022.* A copy is attached at Appendix I.

Figure 6 – Transmission line from KGPH to Heywood Interconnector

White lines are existing high voltage transmission lines

5.4 Relevant Air Routes

The significant published air routes in the vicinity of the KGPH and their LSALT are shown in Table 2.

Route	Segment	LSALT	Amended LSALT
Grid		2200	2400
W519	MTG/NOGIP	2200	2400
W584	HML/NOGIP	2900	No change
W584	NOGIP/HML	2500	No change

Table 3 – Published and Amended LSALT over KGPH[12]

The lowest safe altitude required over the KGPH is 2400ft.

The air route W584, at 8nm, is outside the tolerances used for calculating the LSALT for

[12] LSALT from AIP ERC L2, dated 16 June 2022

an RNP 2 air route. The KGPH does not affect W584.

The Grid LSALT and the LSALT for W519 is 2200ft. This is below the LSALT required over the KGPH. The KGPH affects both these LSALT.

An application to Airservices Australia will need to be made to raise the Grid LSALT and the W519 LSALT to 2400ft. This change will be required before construction of the KGPH begins.

5.5 Night Flying

Aircraft flying at night under either IFR or VFR are protected by published or calculated LSALT. Descent below the LSALT for a VFR at Night flight is restricted to within 3nm (5.4km) of the aerodrome and with it in sight. Where an IFR aircraft is using a published instrument approach it is protected by PANS-OPS surfaces.

The aerodromes at YMTG and YPOD are equipped with Pilot Activated Lighting (PAL) and non-precision RNP Instrument Approach Procedures and therefore are available for night operations by IFR aircraft flights.

Night operations into YMTG and YPOD are not affected by the KGPH.

5.6 General Aviation Flying Training

There is no formal flying training school at Portland. There is an active aeroclub at Portland with approximately 15 light aircraft based at the airport. The aeroclub conducts normal club activities such as “fly-ins” and club flying days. They have an informal training area located north of the aerodrome in the Gorae West area. This area is clear of the KGPH and operations there will not be impacted.

5.7 Recreational and Sport Aviation

Recreational and sport aircraft are generally classified as ultra-light aircraft. These aircraft are limited to a Maximum Take-Off Weight (MTOW) of 600kg and VFR flight by day only.

As explained in section 5.2, aircraft operations into Nelson and Kentbruck airstrips will be by day and in accordance with Visual Flight Rules.

The Nelson airstrip is operated by the *Nelson Aeroplane Company* who specialise in restoration and maintenance of vintage light aircraft. Discussions with the owner indicate that these aircraft are slow by modern standards and if they take-off to the east toward the KGPH, must make either a right (toward the coast) or left turn to avoid rising ground. This manoeuvre keeps them clear of the conspicuous wind turbines. Any aircraft operation into Nelson requires prior approval from the owner, who has a duty of care to brief the pilots about the wind farm. The airstrip hosts “fly-in” gatherings for

vintage and ultra-light aircraft from time to time.

5.8 Approved Low Flying Activities

There are no published flying training areas in the vicinity of the KGPH.

5.9 Aerial Applications Activity

The airstrip within the plantation used for aerial applications aircraft is clear of the KGPH.

Aerial applications are used within the plantation areas for seeding, fertilizing and pest control. The wind farm is within the GTFP plantation area. Turbines are conspicuous obstacles that are avoided in the same way that aerial applications pilots avoid other obstacles such as power lines and trees. In the low speed wind conditions suitable for aerial applications the turbines are at or below the cut-in speed and are either stationary or turning slowly. Therefore the risk to aerial applications flying from downwind turbulence is not greater than when the turbines were not present.

5.10 Known Highly Trafficked Areas

There are no highly trafficked areas within the environs of the KGPH. The VFR coastal route from Mount Gambier to Portland is not affected by the KGPH.

5.11 Emergency Services Flying

All Emergency Services flying is subject to ongoing dynamic risk assessment throughout the flight. The safety of the aircraft and its crew is paramount.

5.11.1 Police Air Wing

The Police Air Wing helicopters are capable of IFR flight and flown by suitably IFR rated pilots who are also qualified for low level flight, for example, search and rescue operations. For low level night operations, the aircraft are equipped with Night Vision Imaging Systems (NVIS) enabling the pilot “to see” in reduced light conditions. For the final descent and landing the searchlight is used to illuminate the landing area.

From previous work done by the author for other wind farms in Victoria the Police Air Wing utilise dynamic risk assessment for all operations and the pilot in command has the final say as to whether the operation is aborted because of the risk to the aircraft and crew.

5.11.2 Helicopter Emergency Medical Services

The Helicopter Emergency Medical Service (HEMS) utilise helicopters capable of IFR flight. For low level night operations, the aircraft are equipped with Night Vision Imaging

Systems (NVIS) enabling the pilot "to see" in reduced light conditions. For the final descent and landing the searchlight is used to illuminate the landing area. All HEMS operations are subject to a dynamic risk assessment and the pilot in command has the final say as to whether the operation is aborted due to the risk to the aircraft and crew.

The Senior Base Pilot made the comment that *"There are lots of them (wind farms) around and we are conscious of their locations. The presence of a wind farm will not stop our operations, we know they are there and fly accordingly."*[13] The presence of tall obstacles influences the cruising level of the helicopters in known aircraft icing conditions due to the capabilities of the aircraft anti-icing equipment.

5.11.3 Fixed Wing Air Ambulance

Fixed wing Air Ambulance operations in Victoria are undertaken in twin engine turbo-prop aircraft in accordance with IFR. The aircraft are usually Beechcraft Super Kingair (BE200) which have a MTOW of 5700kg and use suitable aerodromes. The primary use of these aircraft is for patient transfer from regional to major city hospitals. The KGPH will not affect fixed wing Air Ambulance operations due to the nature of the operations and the aircraft size.

The Senior Base Pilot made the comment that *"The wind farm does not need lights. In solid IMC (Instrument Meteorological Conditions) you can't see them (the lights)."*[14]

Fixed wing Air Ambulance operations in South Australia are undertaken in Pilatus PC12NG single engine turbo-prop aircraft in accordance with IFR. The PC12NG has a MTOW of 4740kg. The KGPH will not affect fixed wing Air Ambulance operations due to the nature of the operations and the aircraft size.

5.12 Fire Fighting

Firefighting is a multi-faceted operation utilising multiple resources and equipment appropriate to the circumstances. A fire ground is a dynamic place where resources are continually being reassigned to have the best effect.

Aerial firefighting is just one of the available resources and its use may or may not be appropriate to the current fire ground situation. There will be times when aerial firefighting is not possible due to turbulence, smoke, strong winds or erratic fire behaviour. High atmospheric temperatures affect the performance of aircraft and reduce the load carrying capacity. Low relative humidity reduces the effectiveness of firebombing due to the rapid evaporation of the water as it is dropped. Intense fires create their own severe weather conditions with pyrocumulonimbus and severe turbulence[15]. Such conditions are dangerous for both large and small aircraft[16] and preclude the use of aerial firefighting.

[13] Stakeholder interview Senior Base Pilot, HEMS Victoria.
[14] Stakeholder interview, Senior Base Pilot, Pelair, Fixed Wing Air Ambulance.
[15] Flight Safety Australia, *Beware of Bushfire Clouds*, 9 January 2020
[16] Flight Safety Australia, *Turbulence on day of tanker crash,* 25 September 2020

5.12.1 Aerial Firefighting

At all times, the pilot in command has the ultimate responsibility for the safety of the aircraft.[17]

Aerial firefighting flying is conducted at low level using specialist aircraft flown by appropriately rated pilots in accordance with the Visual Flight Rules. The pilot is required to maintain forward visibility with the ground, therefore they will remain clear of smoke so that they can accurately and safely drop the fire retardant.

"It is important to remember that aircraft alone do not extinguish fires."[18]

From previous work undertaken by the author regarding firefighting within wind farms it is noted that the rural firefighting agencies in Victoria, New South Wales, South Australia and Western Australia all view wind turbines and wind farms to be 'just another hazard' that has to be considered in the risk management process associated with aerial firefighting.

The photograph above shows an AT802 dropping retardant next to a power line.

At present only organisations operating suitably equipped helicopters are authorised by CASA to conduct aerial firefighting at night. These helicopter operators utilise specific helicopters equipped for night flight using night vision imaging systems (NVIS) that are flown as a two-pilot operation where both are appropriately rated. Night aerial firefighting is not currently undertaken by fixed wing aircraft, other than the very large aerial tankers (VLAT) operated by NSW RFS.

5.13 Topographical and Marginal Weather Conditions

The topography of the area of the KGPH is coastal sand ridges and gently sloping coastal hinterland rising from sea level to 100m AHD[19].

As such the area is subject to areas of low cloud. It is an area known for periods of forecast marginal and/or non VMC. Pilots flying VFR are aware of this and plan their flight accordingly.

VMC are the weather conditions required for VFR flight at or below either 3000ft AMSL or 1000ft AGL, namely: -

- Clear of cloud;

[17] This is part of the Civil Aviation Safety Regulations 1998 and a point reiterated in an interview by the author with a Victorian Forest Fire Management Fire Ground Manager, 6 August 2019.
[18] NSW Rural Fire Service submission to the Senate Select Committee on Wind Turbines, 6 March 2015, page 2
[19] World Aeronautical Chart (WAC) 3469 HAMILTON, 21st edition hypsometric tints.

- In sight of the ground or water; and
- With a forward visibility of 5000m[20].

The rules governing VFR flight require that pilots remain clear of cloud and not get into such situations by turning away from the low cloud and terminating the flight at the nearest suitable aerodrome.

Otherwise, CASR 91.267 states (in part) that an aircraft operating under VFR must not fly lower than 152m/500ft over a non-populated area being terrain or obstacles on that terrain and within, for an aircraft other than a helicopter, 600m horizontally and, in the case of a helicopter, 300m horizontally to the same, unless:

- Due stress of weather or any other unavoidable cause it is essential that a lower height be maintained; or
- It is engaged in approved low flying private or aerial work; or
- It is engaged in flying training and flies over part of a flying training area in respect of which low flying is authorised by CASA under sub regulation 141(1); or
- It is undertaking a baulked approach; or
- It is flying in the course of actually taking-off or landing at an aerodrome.

Regarding the first bullet point above it is possible that due to lowering cloud base, and if through poor airmanship the aircraft had pressed on to the point that it was unable to execute a turn and fly away from the weather, an aircraft could find itself lower than 152m/500ft above the terrain or obstacles. The operative word is unavoidable. Flying into marginal or non VMC weather is entirely avoidable. It should be noted that a non-instrument rated pilot flying in cloud almost always has a fatal outcome.[21]

Aircraft operating under Instrument Flight Rules (IFR) can operate in poor weather conditions and in cloud which precludes visual acquisition of obstacles and terrain. These operations are protected by PANS OPS surfaces and LSALT's that are designed to keep the aircraft clear of obstacles and terrain.

5.14 NASF Guidelines

The National Airports Safeguarding Framework – Guideline D *Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms)/Wind Monitoring Towers* provides guidance for the siting and marking of the turbines and meteorological monitoring towers associated with wind farms.

5.14.1 Notification to Authorities

Paragraph 20 of Guideline D advises that:

When wind turbines over 150m above ground level are to be built

[20] AIP ENROUTE, page ENR 1.2 – 1 date 15 June 2023.

[21] Accidents involving Visual Flight Rules pilots in Instrument Meteorological Conditions, Australian Transport Safety Bureau, 22 August 2019, available at http://www.atsb.gov.au/publications/2019/avoidable-accidents-4-vfr-into-imc/

> *within 30km (16.2nm) of a certified or registered aerodrome, the proponent should notify the Civil Aviation Safety Authority and Airservices. If the wind farm is within 30km of a military aerodrome, Defence should be notified.*

The turbines are greater than 150m and are within 30nm of a certified aerodrome. Airservices Australia has been notified (see Section 4) and through them CASA is aware of the KGPH.

The turbines and meteorological monitoring towers used in the KGPH must be reported to Airservices Australia in accordance with AC 139.E-01 v1.0 *Reporting of Tall Structures* to ensure their position is marked on aeronautical charts. The existing meteorological monitoring towers have been reported to Airservices Australia.

5.14.2 Risk Assessment

The NASF Guideline has the following requirements for a risk assessment.

> *26. Following preliminary assessment by an aviation consultant of potential issues, proponents should expect to commission a formal assessment of any risks to aviation safety posed by the proposed development. This assessment should address any issues identified during stakeholder consultation.*

The risk assessment for the KGPH indicates that the overall risk to aviation is LOW. A risk assessment of LOW indicates that the wind farm is *'not a hazard to aircraft safety.'*

> *27. The risk assessment should address the merits of installing obstacle marking or lighting. The risk assessment should determine whether or not a proposed structure will be a hazardous object. CASA may determine, and subsequently advise a proponent and relevant planning authorities that the structures have been determined as:*
>
> *(a) Hazardous but that the risks to aircraft safety would be reduced by the provision of approved lighting and/or marking; or*
>
> *(b) Hazardous and should not be built, either in the location and/or to the height proposed as an unacceptable risk to aircraft safety will be created; or*
>
> *(c) Not a hazard to aircraft safety.*

By day, the KGPH turbines are conspicuous by their size and colour. After appropriate amendments are made, the KGPH will not impact on any LSALT in the area. Night operations for aircraft do not occur below the LSALT for IFR and VFR at night. IFR aircraft are protected by the LSALT and PANS-OPS prescribed airspace at each certified aerodrome. Where an approach to land is undertaken operating to VFR at night, descent below the LSALT does not occur until within 3nm of the airport and with

it in sight. The nearest aerodrome equipped for night operations is Portland 11.36nm (21.04km) to the southeast of the KGPH.

Given the above, the KGPH does not require obstacle lighting as the risk to aviation is LOW and no additional mitigating strategies are required.

Overall, the risk assessment demonstrates that the KGPH is a low risk to aviation and is therefore *not a hazard to aircraft safety.*

> *28 If CASA advice is that the proposal is hazardous and should not be built, planning authorities should not approve the proposal. If a wind turbine will penetrate a PANS-OPS surface, CASA will object to the proposal. Planning decision makers should not approve a wind turbine to which CASA has objected.*

The KGPH will not penetrate any OLS or PANS-OPS (after amendment) surfaces either civil or military, therefore CASA has no reason to determine that it is hazardous.

> *29 In the case of military aerodromes, Defence will conduct a similar assessment to the process described above if required. Airservices, or in the case of a military aerodrome, Defence, may object to a proposal if it will adversely impact on Communications, Navigation or Surveillance (CNS) infrastructure. Airservices/ Defence will provide detailed advice to proponents on request regarding the requirements that a risk assessment process must meet from the CNS perspective.*

There is no civil or known military CNS infrastructure that will be impacted by the KGPH.

> *30 During the day, large wind turbines are sufficiently conspicuous due to their shape and size, provided the colour of the turbine is of a contrasting colour to the background. 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. Other colours are also acceptable unless the colour of the turbine is likely to blend in with the background.*

The KGPH turbines will be appropriately painted to ensure they are conspicuous by day.

5.14.3 Lighting Wind Turbines

> *33 Where a wind turbine 150m or taller in height is proposed away from aerodromes, the proponent should conduct an aeronautical risk assessment.*
>
> *34. The risk assessment, to be conducted by a suitably qualified person(s), should examine the effect of the proposed wind turbines on the operation of aircraft. The study must be submitted to CASA to enable an assessment of any potential risk to aviation safety. CASA may determine that the proposal is:*

(a) hazardous, but that the risks to aircraft safety would be reduced by the provision of approved lighting and/or marking; or

(b) not a hazard to aircraft safety.

The KGPH is not sited within the OLS of any certified aerodrome and does not penetrate any PANS-OPS airspace, once the YPOD RNP non-precision approaches are amended, and is assessed as a low risk to aviation and is therefore *not a hazard to aircraft safety.*

5.15 CASA Advisory Circular AC 139.E-05 v1.0 May 2021

CASA have issued Advisory Circular AC 139.E-05 v1.0 *Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome*, dated May 2021.

This Advisory Circular, at the opening section states:

2.1.1 CASA provides advice about lighting of wind farms and other tall structures in submissions to planning authorities who are considering a wind farm or tall structure.

2.1.2 Regardless of CASA advice, planning authorities make the final determination whether a wind farm or a tall structure not in the vicinity of a CASA regulated aerodrome will require lighting or marking.

This AC provides advisory information regarding the process for ascertaining if a wind farm is a hazard to aircraft safety. It provides information to proponents and planning authorities about who is responsible for deciding if a wind farm requires aviation obstacle lighting.

This AC, in the author's opinion, reinforces that aviation obstacle lighting is not required on the KGPH.

5.16 QRA Findings

The table below summarises the findings of Section 5 (QRA) of the report.

As discussed in the sections above the QRA finds that the assessed risk to aviation activity in the vicinity of the KGPH is low once the required amendments to the Portland (YPOD) RNP Instrument Approaches and the Lowest Safe Altitudes of the overlying air routes are made.

The KGPH is assessed as a low risk to aviation and is therefore *not a hazard to aircraft safety.*

Risk Element	Assessed Risk Level	Comment
Airport Operations	LOW	YPOD RNP approaches to be amended
ALA Operations	LOW	Suitability for use is a pilot responsibility.
Nelson	LOW	
Kentbruck	LOW	
Known Highly Trafficked Routes	LOW	None identified
Published Air Routes	LOW	LSALT to be amended
PRD Airspace	LOW	Nil exist in the area
Promulgated Flying Training Areas	LOW	Nil exist in the area
GA Flying	LOW	
Night Flying	LOW	
Emergency Services Flying	LOW	
Commercial Flying	LOW	
Recreational and Sport Aviation	LOW	
Recreational Pilot Training (RA-AUS)	LOW	None at YPOD
GA Pilot Training	LOW	None at YPOD
Weather and Topographical Issues	LOW	

Table 4 – Risk Assessment Summary

6. OBSTACLE LIGHTING REVIEW

6.1 Australian Regulatory Framework for Obstacle Lighting Wind Farms

The Civil Aviation Safety Authority (CASA) has limited regulatory authority to require the lighting of obstacles (tall structures) away from an aerodrome. This is particularly applicable to wind farms, which are generally beyond the Obstacle Limitation Surface (OLS) of certified or registered aerodromes. It must be noted that Civil Aviation Safety Regulations (CASR) Part 139 – Aerodromes are applicable to certified and registered aerodromes only [Military and Joint User apply the same general form].

CASA can only make recommendations regarding the lighting of wind farms, and not determinations/directions mandating lighting of wind farms that are not in the vicinity [beyond the OLS] of a certified aerodrome. It is noted that in the Senate Select Committee on Wind Turbines (2015) CASA provided evidence to the Committee about the limited role it plays in regulating airspace around wind farms.

> *We know our responsibilities and the power of our legislation, which is very limited. For the most part, wind turbines are built away from aerodromes and certainly away from federally leased aerodromes. So, the only power we have is to make a recommendation to the planning authority about whether the turbine is going to be an obstacle and, if we decide it is an obstacle, we can make a recommendation as to whether it should be lighted and marked. This is the extent of our power.*[22]

In my experience, CASA has emphasised the view that "*it is a matter for the appropriate Land Use Planning Authority to consider the implementation of our recommendations"* regarding aviation obstacle lighting of wind farms[23]. This view is, in my opinion, reinforced by Advisory Circular AC139.E-05 v1.0.

6.1.1 Civil Aviation Safety Regulations

The Civil Aviation Safety Regulations (CASR) Part 139 – Aerodromes, Section E contains the regulations governing obstacles. These regulations are applicable to the protection of airspace and aircraft operations in the vicinity of certified aerodromes. They are not applicable to obstacles that are beyond the vicinity of aerodromes; that is, beyond the OLS. This is outlined in AC 139.E-05 v1.0 for obstacle beyond the OLS of a certified aerodrome.

CASR Part 175 – Aeronautical Information Management requires that tall structures greater than 100m above ground level be reported to Airservices Australia Vertical Objects Database in accordance with Advisory Circular AC 139.E-01 v1.0. This has and will occur for the KGPH.

[22] Senate Select Committee on Wind Turbines, Final Report, August 2015, paragraph 5.38

[23] The author has conducted Aeronautical Impact Assessments for more than 25 wind farms Australia wide and over the last decade has had extensive consultation and discussion with CASA.

6.1.2 *Manual of Standards Part 139 – Aerodromes*

The Manual of Standards (MOS) Part 139 provides amplification and methods of compliance to the CASR Part 139 Aerodromes. As the KGPH is beyond the vicinity of any military, certified or registered aerodrome MOS 139 does not apply.

6.1.3 *National Airports Safeguarding Framework*

The Australian National Airports Safeguarding Advisory Group (NASAG) produced a set of guidelines called the National Airports Safeguarding Framework (NASF) in 2012.

The purpose of the National Airports Safeguarding Framework (the Safeguarding Framework) is to enhance the current and future safety, viability and growth of aviation operations at Australian airports, by supporting and enabling:

- 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; and
- the publication and dissemination of information on best practice in land use and related planning that supports the safe and efficient operation of airports.

Guideline D *Managing the Risk to Aviation Safety of Wind Turbine Installations [Wind Farms] / Wind Monitoring Towers* provides information regarding wind farms. This guideline provides the following information: -

> *20 When wind turbines over 150m above ground level are to be built within 30km (16.2nm) of a certified or registered aerodrome, the proponent should notify the Civil Aviation Safety Authority and Airservices. If the wind farm is within 30km of a military aerodrome, Defence should be notified.*
>
> *33 Where a wind turbine 150m or taller in height is proposed away from aerodromes, the proponent should conduct an aeronautical risk assessment.*
>
> *34. The risk assessment, to be conducted by a suitably qualified person(s), should examine the effect of the proposed wind turbines on the operation of aircraft. The study must be submitted to CASA to enable an assessment of any potential risk to aviation safety. CASA may determine that the proposal is:*
>
> > *(a) hazardous, but that the risks to aircraft safety would be reduced by the provision of approved lighting and/or marking; or*

(b) not a hazard to aircraft safety.

The KGPH is not sited within the OLS of any certified aerodrome and will not penetrate any PANS-OPS (after amendment) airspace; and is assessed as a low risk to aviation and is therefore *not a hazard to aircraft safety.*

Given the above, the KGPH does not require obstacle lighting as the risk to aviation is low and no additional mitigating strategies are required. As noted in Section 5, several IFR rated pilots have made the statement that obstacle lighting cannot be seen in solid Instrument Meteorological Conditions, therefore it is not required.

6.2 Obstacle Lighting Summary

The risk assessment, sections 5.14 and 5.15, demonstrates that the KGPH does not require aviation obstacle lighting.

By day, the KGPH turbines are conspicuous by their size and colour. After appropriate amendments are made, the KGPH will not impact on any LSALT in the area. Night operations for aircraft do not occur below the LSALT for IFR and VFR at night. IFR aircraft are protected by the LSALT and PANS-OPS prescribed airspace at each certified aerodrome. Where an approach to land is undertaken operating to VFR at night, descent below the LSALT does not occur until within 3nm of the airport and with it in sight. The nearest aerodrome equipped for night operations is Portland 11.36nm (21.04km) to the southeast of the KGPH.

Given the above, the KGPH does not require obstacle lighting as the risk to aviation is LOW and no additional mitigating strategies are required.

7. WIND MONITORING TOWERS

Meteorological Monitoring Masts are very difficult to see due to their slender construction and thin guy wires. The masts are often a grey (galvanised steel) colour that readily blends with the background.

The photograph in Fig 7 shows a Meteorological Monitoring Mast as seen from the ground.

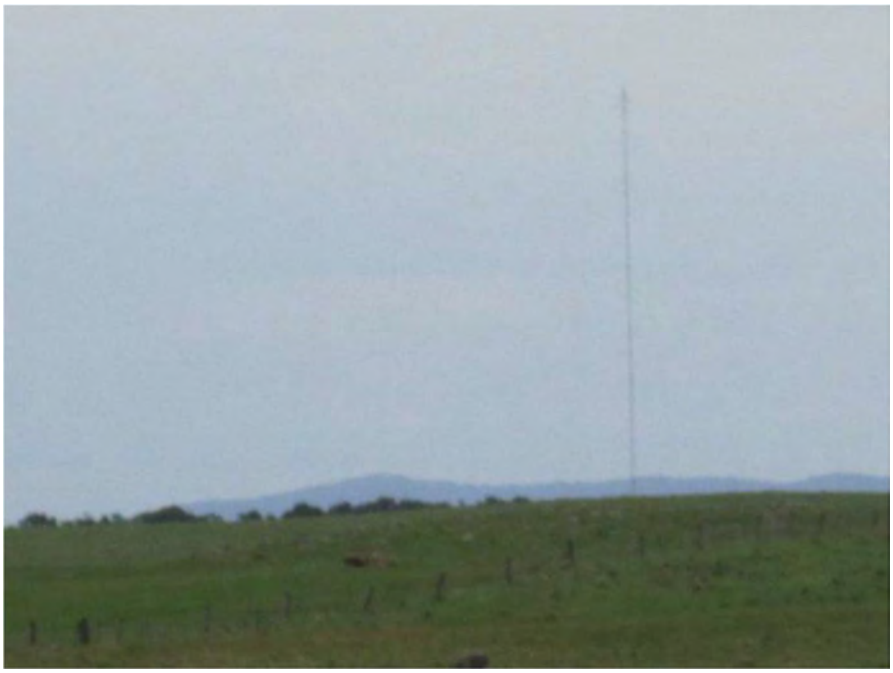


Figure 7 – A Meteorological Monitoring Mast photographed from the ground

The aerial applications operators and the emergency services pilots all note the danger of meteorological monitoring masts to low flying aircraft. All these pilots made comment that "met masts are extremely dangerous." Each of these stakeholders requested that the NASF Guidelines, except for the strobe light, be used to make the masts more visible and that the markings be maintained in a serviceable condition.

The aerial applications pilots all requested that the outer guy wires be fitted with marker balls approximately 6m AGTL and the ground anchor points be painted a contrasting colour to enhance their visibility. When low flying, particularly when spraying, the pilot is looking at the ground as their reference point. The contrasting ground anchor point is the most valuable visual cue in this situation.

It is generally considered by aerial applications pilots that a flashing strobe light is ineffective and as such should not be used.

All the markings used to make the masts more visible must be maintained in a serviceable condition. This is particularly important for balls, flaps and sleeves that deteriorate due to wind and sun damage.

7.1 NASF Guidelines – Marking of Meteorological Monitoring Masts

The NASF guideline also refers to the marking and lighting of wind monitoring towers. The relevant points are summarised as:

> *Wind monitoring towers are very difficult to see from the air due to their slender construction and guy wires. This is a particular problem for low flying aircraft, particularly aerial agricultural and*

emergency services operations.

Measures to be considered to improve visibility include:

- *The top one third of wind monitoring towers be painted in alternating contrasting bands of colour. Examples can be found in the CASA MOS 139 sections 8 and 9;*
- *Marker balls, high visibility flags or high visibility sleeves placed on the outer guy wires;*
- *Ensuring the guy wire ground attachment points have contrasting colours to the surrounding ground and vegetation; or*
- *A flashing strobe light during daylight hours*

7.2 Reporting of Tall Structures

The turbines proposed for the KGPH have a tip height of 270m (886ft) AGL; therefore, they must be reported as per CASR 175.480.

CASR Part 175E requires that obstacles having a height of 100m AGL (turbines and meteorological monitoring masts) be reported as tall structures for inclusion in the vertical obstacle database and on appropriate aeronautical charts.

The procedure for reporting tall structures is contained in Advisory Circular AC 139.E-01 v1.0 *Reporting of Tall Structures*[24].

Meteorological Monitoring Masts for the KGPH must also be reported as per AC 139.E-01 v1.0 and to the Aerial Application Association of Australia (admin@aaaa.org.au).

Consideration should be given to ensuring a NOTAM or Aeronautical Information Circular (AIC) that provides the height and location of the structure is issued. This is due to the current lead time between reporting tall structures and the information appearing on aeronautical charts.

7.3 Recommendation

It is recommended that the KGPH proponent ensures the wind monitoring towers used in the KGPH are:

- Appropriately marked as per guidelines above except for strobe light;
- Fitted with marker balls on the outer guy wires approximately 6m AGL;
- Reported as tall structures in accordance with AC139.E-01;

[24] Advisory Circular AC 139-.E-01 v1.0 dated December 2021

- Notified to the Aerial Agricultural Association of Australia;
- Subject to a NOTAM specifying their location and height.

8. TRANSMISSION LINE ROUTE

Several options for the route of the high voltage transmission line to connect the KGPH into the electricity grid have been considered. The iterative design process used by Neoen has reduced the options to two. These are assessed from an aviation perspective.

8.1 Option 1A - Heywood – partial underground

This proposed route option runs from the KGPH terminal station, underground through the Cobboboonee National Park to the Surrey River and then above ground to the Heywood Terminal Station. The Heywood Terminal Station is 11.3nm (21km) northeast of Portland aerodrome (YPOD). The KGPH terminal station is 9.75nm (18km) northwest of YPOD.

The underground section of this option will have no impact on aviation activity.

An above ground section from the Surrey River to the Heywood Terminal Station, is beyond the YPOD OLS and below the 25nm MSA for the instrument approach procedures, therefore, it is sufficiently distant from YPOD to have no impact on aerodrome operations.

There are two existing high voltage transmission lines emanating from the Heywood Terminal Station that the pilot in command of an aircraft conducting authorised low flying will be aware of and conduct their flight accordingly.

8.2 Option 1B – Heywood - total underground

This proposed route option runs from the KGPH terminal station, underground through the Cobboboonee National Park to the Heywood Terminal Station. The Heywood Terminal Station is 11.3nm (21km) northeast of Portland aerodrome (YPOD). The KGPH terminal station is 9.75nm (18km) northwest of YPOD.

This option will have no impact on aviation.

8.3 Other options considered

Several options to run the transmission line from the KGPH terminal station, southeast to connect to the existing Heywood - Portland 500kV transmission line were considered. These options had several possible route options, all near YPOD.

Chiron Aviation Consultants has conducted an aviation impact assessment and provided advice to Neoen for the various Portland connection transmission line routes in a separate report *Proposed Transmission Line Corridors, Portland to Kentbruck Green Power Hub, Advice regarding proximity to Portland Aerodrome*, dated 29 July 2022.

This study concluded that all the above ground routes to Portland infringe on prescribed airspace protecting YPOD. The OLS Inner Horizontal Surface and the PANS-OPS surfaces for the runway 26 instrument approach impose height restrictions on the towers.

8.4 Recommendation

From an aviation impact perspective, either of the Heywood options is the preferred route because it is sufficiently distant from YPOD for there to be no impact on operations at the aerodrome.

9. REGULATORY FRAMEWORK – AVIATION AND WIND FARMS

The purpose of this section is to consolidate the various regulations and planning guidelines addressed in the AIA.

9.1 Civil Aviation Safety Regulations (CASR)

CASR Part 139 – Aerodromes, is the relevant part dealing with the protection of certified and registered aerodromes.

Part 139 is applicable “within the vicinity,” [considered to be within the Obstacle Limitation Surface (OLS)], of Certified aerodromes.

The Kentbruck Green Power Hub is beyond any Obstacle Limitation Surfaces. (See Sections 4 and 5).

CASR Part 175 – Aeronautical information management, covers the reporting requirements for aeronautical information, including objects and structures that affect aviation safety. CASR Part 175 requires the reporting of structures with a height of 100m or more above ground level (AGL) to Airservices Australia for inclusion in the vertical obstacle database (VOD). The RAAF has access to the VOD.

The Kentbruck Green Power Hub will comply with Part 175 by reporting all tall structures in accordance with Advisory Circular AC 139.E-01 v1.0. An erected wind monitoring mast has been reported and its location is published by NOTAM and on the appropriate aeronautical charts. (See Section 7)

For Certified aerodromes with published Instrument Approach Procedures (IAP) there is ICAO Annexe 14 PANS-OPS prescribed airspace protecting the procedures from obstacle penetration. (See Section 4)

The Kentbruck Green Power Hub will impact on the PANS-OPS airspace associated with Portland airport. The Portland Airport Operator, Glenelg Shire, supports the required changes to the relevant parts of the IAP and has written to Airservices Australia (the procedure designer) advising them of their support.

9.1.1 CASA Advisory Circular AC139.E-05 v1.0

CASA have issued Advisory Circular AC 139.E-05 v1.0 *Obstacle (including wind farms) outside the vicinity of a CASA certified aerodrome*, dated May 2021.

This Advisory Circular, at the opening section states:

> *2.1.1 CASA provides advice about lighting of wind farms and other tall structures in submissions to planning authorities who are considering a wind farm or tall structure.*
>
> *2.1.2 Regardless of CASA advice, planning authorities make the final determination whether a wind farm or a tall structure not in the vicinity of a CASA regulated aerodrome will require lighting or marking.*

This AC provides advisory information regarding the process for ascertaining if a wind farm is a hazard to aircraft safety. It provides information to proponents and planning authorities about who is responsible for deciding if a wind farm requires aviation obstacle lighting.

9.2 National Airports Safeguarding Framework (NASF)

The Australian National Airports Safeguarding Advisory Group (NASAG) produced a set of guidelines called the National Airports Safeguarding Framework (NASF) in 2012.

The purpose of the National Airports Safeguarding Framework (the Safeguarding Framework) is to enhance the current and future safety, viability, and growth of aviation operations at Australian airports, by supporting and enabling:

- 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 and
- the publication and dissemination of information on best practice in land use and related planning that supports the safe and efficient operation of airports.

Guideline D *Managing the Risk to Aviation Safety of Wind Turbine Installations [Wind*

Farms] / Wind Monitoring Towers[25] provides information regarding wind farms. This guideline provides the following information: -

> *20 When wind turbines over 150m above ground level are to be built within 30km (16.2nm) of a certified or registered aerodrome, the proponent should notify the Civil Aviation Safety Authority and Airservices. If the wind farm is within 30km of a military aerodrome, Defence should be notified.*
>
> *33 Where a wind turbine 150m or taller in height is proposed away from aerodromes, the proponent should conduct an aeronautical risk assessment.*
>
> *34. The risk assessment, to be conducted by a suitably qualified person(s), should examine the effect of the proposed wind turbines on the operation of aircraft. The study must be submitted to CASA to enable an assessment of any potential risk to aviation safety. CASA may determine that the proposal is:*
>
> > *(a) hazardous, but that the risks to aircraft safety would be reduced by the provision of approved lighting and/or marking; or*
> >
> > *(b) not a hazard to aircraft safety.*

The risk assessment for the Kentbruck Green Power Hub demonstrates it to be a LOW risk to aviation and is therefore not a hazard to aircraft safety. (See Sections 5 and 6).

The *Aviation Impact Statement* (See Section 4) has been submitted and assessed by Airservices Australia and the Department of Defence. CASA has received a copy accompanied by Airservices assessment.

9.3 Victorian Planning – Wind Energy Facilities

9.3.1 Victorian Planning Provisions

The Victorian Planning Provisions (VPP)[26], at clause 52.32 *Wind Energy Facilities*, states in clause 52.32-6 *Decision Guidelines*, that:

> *Before deciding on an application, in addition to the decision guidelines of Clause 65, the responsible authority must consider, as appropriate:*
>
> - *The Municipal Planning Strategy and the Planning Policy Framework*

[25] Available at https://www.infrastructure.gov.au/aviation/environmental/airport_safeguarding/nasf/nasf_principles_guidelines.aspx
[26] Available at https://planning-schemes.delwp.vic.gov.au/schemes/vppsat

- *The effect of the proposal on the surrounding area in terms of noise, blade glint, shadow flicker and electromagnetic interference*
- *The impact of the development on significant views, including visual corridors and sightlines*
- *The impact of the facility on the natural environment and natural systems*
- *The impact of the facility on cultural heritage*
- *The impact of the facility on aircraft safety*
- *Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria (Department of Environment, Land, Water and Planning, March 2019)*
- *The New Zealand Standard NZS6808:2010, Acoustics – Wind Farm Noise,*

This report, *Kentbruck Green Power Hub Aeronautical Impact Assessment*, assesses the impact of the facility on aircraft safety and demonstrates that it poses a LOW risk to aviation and is therefore not a hazard to aircraft safety.

9.3.2 Victorian Policy and Planning Guidelines

The Victorian Policy and Planning Guidelines for Wind Energy Facilities are in the document *Development of Wind Energy Facilities in Victoria – Policy Planning and Guidelines, November 2021*[27].

Section 4 of the policy guidelines *Planning permit applications – information for applicants* provides information at Section 4.3.5 regarding aircraft safety issues. The advice is that:

> *Applicants should consult with the Civil Aviation Safety Authority (CASA) for wind energy proposals that:*
>
> - *Are within 30km of a declared aerodrome or airfield*
> - *Infringe the Obstacle Limitation Surface (OLS) around a declared aerodrome*
> - *Include a building or structure the top of which will be 110 metres or more above natural ground level (height of a wind turbine is that reached by the tip of the turbine blade when vertical above ground level).*

[27] Available at https://www.planning.vic.gov.au/guides-and-resources/guides/all-guides/renewable-energy-facilities/wind-energy-facilities

> *Early engagement with aviation safety organisations like CASA is encouraged as aviation safety is a complex area of wind energy facility assessment.*
>
> *Operators of certified aerodromes are required to notify CASA if they become aware of any development or proposed construction near the aerodrome that is likely to create an obstacle to aviation, or if an object will infringe the Obstacle Limitation Surfaces (OLS) or Procedures for Air Navigation Services –Operations (PANS-OPS) surfaces of an aerodrome. Operators of registered aerodromes should advise CASA if the proposal will infringe the OLS; CASA will ask Airservices to determine if there is an impact on published flight procedures for the aerodrome.*

The Aeronautical Impact Assessment [this report] undertaken by Chiron Aviation Consultants on behalf of the KGPH proponent addresses the air safety issues raised in this section. Airservices Australia has assessed the Aviation Impact Statement (section 4) of this report regarding PANS-OPS airspace.

Section 5 of the policy guidelines, *Information for responsible authorities assessing a wind energy facility,* at section 5.1.5 refers to *aircraft safety*. The advice in this section is that:

> *Although the Civil Aviation Safety Authority (CASA) is not a formal referral authority for wind energy facility permit applications, a responsible authority should nevertheless consult with CASA in relation to aircraft safety impacts of a wind energy facility proposal, particularly proposals that:*
>
> - *are within 30 kilometres of a declared aerodrome or airfield*
> - *infringe the obstacle limitation surface around a declared aerodrome*
> - *include a building or structure the top of which will be 110 metres or more above natural ground level (height of a wind turbine is that reached by the tip of the turbine blade when vertical above ground level).*

Further advice is that

> *Other private airstrips may not be identified by consultation with CASA. These may be identified using aerial photographs, discussions with the relevant council, or consultation with local authorities.*
>
> *A responsible authority should ensure that the proponent has consulted appropriately with CASA in relation to aircraft safety and navigation issues. It is recommended that the proponent consults and receives approval from CASA prior to lodging their application*

for ease of process. Refer to Section 4.3.6 of these guidelines for more detail.

CASA may recommend appropriate safeguards to ensure aviation safety. These may include changes to turbine locations, turbine heights and/or the provision of aviation safety lighting. A responsible authority should ensure that any concerns raised by CASA are appropriately reflected in permit conditions.

9.3.3 Comments on each of the above requirements

The responses to each of the above are outlined below.

9.3.3.1 Consultation with CASA by the Applicant

All the requirements raised in the VPP and Guidelines under the heading *consultation with CASA* have been addressed in the AIA.

The AIA assesses the impact of the facility on aircraft safety and demonstrates that it poses a LOW risk to aviation and is therefore not a hazard to aircraft safety. This addresses the impact of the facility on aircraft safety.

As noted above CASA is not a formal referral authority. CASA can only make recommendations, not determinations/directions mandating that wind turbines are obstacles when the turbines are beyond the OLS [not in the vicinity] of a certified aerodrome. Penetration of PANS-OPS airspace is not permitted.

CASA have issued Advisory Circular AC 139.E-05 v1.0 *Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome*, dated May 2021.

This Advisory Circular, at the opening section states:

> *2.1.1 CASA provides advice about lighting of wind farms and other tall structures in submissions to planning authorities who are considering a wind farm or tall structure.*
>
> *2.1.2 Regardless of CASA advice, planning authorities make the final determination whether a wind farm or a tall structure not in the vicinity of a CASA regulated aerodrome will require lighting or marking.*

This AC provides advisory information regarding the process for ascertaining if a wind farm is a hazard to aircraft safety. It provides information to proponents and planning authorities about who is responsible for deciding if a wind farm requires aviation obstacle lighting.

It is the author's experience[28], that CASA does not provide approval regarding wind farms and provides no comment on risk assessment reports prepared by Applicants.

[28] The author has conducted Aeronautical Impact Assessments for more than 25 wind farms Australia wide and over the last decade has had extensive consultation and discussion with CASA.

CASA has emphasised to the author that "*it is a matter for the appropriate Land Use Planning Authority to consider the implementation of our recommendations*" regarding wind farms.

The AIA uses 30nm (56km) from any declared aerodrome to the wind farm boundary, as requested by Airservices Australia, when assessing the *aircraft safety impacts of a wind energy facility.* The 30nm encompasses the PANS-OPS airspace of 25nm plus buffer associated with any published Instrument Approach Procedures at the declared aerodrome as well as the OLS of 15km from the runway threshold.

The requirements raised in the Policy and Guidelines, sections 4 and 5 *Consultation with CASA*: -

- Aircraft safety
- Infringement of OLS
- Infringement of PANS-OPS
- Tall structures – 110m or taller
- Approval from CASA
- Identification of private airstrips

have been addressed.

CASA has not been consulted with respect to this risk assessment.

9.3.3.2 *Private Airstrips*

Section 4.4 of this report details the aerodromes and airstrips identified within 30nm (56km) of the wind energy facility. The official register of aerodromes and airstrips, published in the public domain, is held in the Aeronautical Information Publication (AIP).

CASA do not hold any other register of private airstrips. Relevant council and local authorities often do not know the locations of airstrips, particularly those used infrequently for aerial agricultural applications activity.

Section 1.2 of this report notes that the identification of aerodromes and airstrips not listed in the Aeronautical Information Publication is a difficult process.

9.3.4 Additional Comment

The NASF Guideline D and Victorian Policy and Planning Guidelines use 30km from a declared aerodrome as the refence distance when considering wind farms.

It is the author's opinion that this distance needs to be amended to 30nm (56km) to ensure consideration of any published instrument approach procedures. The associated PANS-OPS prescribed airspace extends to 30nm (56km), that is 25nm Minimum Safe Altitude (MSA) plus buffer zone. An OLS extends to 15km from the runway threshold and is therefore encompassed in the 30nm distance.

Additionally, the Policy and Planning Guidelines and NASF Guideline D, advise that tall

structures, above 30m AGL within 30km of an aerodrome and 45m AGL elsewhere, should be notified to RAAF AIS for inclusion in the database of tall structures. This is incorrect.

CASA Advisory Circular AC139.E-01 v1.0 – *Reporting of tall structures* advises that the *Vertical Obstacles Database* is maintained by Airservices Australia and has been since at least 2016.

The RAAF accesses the *Vertical Obstacles Database*.

10. CONCLUSIONS – AERONAUTICAL IMPACT ASSESSMENT

The following conclusions are drawn from the Aeronautical Impact Assessment.

10.1 Aviation Impact Statement

Both the Lowest Safe Altitude for air route W519 and the Grid LSALT require raising to 2400ft.

The Portland RNP non-precision instrument approaches require amendment

- To commence at 2400ft,
- Holding altitudes raised to 2400ft
- 25nm and 10nm MSA raised to 2400ft and
- Missed approaches to climb to 2400ft.

Consultation with Glenelg Shire Council, as the airport operator, and Airservices Australia, as the instrument approach designer, have occurred to facilitate the required amendments.

The Glenelg Shire Council supports the necessary changes and has advised Airservices Australia accordingly. See Appendix G.

The KGPH does not impact any civil or Military CNS facilities.

10.1.1 Airservices Australia Response to AIS

The KGPH will not affect any CNS facilities. It will require an amendment to the LSALT for air route W519 and the GRID LSALT. The KGPH will impact on the two RNAV-Z Instrument Approach Procedures. These will need to be redesigned to raise the MSA to 2500ft. **Note**: - this response is to the original turbine layout (June 2022) which had a 2500ft LSALT. As demonstrated in section 4.2, the revised layout requires a LSALT of 2400ft.

10.1.2 Aerodrome Operator Response

The Glenelg Shire Council, as the operator of Portland Aerodrome, have written to Airservices Australia (21 May 2021) supporting the required changes to the YPOD Instrument Approach Procedures and the GRID and W519 LSALT changes.

10.1.3 Department of Defence Response to AIS

The Department of Defence has no objection to the KGPH. In their response Defence refer to the need to report tall structures to the Airservices Australia Vertical Obstructions Database in accordance with AC 139.E-01 v1.0 *Reporting tall structures.*

10.2 Risk Assessment

The Qualitative Risk Assessment demonstrates that the KGPH poses a LOW risk to aviation and is not a hazard to aircraft safety.

10.3 Obstacle Lighting Review

As demonstrated by the QRA, the KGPH is a LOW risk to aviation activity and therefore does not require obstacle lighting, as there is no further mitigation required.

10.4 Met Masts

All met masts will be marked in accordance with NASF Guideline D and notified to Airservices Australia in accordance with AC 139.E-01 v1.0. The location of the met masts will also be notified to the aerodrome operators at Portland and Nelson, Aerial Application Association of Australia, local aerial applications operators, Police Air Wing, Helicopter Emergency Medical Services (Ambulance Victoria), Forest Fire Management and the Country Fire Authority.

10.5 Reporting Tall Structures

The location of the met masts, wind turbines and associated transmission line infrastructure will be reported in accordance with AC 139 E-01 v1.0.

10.6 Consultation with Authorities

Consultation with Airservices Australia and Glenelg Shire Council has been undertaken regarding the identified requirement to amend the RNAV-Z non-precision approaches at Portland airport. Glenelg Shire Council, the Portland airport operator, supports the KGPH and has written to Airservices Australia supporting the necessary changes to the non-precision approach procedures.

All the requirements raised in the VPP and Guidelines under the heading *consultation with CASA* have been addressed in the AIA.

10.7 Environment Effects Statement

The items raised for consideration in the EES have been addressed in the AIA.

The issue of electromagnetic interference with air traffic control facilities is dealt with in section 4.7 Communications, Navigation and Surveillance. As noted in the assessment response from Airservices Australia the KGPH will not affect civil CNS facilities. Should

future CNS facilities be constructed then the existence of the KGPH will be part of the design considerations.

The potential adverse effects of the KGPH from an aviation perspective are addressed in section 4 - Aviation Impact Statement. As shown in section 4.8 AIS – Conclusions, the KGPH requires amendment of the YPOD RNP Instrument Approach Procedures to raise the PANS-OPS airspace to ensure safety. Consultation for this process is underway with Glenelg Shire Council (YPOD operator) and Airservices Australia (procedure designer). An amendment to the GRID and air route W519 LSALT is being negotiated with Airservices Australia as the airspace procedures provider.

The specific risks to aircraft safety are addressed in section 5 – Qualitative Risk Assessment. Aerial applications are addressed in section 5.9, Emergency Services operations in section 5.11 and Fire Fighting in section 5.12. The KGPH is within a forest plantation and is away from agricultural areas. The plantation owners are aware of the effects the turbines will have on the use aerial applications. The KGPH has been designed to not adversely impact on the operation Kentbruck airstrip.

The proposed corridor for the connecting high voltage transmission line follows the *Boiler Swamp Road* from Mount Richmond to the Heywood Inter-connector terminal station. The preferred option is underground. The above ground section is between the two existing high voltage lines from Heywood to Dartmoor and to the Portland smelter. Consequently, pilots are aware of the existing high voltage lines and fly accordingly.

This corridor is clear of YPOD and does not pose any additional risk to aviation activity in the area.

The items referred to in the VPP Guidelines as being subject to consultation with CASA have been addressed. For further comment see section 8.3 – Victorian Planning – Wind Energy Facilities.

The Aeronautical Impact Assessment demonstrates that the KGPH poses a LOW risk to aviation and is not a hazard to aircraft safety and satisfies the scope of the KGPH EES.

APPENDIX A

Kentbruck Green Power Hub
Turbine Locations and Heights
Layout ID 11092023
105 turbines

Layout current on 11 September 2023

APPENDIX A
Note: turbine numbering is not sequential

GDA2020 MGA zone 54WGS84 version 11092023 - 105 turbine

Turbine Number	ELEVATION (m)	Easting	Northing	LongDD	LatDD	Turbine Tip (m) AHD	Turbine Tip (ft) AHD	Add MOC 1000ft	LSALT
1	36	508689.5797	5787384.499	141.0990556	-38.06125	306	1003.68	2003.68	2100
2	34	513954.9302	5783737.543	141.1591482	-38.09405319	304	997.12	1997.12	2000
3	44	515713.4851	5783576.576	141.179207	-38.09547506	314	1029.92	2029.92	2100
4	38	514311.0994	5785631.203	141.1631722	-38.07698056	308	1010.24	2010.24	2100
5	44	515053.4023	5785348.783	141.1716417	-38.07951389	314	1029.92	2029.92	2100
6	36	513367.5747	5785108.475	141.1524241	-38.08170622	306	1003.68	2003.68	2100
7	34	513172.374	5785925.919	141.1501833	-38.07434167	304	997.12	1997.12	2000
9	42	513787.1275	5785817.955	141.1571944	-38.07530556	312	1023.36	2023.36	2100
10	30	523752.985	5775480.133	141.2711639	-38.16826944	300	984	1984	2000
11	36	523171.1411	5778194.077	141.2644333	-38.143825	306	1003.68	2003.68	2100
12	132	525052.0958	5775635.576	141.2859889	-38.16683333	402	1318.56	2318.56	2400
13	26	525321.1433	5773426.7	141.2891389	-38.18673333	296	970.88	1970.88	2000
14	22	524319.5783	5774246.045	141.2776743	-38.17937658	292	957.76	1957.76	2000
15	38	515619.1214	5785209.46	141.1780952	-38.08075997	308	1010.24	2010.24	2100
16	36	516534.8877	5784048.054	141.1885639	-38.09121111	306	1003.68	2003.68	2100
17	34	519322.2978	5780197.637	141.2204556	-38.12585833	304	997.12	1997.12	2000
18	34	518620.7556	5781851.578	141.2124083	-38.11096667	304	997.12	1997.12	2000
19	38	507938.6533	5787486.664	141.0904944	-38.06033611	308	1010.24	2010.24	2100
20	46	507567.4531	5788187.564	141.0862556	-38.05402222	316	1036.48	2036.48	2100

Turbine Number	ELEVATION (m)	Easting	Northing	LongDD	LatDD	Turbine Tip (m) AHD	Turbine Tip (ft) AHD	Add MOC 1000ft	LSALT
22	42	516180.319	5784825.755	141.1845028	-38.08420833	312	1023.36	2023.36	2100
23	16	512880.5795	5783513.485	141.1468999	-38.09608851	286	938.08	1938.08	2000
24	20	505966.0928	5788523.545	141.0680001	-38.05100606	290	951.2	1951.2	2000
25	20	513462.5179	5783245.5	141.1535418	-38.0984953	290	951.2	1951.2	2000
26	38	511847.0275	5784771.259	141.1350917	-38.08476667	308	1010.24	2010.24	2100
27	38	520877.4426	5779000.41	141.2382338	-38.13661384	308	1010.24	2010.24	2100
28	24	514004.5794	5782898.485	141.1597309	-38.10161461	294	964.32	1964.32	2000
29	34	511997.1366	5786128.683	141.1367806	-38.07253056	304	997.12	1997.12	2000
30	34	512907.8521	5784580.41	141.1471917	-38.08647222	304	997.12	1997.12	2000
31	32	509545.2357	5787055.613	141.1088139	-38.06420556	302	990.56	1990.56	2000
32	22	514558.4939	5782557.025	141.1660556	-38.10468333	292	957.76	1957.76	2000
33	70	524722.3172	5775056.221	141.2822444	-38.17206389	340	1115.2	2115.2	2200
34	142	525399.8934	5775115.464	141.2899778	-38.17151111	412	1351.36	2351.36	2400
35	118	525714.7117	5774415.137	141.2935972	-38.17781389	388	1272.64	2272.64	2300
37	26	525778.8698	5773088.764	141.2943778	-38.18976599	296	970.88	1970.88	2000
39	52	521273.2613	5778644.012	141.2427611	-38.13981667	322	1056.16	2056.16	2100
40	38	510521.7922	5786059.527	141.1199611	-38.07317222	308	1010.24	2010.24	2100
41	46	510282.356	5786688.262	141.1172222	-38.06750833	316	1036.48	2036.48	2100
42	110	526022.1279	5773848.894	141.2971278	-38.18290833	380	1246.4	2246.4	2300
43	32	511101.1697	5785508.448	141.1265752	-38.07813204	302	990.56	1990.56	2000
44	40	509030.1694	5787978.346	141.1029306	-38.05589444	310	1016.8	2016.8	2100

Turbine Number	ELEVATION (m)	Easting	Northing	LongDD	LatDD	Turbine Tip (m) AHD	Turbine Tip (ft) AHD	Add MOC 1000ft	LSALT
45	52	508937.742	5788808.131	141.1018667	-38.04841667	322	1056.16	2056.16	2100
48	28	513301.3607	5784047.197	141.1516889	-38.09127222	298	977.44	1977.44	2000
49	20	515709.9204	5781752.418	141.1792065	-38.1119157	290	951.2	1951.2	2000
50	74	525165.0653	5774480.044	141.2873194	-38.17724444	344	1128.32	2128.32	2200
51	28	515034.4154	5783116.48	141.1714722	-38.09963333	298	977.44	1977.44	2000
52	44	516228.5662	5783367.224	141.1850861	-38.09735278	314	1029.92	2029.92	2100
53	40	515672.5341	5784515.767	141.1787194	-38.08701111	310	1016.8	2016.8	2100
54	34	515144.9207	5784259.412	141.1727083	-38.08933056	304	997.12	1997.12	2000
55	30	519750.8853	5779031.575	141.2253778	-38.13635833	300	984	1984	2000
56	20	515587.8576	5782780.109	141.1777917	-38.10265556	290	951.2	1951.2	2000
58	18	510218.2651	5784928.801	141.1165167	-38.08336667	288	944.64	1944.64	2000
59	32	510734.5796	5784443.924	141.1224114	-38.08773076	302	990.56	1990.56	2000
60	26	518235.455	5780301.854	141.2080528	-38.12494167	296	970.88	1970.88	2000
61	20	516205.8461	5781499.225	141.1848694	-38.11418889	290	951.2	1951.2	2000
62	30	519029.2486	5779194.182	141.2171389	-38.13490833	300	984	1984	2000
63	70	521958.9388	5779172.311	141.2505694	-38.13503889	340	1115.2	2115.2	2200
64	34	522798.1336	5778675.632	141.2601611	-38.13949444	304	997.12	1997.12	2000
66	30	511875.4303	5783968.577	141.1354289	-38.09200066	300	984	1984	2000
67	20	512321.9534	5783587.935	141.1405277	-38.09542531	290	951.2	1951.2	2000
68	32	506962.2592	5787495.606	141.0793642	-38.06026356	302	990.56	1990.56	2000
69	22	511670.4109	5785447.409	141.1330667	-38.078675	292	957.76	1957.76	2000

Turbine Number	ELEVATION (m)	Easting	Northing	LongDD	LatDD	Turbine Tip (m) AHD	Turbine Tip (ft) AHD	Add MOC 1000ft	LSALT
70	44	511504.1509	5786578.141	141.1311528	-38.06848611	314	1029.92	2029.92	2100
71	38	510927.9946	5786647.356	141.1245833	-38.06786944	308	1010.24	2010.24	2100
72	40	522506.2221	5778130.604	141.2568472	-38.14441389	310	1016.8	2016.8	2100
73	24	517348.5919	5781375.435	141.1979083	-38.11528333	294	964.32	1964.32	2000
77	20	515148.0343	5782134.321	141.1727889	-38.10848333	290	951.2	1951.2	2000
78	32	509871.6111	5785933.977	141.11255	-38.07431111	302	990.56	1990.56	2000
79	46	517402.9793	5782893.859	141.1984917	-38.10159722	316	1036.48	2036.48	2100
80	46	517810.7102	5782352.688	141.2031556	-38.10646667	316	1036.48	2036.48	2100
81	22	517685.6497	5780863.749	141.201766	-38.11988845	292	957.76	1957.76	2000
82	30	519044.5535	5781052.338	141.2172639	-38.11816111	300	984	1984	2000
83	18	523981.7386	5774773.374	141.2737992	-38.17463307	288	944.64	1944.64	2000
84	24	523468.118	5774997.992	141.2679278	-38.17262222	294	964.32	1964.32	2000
85	26	512203.5734	5785367.419	141.1391472	-38.07938889	296	970.88	1970.88	2000
86	52	520386.8077	5780617.901	141.2325889	-38.12204722	322	1056.16	2056.16	2100
87	46	519753.8304	5780948.014	141.2253583	-38.11908611	316	1036.48	2036.48	2100
88	70	521458.0767	5779497.885	141.2448444	-38.13211667	340	1115.2	2115.2	2200
91	24	516246.5968	5782516.537	141.1853111	-38.10501944	294	964.32	1964.32	2000
92	62	521806.3301	5778545.822	141.2488472	-38.14068889	332	1088.96	2088.96	2100
93	36	506789.6626	5788321.392	141.0773889	-38.05282222	306	1003.68	2003.68	2100
96	46	519877.5829	5780173.182	141.2267917	-38.12606667	316	1036.48	2036.48	2100
97	50	522771.0934	5777450.569	141.2598917	-38.15053611	320	1049.6	2049.6	2100

Turbine Number	ELEVATION (m)	Easting	Northing	LongDD	LatDD	Turbine Tip (m) AHD	Turbine Tip (ft) AHD	Add MOC 1000ft	LSALT
98	36	516817.1332	5782248.779	141.191825	-38.10742222	306	1003.68	2003.68	2100
99	34	508054.2426	5788554.784	141.0918	-38.05070833	304	997.12	1997.12	2000
100	22	509280.9581	5785652.972	141.1058194	-38.07685	292	957.76	1957.76	2000
102	14	509619.9468	5785251.923	141.1096899	-38.08046101	284	931.52	1931.52	2000
103	42	509217.8575	5789310.808	141.1050528	-38.04388333	312	1023.36	2023.36	2100
104	46	516721.3946	5783062.335	141.1907139	-38.10009167	316	1036.48	2036.48	2100
108	50	517033.1493	5783655.598	141.1942554	-38.09473894	320	1049.6	2049.6	2100
109	30	511353.0315	5784188.638	141.1294679	-38.09002403	300	984	1984	2000
110	44	513891.4216	5784969.596	141.1584	-38.08295	314	1029.92	2029.92	2100
111	26	518110.7537	5781264.977	141.2066056	-38.11626389	296	970.88	1970.88	2000
112	54	523225.3377	5776970.631	141.2650917	-38.15485	324	1062.72	2062.72	2100
113	52	508305.4348	5788004.697	141.0946694	-38.05566389	322	1056.16	2056.16	2100
114	32	512763.741	5785267.01	141.1455361	-38.08028611	302	990.56	1990.56	2000
115	24	516732.0639	5781365.292	141.1908754	-38.11538639	294	964.32	1964.32	2000
117	32	512618.2504	5786018.95	141.1438639	-38.07351111	302	990.56	1990.56	2000
118	18	506477.9645	5787603.682	141.0738427	-38.05929309	288	944.64	1944.64	2000
119	50	520404.5234	5779234.921	141.2328306	-38.13451111	320	1049.6	2049.6	2100
120	28	518701.208	5779770.369	141.2133806	-38.12972222	298	977.44	1977.44	2000
123	54	524345.0337	5775411.498	141.277925	-38.16887222	324	1062.72	2062.72	2100
124	40	520725.7904	5780069.357	141.2364722	-38.12698333	310	1016.8	2016.8	2100
126	22	524758.1035	5773839.408	141.2826953	-38.18302945	292	957.76	1957.76	2000

Turbine Number	ELEVATION (m)	Easting	Northing	LongDD	LatDD	Turbine Tip (m) AHD	Turbine Tip (ft) AHD	Add MOC 1000ft	LSALT
127	34	514386.5899	5784608.599	141.1640535	-38.08619583	304	997.12	1997.12	2000
128	30	514598.5756	5783908.65	141.1664851	-38.09250088	300	984	1984	2000

Turbine #34 is the tallest with a tip height of 412m (1351.36ft) AHD

APPENDIX B

Kentbruck Green Power Hub
Turbine Locations and Heights
Layout ID V7_230525
116 turbines

Layout current on 19 June 2023

For information only

APPENDIX B
Turbine Layout V7_230525

Turbine ID	Latitude	Longitude	Ground Elevation	Max Tip Height (m)	Max Tip Height (ft)	Add MOC 1000ft	LSALT
1	38° 3'14.48"S	141° 5'56.60"E	37.14	307.14	1007.41	2007.41	2100
2	38° 5'38.21"S	141° 9'31.47"E	32.58	302.58	992.47	1992.47	2000
3	38° 5'43.92"S	141°10'45.13"E	44.01	314.01	1029.94	2029.94	2100
4	38° 4'37.13"S	141° 9'47.42"E	38.03	308.03	1010.34	2010.34	2100
5	38° 4'46.25"S	141°10'17.91"E	42.88	312.88	1026.25	2026.25	2100
6	38° 4'53.85"S	141° 9'7.06"E	35.19	305.19	1001.02	2001.02	2100
7	38° 4'27.63"S	141° 9'0.66"E	36.03	306.03	1003.78	2003.78	2100
9	38° 4'31.10"S	141° 9'25.90"E	41.57	311.57	1021.94	2021.94	2100
10	38°10'5.77"S	141°16'16.19"E	27.63	297.63	976.22	1976.22	2000
11	38° 8'37.77"S	141°15'51.96"E	34.58	304.58	999.01	1999.01	2000
12	38°10'0.60"S	141°17'9.56"E	130.05	400.05	1312.15	2312.15	2400
13	38°11'12.24"S	141°17'20.90"E	23.80	293.80	963.66	1963.66	2000
14	38°10'45.96"S	141°16'39.63"E	22.02	292.02	957.84	1957.84	2000
15	38° 4'50.55"S	141°10'41.25"E	38.36	308.36	1011.42	2011.42	2100
16	38° 5'28.36"S	141°11'18.83"E	33.72	303.72	996.21	1996.21	2000
17	38° 7'33.09"S	141°13'13.64"E	33.84	303.84	996.59	1996.59	2000
18	38° 6'39.48"S	141°12'44.67"E	33.38	303.38	995.08	1995.08	2000
19	38° 3'37.21"S	141° 5'25.78"E	37.68	307.68	1009.20	2009.20	2100
20	38° 3'14.48"S	141° 5'10.52"E	45.65	315.65	1035.32	2035.32	2100
21	38° 2'50.36"S	141° 4'51.38"E	28.76	298.76	979.93	1979.93	2000
22	38° 5'3.15"S	141°11'4.21"E	41.05	311.05	1020.23	2020.23	2100
23	38° 5'46.19"S	141° 8'48.82"E	17.03	287.03	941.47	1941.47	2000
24	38° 3'3.86"S	141° 4'4.81"E	19.79	289.79	950.52	1950.52	2000
25	38° 5'54.84"S	141° 9'12.73"E	20.80	290.80	953.84	1953.84	2000
26	38° 5'5.16"S	141° 8'6.33"E	37.70	307.70	1009.27	2009.27	2100
27	38° 8'19.91"S	141°14'12.26"E	36.52	306.52	1005.40	2005.40	2100
28	38° 6'6.06"S	141° 9'35.03"E	22.90	292.90	960.70	1960.70	2000
29	38° 4'21.11"S	141° 8'12.41"E	34.80	304.80	999.75	1999.75	2000
30	38° 5'11.30"S	141° 8'49.89"E	33.54	303.54	995.60	1995.60	2000
31	38° 3'51.14"S	141° 6'31.73"E	32.21	302.21	991.26	1991.26	2000
32	38° 6'16.86"S	141° 9'57.80"E	21.57	291.57	956.34	1956.34	2000
33	38°10'19.43"S	141°16'56.08"E	70.69	340.69	1117.47	2117.47	2200
34	38°10'17.44"S	141°17'23.92"E	142.12	412.12	1351.76	2351.76	2400
35	38°10'40.13"S	141°17'36.95"E	117.69	387.69	1271.62	2271.62	2300
37	38°11'23.73"S	141°17'39.50"E	25.67	295.67	969.80	1969.80	2000
39	38° 8'23.34"S	141°14'33.94"E	49.35	319.35	1047.47	2047.47	2100

Turbine ID	Latitude	Longitude	Ground Elevation	Max Tip Height (m)	Max Tip Height (ft)	Add MOC 1000ft	LSALT
40	38° 4'23.42"S	141° 7'11.86"E	38.43	308.43	1011.64	2011.64	2100
41	38° 4'3.03"S	141° 7'2.00"E	45.61	315.61	1035.20	2035.20	2100
42	38°10'58.47"S	141°17'49.66"E	110.30	380.30	1247.38	2247.38	2300
43	38° 4'41.43"S	141° 7'36.59"E	32.70	302.70	992.87	1992.87	2000
44	38° 3'21.22"S	141° 6'10.55"E	41.71	311.71	1022.42	2022.42	2100
45	38° 2'54.30"S	141° 6'6.72"E	50.87	320.87	1052.45	2052.45	2100
46	38° 2'37.59"S	141° 5'50.19"E	41.37	311.37	1021.28	2021.28	2100
48	38° 5'28.58"S	141° 9'6.08"E	27.77	297.77	976.67	1976.67	2000
49	38° 6'43.33"S	141°10'45.22"E	19.41	289.41	949.25	1949.25	2000
50	38°10'38.08"S	141°17'14.35"E	74.37	344.37	1129.53	2129.53	2200
51	38° 5'58.68"S	141°10'17.30"E	27.23	297.23	974.93	1974.93	2000
52	38° 5'50.47"S	141°11'6.31"E	43.02	313.02	1026.71	2026.71	2100
53	38° 5'13.24"S	141°10'43.39"E	39.39	309.39	1014.80	2014.80	2100
54	38° 5'21.59"S	141°10'21.75"E	35.09	305.09	1000.69	2000.69	2100
55	38° 8'10.89"S	141°13'31.36"E	28.78	298.78	980.01	1980.01	2000
56	38° 6'9.56"S	141°10'40.05"E	19.02	289.02	948.00	1948.00	2000
58	38° 5'0.12"S	141° 6'59.46"E	17.14	287.14	941.82	1941.82	2000
59	38° 5'16.04"S	141° 7'20.76"E	31.37	301.37	988.50	1988.50	2000
60	38° 7'29.79"S	141°12'28.99"E	24.90	294.90	967.27	1967.27	2000
61	38° 6'51.08"S	141°11'5.53"E	20.33	290.33	952.28	1952.28	2000
62	38° 8'5.67"S	141°13'1.70"E	29.52	299.52	982.41	1982.41	2000
63	38° 8'6.14"S	141°15'2.05"E	72.11	342.11	1122.12	2122.12	2200
64	38° 8'22.18"S	141°15'36.58"E	32.86	302.86	993.37	1993.37	2000
66	38° 5'31.77"S	141° 8'7.27"E	29.69	299.69	982.98	1982.98	2000
67	38° 5'43.91"S	141° 8'25.06"E	21.16	291.16	955.00	1955.00	2000
68	38° 3'36.93"S	141° 4'45.86"E	33.26	303.26	994.69	1994.69	2000
69	38° 4'43.23"S	141° 7'59.04"E	20.04	290.04	951.34	1951.34	2000
70	38° 4'6.55"S	141° 7'52.15"E	44.87	314.87	1032.77	2032.77	2100
71	38° 4'4.33"S	141° 7'28.50"E	37.49	307.49	1008.58	2008.58	2100
72	38° 8'39.89"S	141°15'24.65"E	38.94	308.94	1013.34	2013.34	2100
73	38° 6'55.02"S	141°11'52.47"E	21.90	291.90	957.44	1957.44	2000
74	38° 9'38.03"S	141°22'2.58"E	155.48	425.48	1395.57	2395.57	2400
75	38° 9'58.91"S	141°21'21.18"E	138.38	408.38	1339.48	2339.48	2400
76	38° 9'39.32"S	141°21'29.30"E	150.39	420.39	1378.87	2378.87	2400
77	38° 6'30.54"S	141°10'22.04"E	20.74	290.74	953.62	1953.62	2000
78	38° 4'27.52"S	141° 6'45.18"E	31.44	301.44	988.71	1988.71	2000
79	38° 6'5.75"S	141°11'54.57"E	44.50	314.50	1031.56	2031.56	2100
80	38° 6'23.28"S	141°12'11.36"E	46.69	316.69	1038.76	2038.76	2100

Turbine ID	Latitude	Longitude	Ground Elevation	Max Tip Height (m)	Max Tip Height (ft)	Add MOC 1000ft	LSALT
81	38° 7'16.10"S	141°12'5.61"E	22.10	292.10	958.09	1958.09	2000
82	38° 7'5.38"S	141°13'2.15"E	29.72	299.72	983.09	1983.09	2000
83	38°10'29.11"S	141°16'25.70"E	17.64	287.64	943.45	1943.45	2000
84	38°10'21.44"S	141°16'4.54"E	21.40	291.40	955.79	1955.79	2000
85	38° 4'45.80"S	141° 8'20.93"E	24.45	294.45	965.78	1965.78	2000
86	38° 7'19.37"S	141°13'57.32"E	51.41	321.41	1054.22	2054.22	2100
87	38° 7'8.71"S	141°13'31.29"E	44.83	314.83	1032.64	2032.64	2100
88	38° 7'55.62"S	141°14'41.44"E	68.59	338.59	1110.59	2110.59	2200
91	38° 6'18.07"S	141°11'7.12"E	24.23	294.23	965.09	1965.09	2000
92	38° 8'26.48"S	141°14'55.85"E	61.14	331.14	1086.15	2086.15	2100
93	38° 3'10.16"S	141° 4'38.60"E	36.06	306.06	1003.86	2003.86	2100
94	38° 2'44.73"S	141° 3'55.12"E	41.17	311.17	1020.62	2020.62	2100
95	38° 2'32.40"S	141° 4'15.51"E	31.97	301.97	990.45	1990.45	2000
96	38° 7'33.84"S	141°13'36.45"E	44.48	314.48	1031.49	2031.49	2100
97	38° 9'1.93"S	141°15'35.61"E	50.35	320.35	1050.75	2050.75	2100
98	38° 6'26.72"S	141°11'30.57"E	25.93	295.93	970.65	1970.65	2000
99	38° 3'2.55"S	141° 5'30.48"E	33.35	303.35	994.98	1994.98	2000
100	38° 4'36.66"S	141° 6'20.95"E	21.87	291.87	957.35	1957.35	2000
102	38° 4'50.93"S	141° 6'34.72"E	13.67	283.67	930.45	1930.45	2000
103	38° 2'37.98"S	141° 6'18.19"E	41.38	311.38	1021.32	2021.32	2100
104	38° 6'0.33"S	141°11'26.57"E	43.94	313.94	1029.71	2029.71	2100
107	38° 2'56.07"S	141° 4'25.03"E	27.87	297.87	977.03	1977.03	2000
108	38° 5'43.18"S	141°11'39.14"E	48.21	318.21	1043.74	2043.74	2100
109	38° 5'24.83"S	141° 7'45.68"E	31.58	301.58	989.18	1989.18	2000
110	38° 4'58.62"S	141° 9'30.24"E	43.03	313.03	1026.74	2026.74	2100
111	38° 6'58.55"S	141°12'23.78"E	25.26	295.26	968.44	1968.44	2000
112	38° 9'17.46"S	141°15'54.33"E	53.18	323.18	1060.02	2060.02	2100
113	38° 3'20.39"S	141° 5'40.81"E	51.14	321.14	1053.35	2053.35	2100
114	38° 4'49.03"S	141° 8'43.93"E	34.26	304.26	997.97	1997.97	2000
115	38° 7'1.19"S	141°11'23.54"E	22.67	292.67	959.95	1959.95	2000
116	38° 2'33.69"S	141° 5'21.80"E	60.27	330.27	1083.27	2083.27	2100
117	38° 4'24.64"S	141° 8'37.91"E	31.24	301.24	988.05	1988.05	2000
118	38° 3'35.43"S	141° 4'24.86"E	18.06	288.06	944.84	1944.84	2000
119	38° 8'4.24"S	141°13'58.19"E	50.26	320.26	1050.46	2050.46	2100
120	38° 7'47.00"S	141°12'48.17"E	28.67	298.67	979.64	1979.64	2000
121	38°10'5.88"S	141°21'42.63"E	139.46	409.46	1343.03	2343.03	2400
123	38°10'7.94"S	141°16'40.53"E	52.37	322.37	1057.39	2057.39	2100
124	38° 7'37.14"S	141°14'11.30"E	40.63	310.63	1018.85	2018.85	2100

Turbine ID	Latitude	Longitude	Ground Elevation	Max Tip Height (m)	Max Tip Height (ft)	Add MOC 1000ft	LSALT
126	38°10'59.51"S	141°16'57.52"E	21.61	291.61	956.46	1956.46	2000
127	38° 5'9.68"S	141° 9'49.30"E	33.88	303.88	996.72	1996.72	2000
128	38° 5'34.92"S	141° 9'59.51"E	29.84	299.84	983.48	1983.48	2000
129	38° 2'31.36"S	141° 4'44.37"E	22.70	292.70	960.05	1960.05	2000

Notes

1. Turbine numbering is NOT sequential
2. Tallest turbine is #74 at 425.48m AHD = 1395.57ft AHD
3. Lowest Safe Altitude over KGPH is 2400ft.
4. Turbine numbers with grey hatch (6 in total) require 2400ft LSALT

APPENDIX C

Kentbruck Green Power Hub
Turbine Locations and Heights
WTG ID_20220630_V1
Layout current on 30 June 2022
For information only

APPENDIX C

KENTBRUCK WTG ID_20220630_V1

WTG ID	Latitude	Longitude	Easting	Northing	Elevation AHD (m)	Tip Height AHD (m)	Tip Height AHD (ft)	Add MOC	LSALT
1	38° 3'40.50"S	141° 5'56.60"E	508689.5797	5787384.499	37	307	1006.96	2006.96	2100
2	38° 5'38.21"S	141° 9'31.47"E	513919.3027	5783749.361	34	304	997.12	1997.12	2000
3	38° 5'43.92"S	141°10'45.13"E	515713.1007	5783570.112	44	314	1029.92	2029.92	2100
4	38° 4'37.13"S	141° 9'47.42"E	514311.0994	5785631.203	38	308	1010.24	2010.24	2100
5	38° 4'46.25"S	141°10'17.91"E	515053.4023	5785348.783	43	313	1026.64	2026.64	2100
6	38° 4'53.85"S	141° 9'7.06"E	513326.9807	5785117.553	38	308	1010.24	2010.24	2100
7	38° 4'27.63"S	141° 9'0.66"E	513172.374	5785925.919	36	306	1003.68	2003.68	2100
9	38° 4'31.10"S	141° 9'25.90"E	513787.1275	5785817.955	42	312	1023.36	2023.36	2100
10	38°10'5.77"S	141°16'16.19"E	523752.985	5775480.133	28	298	977.44	1977.44	2000
11	38° 8'37.77"S	141°15'51.96"E	523171.1411	5778194.077	35	305	1000.4	2000.4	2000
12	38°10'0.60"S	141°17'9.56"E	525052.0958	5775635.576	130	400	1312	2312	2400
13	38°11'12.24"S	141°17'20.90"E	525321.1433	5773426.7	24	294	964.32	1964.32	2000
14	38°10'45.96"S	141°16'39.63"E	524319.6248	5774239.748	21	291	954.48	1954.48	2000
15	38° 4'50.55"S	141°10'41.25"E	515621.7501	5785215.185	38	308	1010.24	2010.24	2100
16	38° 5'28.36"S	141°11'18.83"E	516534.8877	5784048.054	34	304	997.12	1997.12	2000
17	38° 7'33.09"S	141°13'13.64"E	519322.2978	5780197.637	34	304	997.12	1997.12	2000
18	38° 6'39.48"S	141°12'44.67"E	518620.7556	5781851.578	33	303	993.84	1993.84	2000
19	38° 3'37.21"S	141° 5'25.78"E	507938.6533	5787486.664	38	308	1010.24	2010.24	2100
20	38° 3'14.48"S	141° 5'10.52"E	507567.4531	5788187.564	46	316	1036.48	2036.48	2100
21	38° 2'50.36"S	141° 4'51.38"E	507101.6509	5788931.369	29	299	980.72	1980.72	2000

WTG ID	Latitude	Longitude	Easting	Northing	Elevation AHD (m)	Tip Height AHD (m)	Tip Height AHD (ft)	Add MOC	LSALT
22	38° 5'3.15"S	141°11'4.21"E	516180.319	5784825.755	41	311	1020.08	2020.08	2100
23	38° 5'46.19"S	141° 8'48.82"E	512880.0798	5783505.122	17	287	941.36	1941.36	2000
24	38° 3'3.86"S	141° 4'4.81"E	505966.3215	5788516.204	19	289	947.92	1947.92	2000
25	38° 5'54.84"S	141° 9'12.73"E	513462.0008	5783237.582	21	291	954.48	1954.48	2000
26	38° 5'5.16"S	141° 8'6.33"E	511847.0275	5784771.259	38	308	1010.24	2010.24	2100
27	38° 8'19.91"S	141°14'12.26"E	520745.8023	5778751.092	32	302	990.56	1990.56	2000
28	38° 6'6.06"S	141° 9'35.03"E	514004.5382	5782890.86	23	293	961.04	1961.04	2000
29	38° 4'21.11"S	141° 8'12.41"E	511997.1366	5786128.683	35	305	1000.4	2000.4	2000
30	38° 5'11.30"S	141° 8'49.89"E	512907.8521	5784580.41	34	304	997.12	1997.12	2000
31	38° 3'51.14"S	141° 6'31.73"E	509545.2357	5787055.613	32	302	990.56	1990.56	2000
32	38° 6'16.86"S	141° 9'57.80"E	514558.4939	5782557.025	22	292	957.76	1957.76	2000
33	38°10'19.43"S	141°16'56.08"E	524722.3172	5775056.221	71	341	1118.48	2118.48	2200
34	38°10'17.44"S	141°17'23.92"E	525399.8934	5775115.464	142	412	1351.36	2351.36	2400
35	38°10'40.13"S	141°17'36.95"E	525714.7117	5774415.137	118	388	1272.64	2272.64	2300
37	38°11'23.73"S	141°17'39.50"E	525772.4899	5773071.141	25	295	967.6	1967.6	2000
39	38° 8'23.34"S	141°14'33.94"E	521273.2613	5778644.012	49	319	1046.32	2046.32	2100
40	38° 4'23.42"S	141° 7'11.86"E	510521.7922	5786059.527	38	308	1010.24	2010.24	2100
41	38° 4'3.03"S	141° 7'2.00"E	510282.356	5786688.262	46	316	1036.48	2036.48	2100
42	38°10'58.47"S	141°17'49.66"E	526022.1279	5773848.894	110	380	1246.4	2246.4	2300
43	38° 4'41.43"S	141° 7'36.59"E	511123.5588	5785503.651	35	305	1000.4	2000.4	2000
44	38° 3'21.22"S	141° 6'10.55"E	509030.1694	5787978.346	42	312	1023.36	2023.36	2100
45	38° 2'54.30"S	141° 6'6.72"E	508937.742	5788808.131	51	321	1052.88	2052.88	2100
46	38° 2'37.59"S	141° 5'50.19"E	508535.4069	5789323.57	41	311	1020.08	2020.08	2100

WTG ID	Latitude	Longitude	Easting	Northing	Elevation AHD (m)	Tip Height AHD (m)	Tip Height AHD (ft)	Add MOC	LSALT
48	38° 5'28.58"S	141° 9'6.08"E	513301.3607	5784047.197	28	298	977.44	1977.44	2000
49	38° 6'43.33"S	141°10'45.22"E	515711.7583	5781739.055	21	291	954.48	1954.48	2000
50	38°10'38.08"S	141°17'14.35"E	525165.0653	5774480.044	74	344	1128.32	2128.32	2200
51	38° 5'58.68"S	141°10'17.30"E	515034.4154	5783116.48	27	297	974.16	1974.16	2000
52	38° 5'50.47"S	141°11'6.31"E	516228.5662	5783367.224	43	313	1026.64	2026.64	2100
53	38° 5'13.24"S	141°10'43.39"E	515672.5341	5784515.767	39	309	1013.52	2013.52	2100
54	38° 5'21.59"S	141°10'21.75"E	515144.9207	5784259.412	35	305	1000.4	2000.4	2000
55	38° 8'10.89"S	141°13'31.36"E	519750.8853	5779031.575	29	299	980.72	1980.72	2000
56	38° 6'9.56"S	141°10'40.05"E	515587.8576	5782780.109	19	289	947.92	1947.92	2000
57	38°10'44.34"S	141°21'11.24"E	530927.7291	5774267.194	138	408	1338.24	2338.24	2400
58	38° 5'0.12"S	141° 6'59.46"E	510218.2651	5784928.801	17	287	941.36	1941.36	2000
59	38° 5'16.04"S	141° 7'20.76"E	510736.4917	5784437.471	32	302	990.56	1990.56	2000
60	38° 7'29.79"S	141°12'28.99"E	518235.455	5780301.854	25	295	967.6	1967.6	2000
61	38° 6'51.08"S	141°11'5.53"E	516205.8461	5781499.225	20	290	951.2	1951.2	2000
62	38° 8'5.67"S	141°13'1.70"E	519029.2486	5779194.182	30	300	984	1984	2000
63	38° 8'6.14"S	141°15'2.05"E	521958.9388	5779172.311	72	342	1121.76	2121.76	2200
64	38° 8'22.18"S	141°15'36.58"E	522798.1336	5778675.632	33	303	993.84	1993.84	2000
66	38° 5'31.77"S	141° 8'7.27"E	511868.7299	5783951.093	29	299	980.72	1980.72	2000
67	38° 5'43.91"S	141° 8'25.06"E	512301.4807	5783576.288	21	291	954.48	1954.48	2000
68	38° 3'36.93"S	141° 4'45.86"E	506965.8916	5787496.183	33	303	993.84	1993.84	2000
69	38° 4'43.23"S	141° 7'59.04"E	511670.4109	5785447.409	20	290	951.2	1951.2	2000
70	38° 4'6.55"S	141° 7'52.15"E	511504.1509	5786578.141	45	315	1033.2	2033.2	2100
71	38° 4'4.33"S	141° 7'28.50"E	510927.9946	5786647.356	37	307	1006.96	2006.96	2100

WTG ID	Latitude	Longitude	Easting	Northing	Elevation AHD (m)	Tip Height AHD (m)	Tip Height AHD (ft)	Add MOC	LSALT
72	38° 8'39.89"S	141°15'24.65"E	522506.2221	5778130.604	39	309	1013.52	2013.52	2100
73	38° 6'55.02"S	141°11'52.47"E	517348.5919	5781375.435	22	292	957.76	1957.76	2000
74	38° 9'38.03"S	141°22'2.58"E	532184.8708	5776306.084	155	425	1394	2394	2400
75	38° 9'58.91"S	141°21'21.18"E	531174.9322	5775666.47	138	408	1338.24	2338.24	2400
76	38° 9'39.32"S	141°21'29.30"E	531374.8526	5776269.493	150	420	1377.6	2377.6	2400
77	38° 6'30.54"S	141°10'22.04"E	515148.0343	5782134.321	21	291	954.48	1954.48	2000
78	38° 4'27.52"S	141° 6'45.18"E	509871.6111	5785933.977	31	301	987.28	1987.28	2000
79	38° 6'5.75"S	141°11'54.57"E	517402.9793	5782893.859	44	314	1029.92	2029.92	2100
80	38° 6'23.28"S	141°12'11.36"E	517810.7102	5782352.688	47	317	1039.76	2039.76	2100
81	38° 7'16.10"S	141°12'5.61"E	517667.1395	5780725.046	19	289	947.92	1947.92	2000
82	38° 7'5.38"S	141°13'2.15"E	519044.5535	5781052.338	30	300	984	1984	2000
83	38°10'29.11"S	141°16'25.70"E	523982.2643	5774760.09	19	289	947.92	1947.92	2000
84	38°10'21.44"S	141°16'4.54"E	523468.118	5774997.992	21	291	954.48	1954.48	2000
85	38° 4'45.80"S	141° 8'20.93"E	512203.5734	5785367.419	24	294	964.32	1964.32	2000
86	38° 7'19.37"S	141°13'57.32"E	520386.8077	5780617.901	51	321	1052.88	2052.88	2100
87	38° 7'8.71"S	141°13'31.29"E	519753.8304	5780948.014	45	315	1033.2	2033.2	2100
88	38° 7'55.62"S	141°14'41.44"E	521458.0767	5779497.885	69	339	1111.92	2111.92	2200
89	38°10'18.86"S	141°21'8.82"E	530871.841	5775052.738	139	409	1341.52	2341.52	2400
91	38° 6'18.07"S	141°11'7.12"E	516246.5968	5782516.537	24	294	964.32	1964.32	2000
92	38° 8'26.48"S	141°14'55.85"E	521806.3301	5778545.822	61	331	1085.68	2085.68	2100
93	38° 3'10.16"S	141° 4'38.60"E	506789.6626	5788321.392	36	306	1003.68	2003.68	2100
94	38° 2'44.73"S	141° 3'55.12"E	505730.5756	5789105.966	41	311	1020.08	2020.08	2100
95	38° 2'32.40"S	141° 4'15.51"E	506227.8319	5789485.615	32	302	990.56	1990.56	2000

WTG ID	Latitude	Longitude	Easting	Northing	Elevation AHD (m)	Tip Height AHD (m)	Tip Height AHD (ft)	Add MOC	LSALT
96	38° 7'33.84"S	141°13'36.45"E	519877.5829	5780173.182	44	314	1029.92	2029.92	2100
97	38° 9'1.93"S	141°15'35.61"E	522771.0934	5777450.569	50	320	1049.6	2049.6	2100
98	38° 6'26.72"S	141°11'30.57"E	516817.1332	5782248.779	26	296	970.88	1970.88	2000
99	38° 3'2.55"S	141° 5'30.48"E	508054.2426	5788554.784	33	303	993.84	1993.84	2000
100	38° 4'36.66"S	141° 6'20.95"E	509280.9581	5785652.972	22	292	957.76	1957.76	2000
102	38° 4'50.93"S	141° 6'34.72"E	509615.9132	5785212.775	13	283	928.24	1928.24	2000
103	38° 2'37.98"S	141° 6'18.19"E	509217.8575	5789310.808	41	311	1020.08	2020.08	2100
104	38° 6'0.33"S	141°11'26.57"E	516721.3946	5783062.335	44	314	1029.92	2029.92	2100
107	38° 2'56.07"S	141° 4'25.03"E	506459.292	5788755.919	28	298	977.44	1977.44	2000
108	38° 5'43.18"S	141°11'39.14"E	517028.6453	5783590.273	50	320	1049.6	2049.6	2100
109	38° 5'24.83"S	141° 7'45.68"E	511343.1489	5784165.736	30	300	984	1984	2000
110	38° 4'58.62"S	141° 9'30.24"E	513891.4216	5784969.596	43	313	1026.64	2026.64	2100
111	38° 6'58.55"S	141°12'23.78"E	518110.7537	5781264.977	25	295	967.6	1967.6	2000
112	38° 9'17.46"S	141°15'54.33"E	523225.3377	5776970.631	53	323	1059.44	2059.44	2100
113	38° 3'20.39"S	141° 5'40.81"E	508305.4348	5788004.697	51	321	1052.88	2052.88	2100
114	38° 4'49.03"S	141° 8'43.93"E	512763.741	5785267.01	34	304	997.12	1997.12	2000
115	38° 7'1.19"S	141°11'23.54"E	516643.7598	5781186.743	18	288	944.64	1944.64	2000
116	38° 2'33.69"S	141° 5'21.80"E	507843.5555	5789444.463	60	330	1082.4	2082.4	2100
117	38° 4'24.64"S	141° 8'37.91"E	512618.2504	5786018.95	31	301	987.28	1987.28	2000
118	38° 3'35.43"S	141° 4'24.86"E	506454.1905	5787542.834	13	283	928.24	1928.24	2000
119	38° 8'4.24"S	141°13'58.19"E	520404.5234	5779234.921	50	320	1049.6	2049.6	2100
120	38° 7'47.00"S	141°12'48.17"E	518701.208	5779770.369	29	299	980.72	1980.72	2000
121	38°10'5.88"S	141°21'42.63"E	531696.0438	5775449.627	139	409	1341.52	2341.52	2400

WTG ID	Latitude	Longitude	Easting	Northing	Elevation AHD (m)	Tip Height AHD (m)	Tip Height AHD (ft)	Add MOC	LSALT
123	38°10'7.94"S	141°16'40.53"E	524345.0337	5775411.498	52	322	1056.16	2056.16	2100
124	38° 7'37.14"S	141°14'11.30"E	520725.7904	5780069.357	41	311	1020.08	2020.08	2100
126	38°10'59.51"S	141°16'57.52"E	524753.5873	5773820.807	20	290	951.2	1951.2	2000
127	38° 5'9.68"S	141° 9'49.30"E	514355.1314	5784627.917	36	306	1003.68	2003.68	2100
128	38° 5'34.92"S	141° 9'59.51"E	514602.4565	5783849.565	25	295	967.6	1967.6	2000
129	38° 2'31.36"S	141° 4'44.37"E	506931.2993	5789517.101	23	293	961.04	1961.04	2000

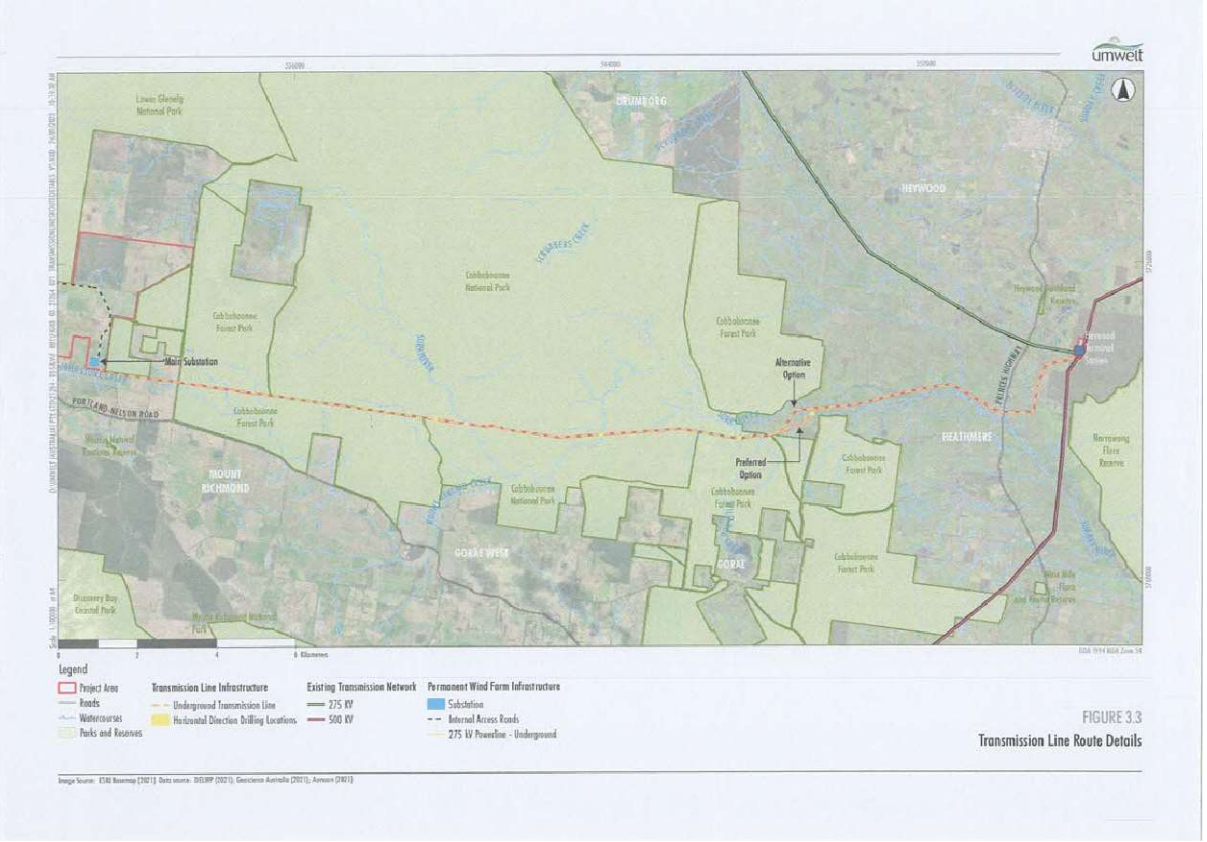
Note: WTG ID numbering is not consecutive.

WTG 74 is the tallest turbine at 425m AHD

APPENDIX D

Kentbruck Green Power Hub
Location Drawing
Transmission Line Drawing

KGPH Location Drawing



KGPH Transmission Line Route

APPENDIX E

Airservices Australia AIS Assessment

APPENDIX E

ian_jennings@netspace.net.au

From: Airport Developments <Airport.Developments@AirservicesAustralia.com>
Sent: Tuesday, 16 June 2020 1:34 PM
To: 'ian_jennings@netspace.net.au'
Cc: Airspace Protection
Subject: Airservices Response: VIC-WF-048 P2 - Kentbruck Wind Farm [SEC=UNCLASSIFIED]

Hi Ian,

I refer to your request for an Airservices assessment of **Kentbruck Wind Farm.**

Airspace Procedures

With respect to procedures designed by Airservices in accordance with ICAO PANS-OPS and Document 9905, at a maximum height of 456m (1497ft) AHD the wind farm will affect the Minimum Sector Altitude (MSA) and the RNAV (GNSS) RWY 08 and 26 instrument procedures at Portland aerodrome.

The 10 NM and 25 NM MSA will need to be raised to 2500ft which will then require the initial approach fix and holding altitudes of RNAV-Z (GNSS) RWY 08 and 26 to be raised to the new MSA.
The maximum height of the wind farm without affecting any procedures at Portland aerodrome is 309.6m (1016ft) AHD

With respect to procedures designed by Airservices in accordance with ICAO PANS-OPS and Document 9905, at a maximum height of 456m (1497ft) AHD the wind farm will not affect any sector or circling altitude, nor any instrument approach or departure procedure at Mount Gambier aerodrome.

The wind farm will affect the W519 air route. The maximum height of the wind farm without affecting any air route is 365.7m (1200ft) AHD.

The wind farm will affect the GRID LSALT of 2200ft AHD.

Note: Procedures not designed by Airservices at Portland and Mount Gambier aerodromes were not considered in this assessment.

Communications/Navigation/Surveillance (CNS) Facilities

This proposal will not adversely impact the performance of any Airservices Precision/Non-Precision Nav Aids, Anemometers, HF/VHF/UHF Comms, A-SMGCS, Radar, PRM, ADS-B, WAM or Satellite/Links.

Summary

At this stage, Airservices cannot support this proposal. Airservices requires that the operator of Portland aerodrome is consulted about the impact to MSA and RNAV (GNSS) RWY 08 and 26 before any change can be supported by Airservices. Furthermore, any Airservices work associated with amending the flight procedures/air route/LSALT will be undertaken on a commercial basis and require further consultation with Airservices.

Kind Regards,

John Graham

WORKING FROM HOME
Airport Development Applications Coordinator
Airservices Australia

1

APPENDIX F

Glenelg Shire
Letter of Support
Changes to Portland
Instrument Approach Procedures

APPENDIX F

Glenelg Shire response.

OUR REF: MB-MB Kentbruck
YOUR REF:

21 May 2021

Airservices Australia
Airport Developments
Attn: William Zhao
Via email: airport.developments@airservicesaustralia.com

Dear Mr Zhao

LAND AT: PORTLAND AIRPORT, 1260 BRIDEWATER LAKES ROAD, CASHOMORE 3305
SUBJECT: CHANGE TO INSTRUMENT APPROACH PROCEDURES

The Kentbruck Wind Farm is currently in the planning phase and preparing to submit a Planning Application. Glenelg Shire Council, as the operator of Portland Airport has been consulted regarding the proposed Kentbruck Wind Farm.

The proposed Kentbruck wind farm seeks to build up to 157 wind turbines. The turbines which are proposed over plantations and farms in the Kentbruck area reach up to a tip height of 270 metres above the ground.

In reviewing this matter Council supports the proposed changes to the Portland Airport Runway 08 and Runway 26 Instrument Approach Procedures required to accommodate the wind farm. These changes are:

- To raise the 25nm and 10nm Minimum Safe Altitude (MSA) from 2000ft to 2500ft
- Raise the Initial Approach Fix altitudes for both RWY 08 and RWY 26 to the new MSA of 2500ft
- Raise the Holding Altitudes for both RWY 08 and RWY 26 to the new MSA

Council understands that the wind farm will also affect the GRID Lowest Safe Altitude and that of air route W519.

All changes would be pursued by the proponent of the Kentbruck wind farm proposal should the facility be approved and constructed.

71 Cliff Street, P.O. Box 152, PORTLAND, VICTORIA, 3305
telephone: 1300 Glenelg (1300 453 635) facsimile: (03) 5522 2290
email: enquiry@glenelg.vic.gov.au www.glenelg.vic.gov.au

Hearing or speech impaired?
Call us via the National Relay Service on 13 36 77
ABN 48 217 289 490

Please do not hesitate to contact Matt Berry, Regulatory Services Manager on (03) 5522 2307 if you wish to discuss the situation further.

Yours faithfully

GREG BURGOYNE
Chief Executive Officer

CC
CASA – Attn Tony Aiezza: airspace.protection@casa.gov.au
NEOEN – Attn Aiden O'Mahony: aidan.omahony@neoen.com

71 Cliff Street, P.O. Box 152, PORTLAND, VICTORIA, 3305
telephone: 1300 Glenelg (1300 453 635) facsimile: (03) 5522 2290
email: enquiry@glenelg.vic.gov.au www.glenelg.vic.gov.au

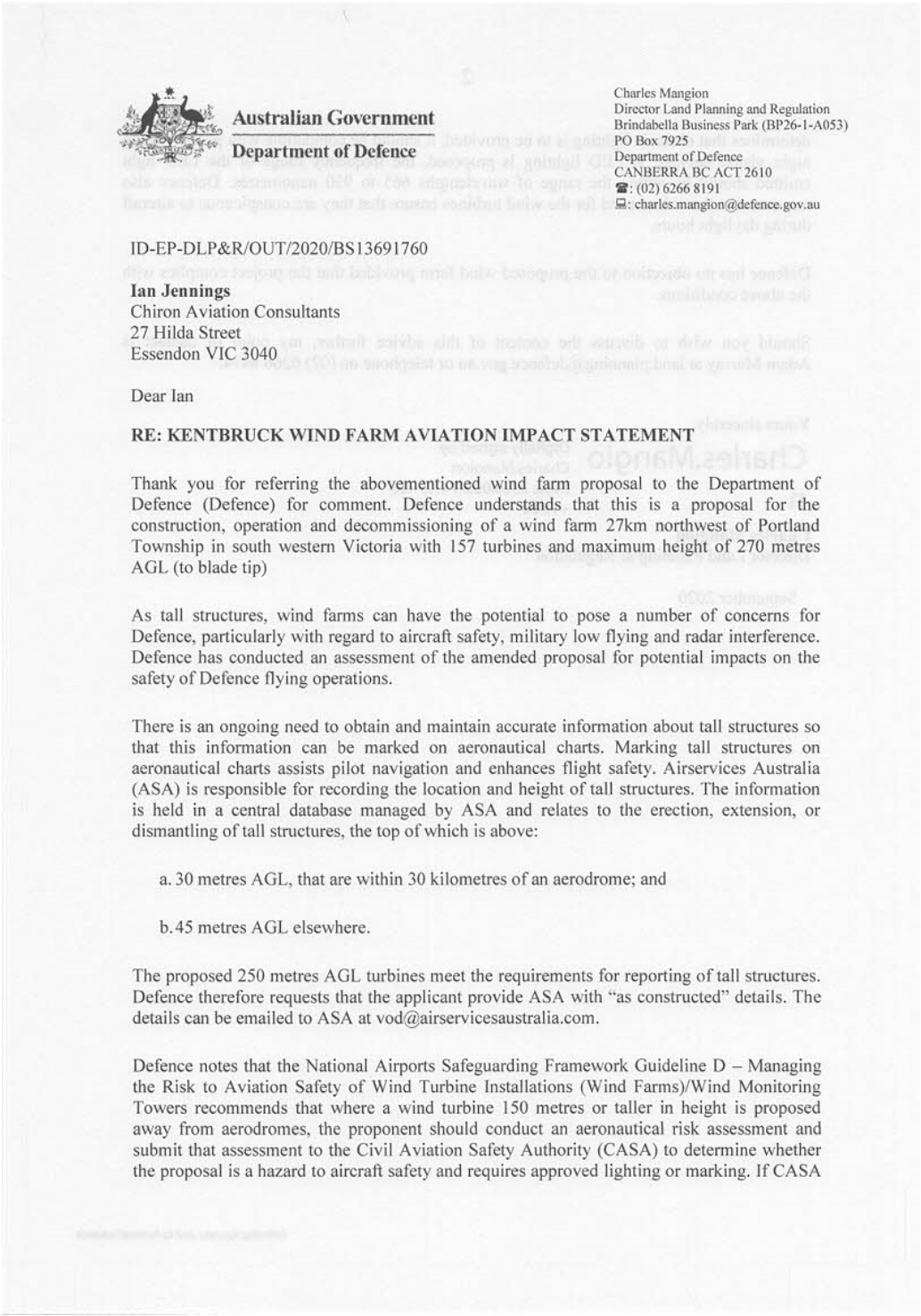
Hearing or speech impaired?
Call us via the National Relay Service on 13 36 77
ABN 48 217 289 490

APPENDIX G

Department of Defence Response

APPENDIX G

Department of Defence response.



Australian Government
Department of Defence

Charles Mangion
Director Land Planning and Regulation
Brindabella Business Park (BP26-1-A053)
PO Box 7925
Department of Defence
CANBERRA BC ACT 2610
☎: (02) 6266 8191
💻: charles.mangion@defence.gov.au

ID-EP-DLP&R/OUT/2020/BS13691760

Ian Jennings
Chiron Aviation Consultants
27 Hilda Street
Essendon VIC 3040

Dear Ian

RE: KENTBRUCK WIND FARM AVIATION IMPACT STATEMENT

Thank you for referring the abovementioned wind farm proposal to the Department of Defence (Defence) for comment. Defence understands that this is a proposal for the construction, operation and decommissioning of a wind farm 27km northwest of Portland Township in south western Victoria with 157 turbines and maximum height of 270 metres AGL (to blade tip)

As tall structures, wind farms can have the potential to pose a number of concerns for Defence, particularly with regard to aircraft safety, military low flying and radar interference. Defence has conducted an assessment of the amended proposal for potential impacts on the safety of Defence flying operations.

There is an ongoing need to obtain and maintain accurate information about tall structures so that this information can be marked on aeronautical charts. Marking tall structures on aeronautical charts assists pilot navigation and enhances flight safety. Airservices Australia (ASA) is responsible for recording the location and height of tall structures. The information is held in a central database managed by ASA and relates to the erection, extension, or dismantling of tall structures, the top of which is above:

a. 30 metres AGL, that are within 30 kilometres of an aerodrome; and

b. 45 metres AGL elsewhere.

The proposed 250 metres AGL turbines meet the requirements for reporting of tall structures. Defence therefore requests that the applicant provide ASA with "as constructed" details. The details can be emailed to ASA at vod@airservicesaustralia.com.

Defence notes that the National Airports Safeguarding Framework Guideline D – Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms)/Wind Monitoring Towers recommends that where a wind turbine 150 metres or taller in height is proposed away from aerodromes, the proponent should conduct an aeronautical risk assessment and submit that assessment to the Civil Aviation Safety Authority (CASA) to determine whether the proposal is a hazard to aircraft safety and requires approved lighting or marking. If CASA

determines that obstacle lighting is to be provided, it should be compatible with persons using night vision devices. If LED lighting is proposed, the frequency range of the LED light emitted should be within the range of wavelengths 665 to 930 nanometres. Defence also requests that the colour used for the wind turbines ensure that they are conspicuous to aircraft during daylight hours.

Defence has no objection to the proposed wind farm provided that the project complies with the above conditions.

Should you wish to discuss the content of this advice further, my point of contact is Adam Murray at land.planning@defence.gov.au or telephone on (02) 6266 8474.

Yours sincerely,

Charles.Mangion

Digitally signed by Charles.Mangion
Date: 2020.09.03 17:31:56 +10'00'

Charles Mangion
Director Land Planning & Regulation

September 2020

APPENDIX H

Stakeholder List

APPENDIX H

The following organisations were consulted.

Stakeholder	Contact
Glenelg Shire	Portland Aerodrome Manager
Portland Aeroclub	President & Vice President
Forest Owners Conference	Past President
CFA District 4	Forest Industry Liaison
Forest Fire manager	Casterton Air Base Manager
Police Air Wing	Senior Base Pilot
Fixed Wing Air Ambulance (Pelair)	Senior Base Pilot
Helicopter Emergency Medical Service	Senior Base Pilot
Airservices Australia	AIS Airport Development
Nelson Aeroplane Company	Nelson airstrip owner

APPENDIX I

Transmission Lines close to Portland Aerodrome

APPENDIX I

PROPOSED TRANSMISSION LINE CORRIDORS

PORTLAND TO KENTBRUCK GREEN POWER HUB

ADVICE REGARDING
PROXIMITY TO
PORTLAND AERODROME

CCP08

Report to:

NEOEN

V4.0
29 July 2022

Chiron Aviation Consultants
Essendon Vic 3040
Australia

DOCUMENT RELEASE APPROVAL

Approved for Final Release:

Name: Ian Jennings

Title: Principal Consultant

Date: 29 July 2022

Distribution: Kristina Yan, Senior Project Developer
Neoen Australia

DOCUMENT CONTROL

Version	Description	Date	Author	QA
V1.0		4 Sep 2019	IJ	RJJ
V2.0	Correction of crossing distance page 7	5 Sep 2019	IJ	RJJ
V3.0	Additional western route along Telegraph Road	21 Jan 2022	IJ	RJJ
V4.0				

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Neoen Australia has requested Chiron Aviation Consultants to provide advice regarding the suitability of five proposed electricity transmission line corridors close to the Portland Aerodrome.

Four corridors are proposed. Of these the two southernmost corridors (#1 and #2 – figure 1) will cross the runway centreline of Runway 08/26 (east/west) at approximately 2200m from the eastern end of the runway. Runway 08/26 is the primary runway and is equipped with lights and a non-precision instrument approach procedure. At the point where corridors 1 and 2 cross the runway centreline, the height of an obstacle (powerline) is restricted to approximately 19m above ground level. The protected airspace associated with an instrument approach procedure must remain obstacle free. On this basis neither of these two routes is considered viable due to the height restrictions.

The third proposed corridor (3# - figure 1) may be possible with height limitations imposed by the Obstacle Limitation Surface as it crosses the northern corner of the approach surface for the instrument approach. Negotiation with the Portland Aerodrome Operator, Glenelg Shire, and their aerodrome surveyor (Airport Survey Consultants) may permit this route to be acceptable, with some amendment.

The fourth, northernmost corridor remains clear of the *Inner Horizontal Surface,* but below the *Conical Surface* sections of the Portland Obstacle Limitation Surface and would allow towers of up to approximately 45m in height.

For an above ground transmission line, the northernmost corridor is the recommended one as it provides the maximum clearance from the protected airspace associated with the Portland Aerodrome.

The final proposed corridor must be discussed with the Portland Aerodrome Operator [Glenelg Shire Council] to ensure they are aware of any new obstacles, including during construction, and that the obstacles (towers and machinery) remain within acceptable clearance limits.

1. INTRODUCTION

Neoen Australia has requested Chiron Aviation Consultants to provide advice regarding the suitability of five proposed electricity transmission line corridors close to the Portland Aerodrome.

1.1 Location

The proposed corridors are shown in the drawing below.

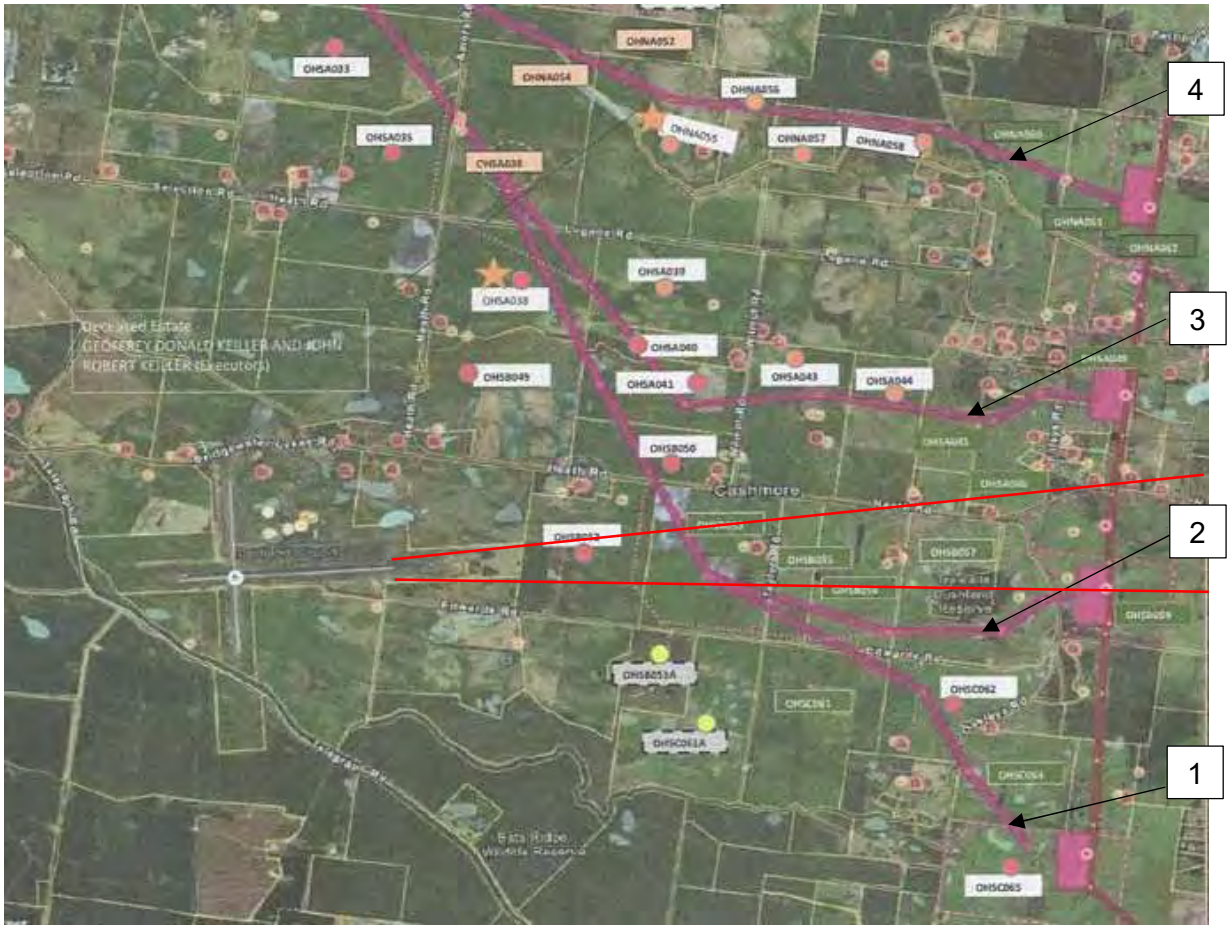


Figure 1 – Proposed Transmission Line Corridors[29]

The drawing shows the four proposed corridors in relation to the Portland Aerodrome. The corridors are numbered 1 to 4 starting at the south. The red lines are the approximate outline of the Instrument Approach prescribed airspace for the Runway 26 RNAV-Z Approach.

[29] Supplied by Neoen Australia

2. PORTLAND AERODROME (YPOD)

Portland (YPOD) is a Regulated Aerodrome with four runways. The main runway is 08/26 which is a sealed surface 1616m in length and 30m in width equipped with runway lighting and GNSS based non-precision instrument approach procedures. Runway 08/26 is suitable for day and night use. Runway 17/35 is a gravel surface 1180m in length and 30m in width, not equipped with lights and suitable for daytime use only. The aerodrome elevation is published as 265ft (81m) above the Australian Height Datum (AHD). The Glenelg Shire Council is the Portland Aerodrome operator.

2.1 Obstacle Limitation Surface (OLS)

YPOD has an Obstacle Limitation Surface associated with all four runways. Of importance is the Inner Horizontal Surface of the OLS. Each runway also has an Approach Surface. An Obstacle Limitation Surface limits the height of obstacles (including power transmission lines) to ensure an aircraft landing or taking off at the aerodrome con operate in obstacle free airspace.

2.2 OLS Description

An OLS is a conceptual (imaginary) surface associated with a runway, which identifies the lower limits of the aerodrome airspace above which an object becomes an obstacle to aircraft operations and must be reported to CASA. The term OLS refers to each of the imaginary surfaces which together define the lower boundary of the aerodrome airspace, as well as refer to the complex imaginary surface formed by combining all the individual surfaces.[30]

[30] Manual of Standards Part139 Aerodromes, Section 7, dated September 2019

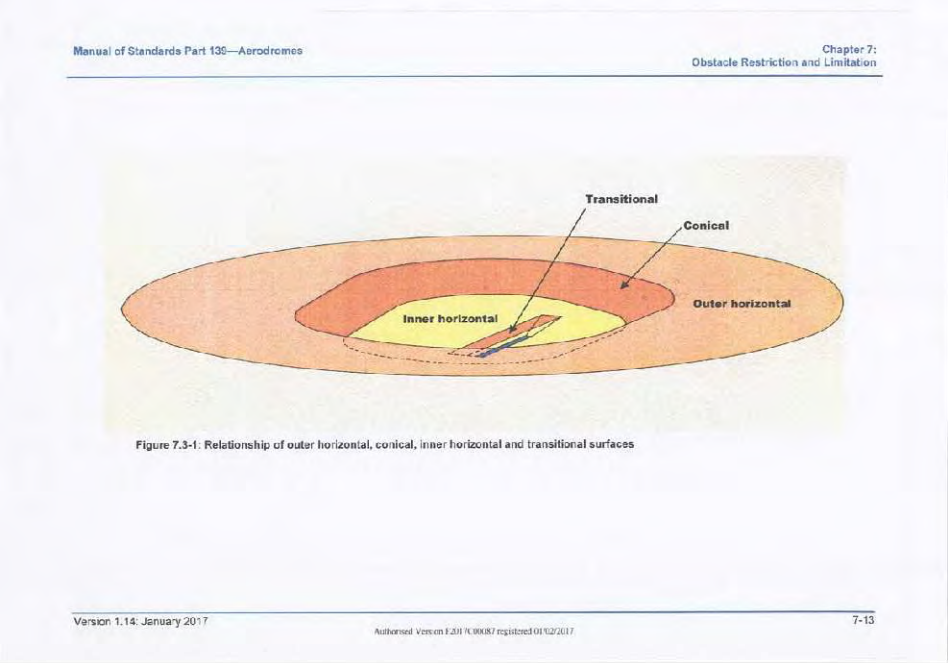


Figure 4 – An Obstacle Limitation Surface

2.3 Portland OLS

YPOD aerodrome elevation is 81m (265ft) AHD.

YPOD is a Code 3 aerodrome where the *Inner Horizontal Surface* is 4000m in radius with a height of 45m above the aerodrome elevation.

The *Conical Surface* has a slope of 5% out to a height of at least 75m above the *Inner Horizontal Surface.*

The *Outer Horizontal Surface* has a radius of 15000m and a height of 150m above the aerodrome elevation.

A copy of the Portland OLS chart is shown at Appendix A.

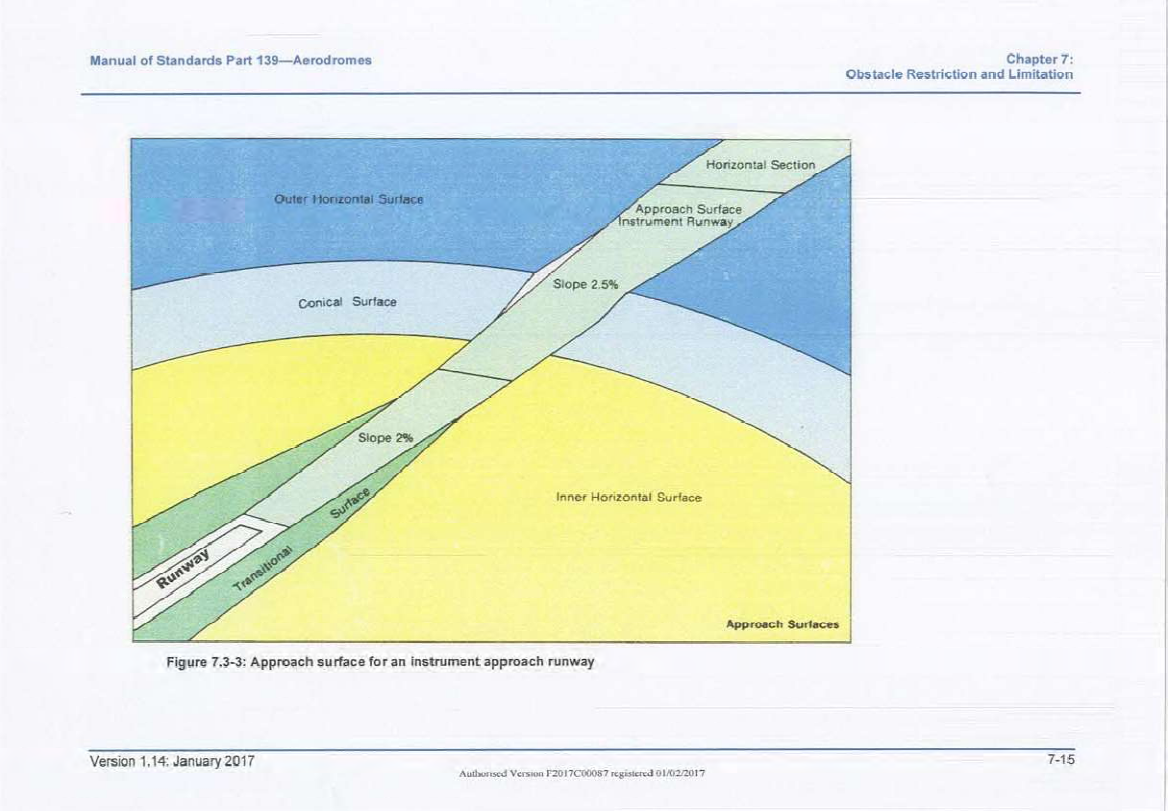


Figure 5 – The Approach Surface for RWY 08/26

As shown in Figure 5, the approach surface has two distinct sloping sections, the latter 2.5% slope is less than the 5% for the *Conical Surface* thus giving a potentially lower height surface.

2.4 Portland Instrument Approach Procedures

Portland Airport has Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) protected airspace and surfaces associated with the instrument approach procedures on both RWY 26 and RWY 08. PANS – OPS airspace must remain obstacle free. The PANS – OPS airspace is a further limitation of possible corridors and the height of transmission towers near the aerodrome.

3. PROPOSED HIGH VOLTAGE TRANSMISSION LINE CORRIDORS

The location of the proposed corridors is shown in Section 1, Figure 1.

3.1 Unsuitable Corridors

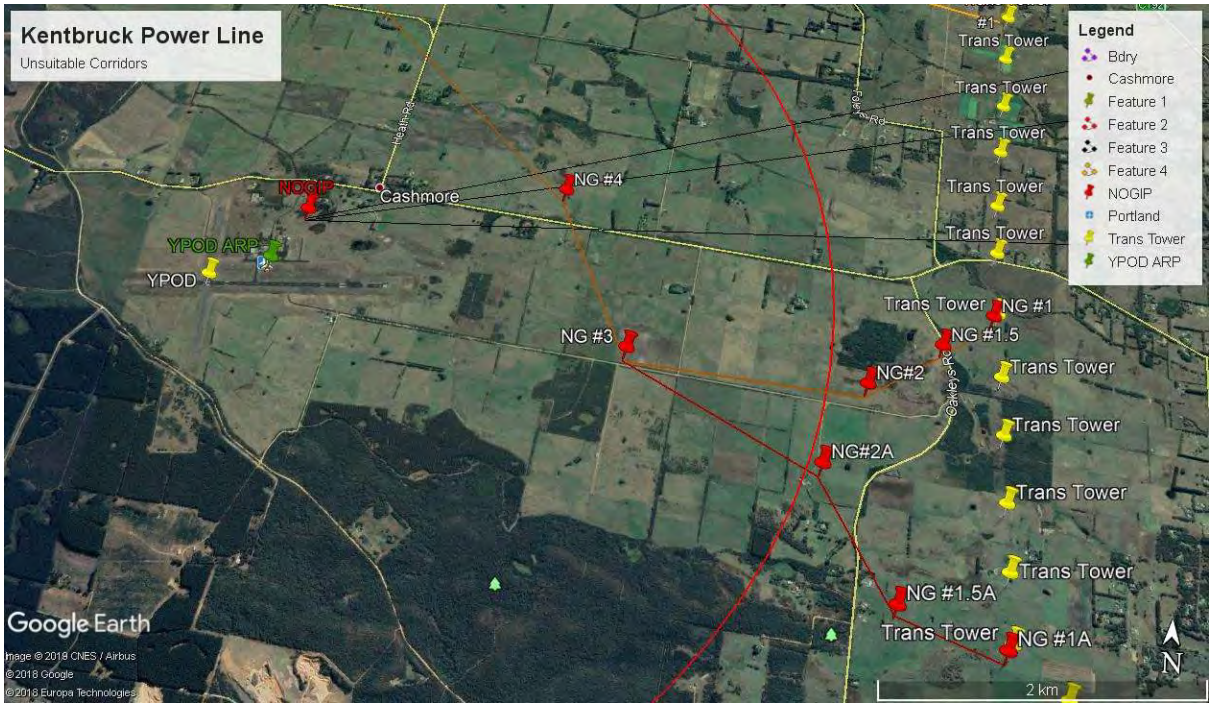


Figure 4 – Corridors 1 and 2 shown in relation to the YPOD OLS

Depicting these corridors against the YPOD OLS shows that corridors 1 and 2 cross the runway centreline within the 4000m *inner horizontal surface*. These two corridors also cross the transitional 2% slope of the *instrument approach surface*. The crossing point between NG#3 and NG#4 is approximately 1400m from the end of the runway. At this point the Obstacle Limitation Chart[31] shows the surveyed Reduced Level (RL) is 100m AHD. This equates to 100 – 81 = 19m AGL.

To remain below the *approach surface* the transmission line towers would be restricted to 19m or less in height.

3.2 Possible Corridors

Figure 5 shows corridors 3 and 4 against the YPOD OLS. Corridor 3 is below the *Inner Horizontal Surface*.

[31] Portland Aerodrome Obstacle Limitation Chart, Airport Survey Consultants, dated 21/10/2013. Supplied by Glenelg Shire.

Corridor 4 is beyond the inner horizontal surface and under the *Conical Surface* close to the 4000m inner horizontal surface.

Corridor 3 (Q #) crosses the northern corner of the *instrument approach surface* at approximately 4000m from the runway end and proceeds west under the *Inner Horizontal Surface.* To remain below the *Inner Horizontal Surface* at RL 123.5m AHD, the towers for corridor 3 would be limited to a height of 123.5 – 81 = 42.5m AGL.

Corridor 4 is beyond the *Inner Horizontal Surface* but remains under the sloping *Conical Surface*. This corridor provides for towers of up to 45m tall without infringing the OLS.

Corridor 4 remains clear of the *approach surface* for RWY 26.

There are no instrument approach surfaces associated with RWY 17.

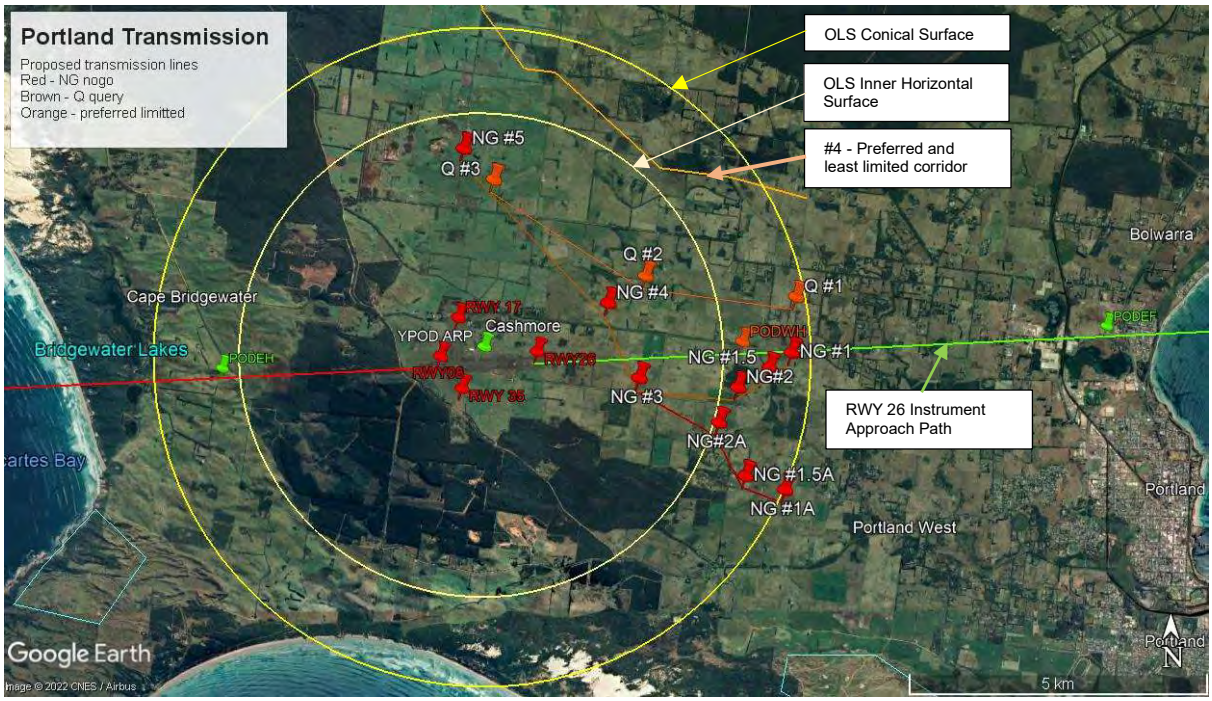


Figure 5 – Corridors 3 and 4 shown in relation to the YPOD OLS

4. RECOMMENDATION

The proposed transmission line corridors close to Portland Airport are restricted in height by the Obstacle Limitation Surface (OLS) and the Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) airspace of the aerodrome.

Any corridor within 5,500m of the aerodrome, particularly those that cross the runway centreline, will be constrained in tower height by the OLS and PANS-OPS surfaces.

Of the four corridors considered, the northern most route #4, is the least constrained as

it remains clear of the *Inner Horizontal Surface* but is under the *Conical Surface* which limits the height of the transmission towers to approximately 45m Above Ground Level.

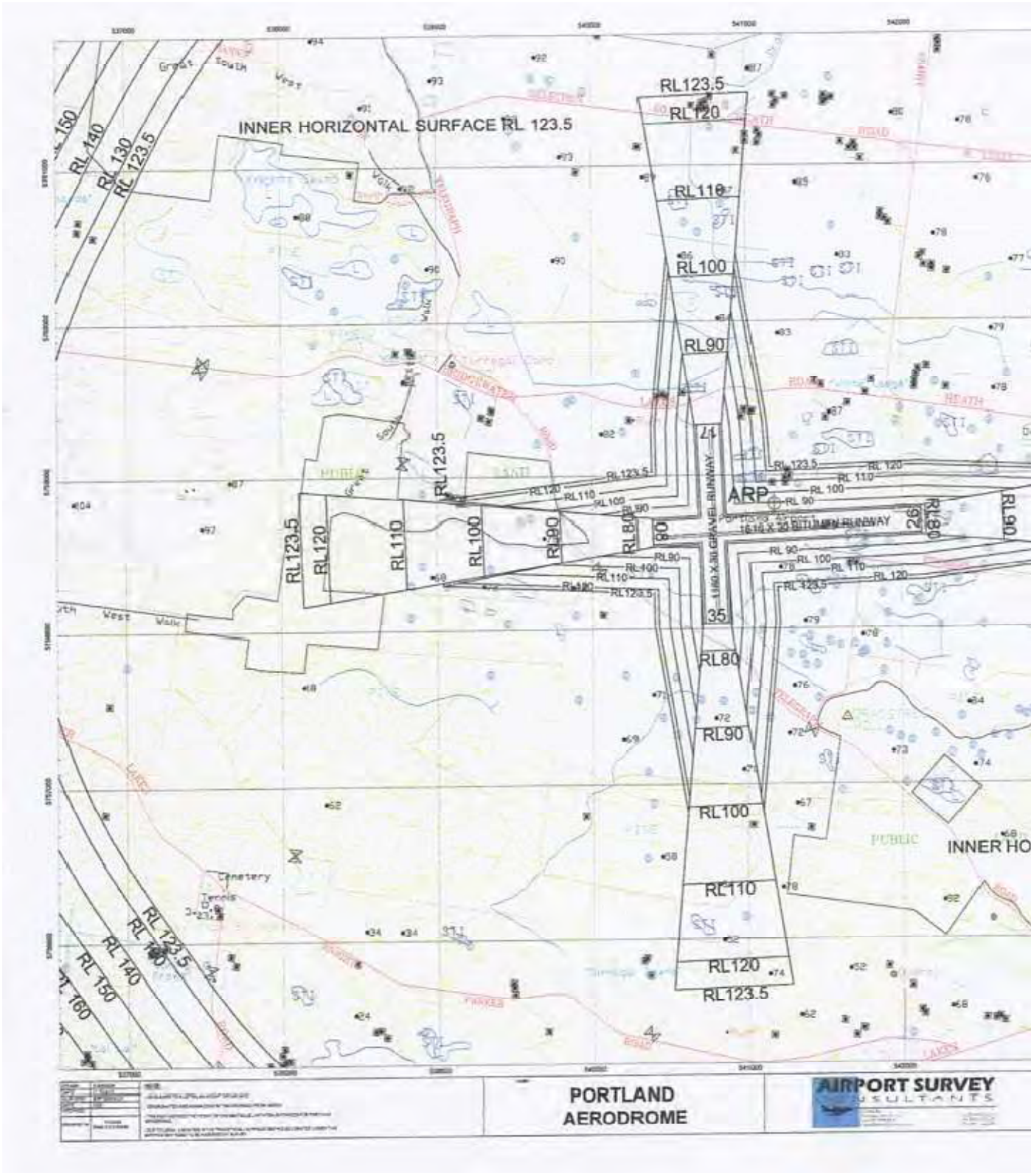
The second northern most corridor #3, may be possible if the height limit of 42.5m Above Ground Level is acceptable.

The two southern routes (#1 and #2) are unacceptable as they would penetrate the *instrument approach surface* as they cross the runway centreline.

Any proposed corridor near the aerodrome must be discussed with the Portland Aerodrome Operator to ensure they are aware of the new obstacles and that the obstacles are within acceptable clearances limits.

APPENDIX A

Portland Aerodrome Obstacle Limitation Chart


INNER HORIZONTAL SURFACE RL 123.5
RL123.5
RL120
RL110
RL100
RL90
RL80
ARP
PORTLAND
AERODROME
AIRPORT SURVEY

APPENDIX B

Glossary of Terms And Abbreviations

APPENDIX B

Glossary of Terms and Abbreviations

AERONAUTICAL STUDY GLOSSARY

To facilitate the understanding of aviation terminology used in this report, the following is a glossary of terms and acronyms that are commonly used in aeronautical impact assessments and similar aeronautical studies

AC (Advisory Circulars) are issued by CASA and are intended to provide recommendations and guidance to illustrate a means, but not necessarily the only means, of complying with the *Regulations*.

Aeronautical study is a tool used to review aerodrome and airspace processes and procedures to ensure that safety criteria are appropriate.

AHD (Australian Height Datum) is the datum to which all vertical control for mapping is to be referred. The datum surface is that which passes through mean sea level at the 30 tide gauges and through points at zero AHD height vertically below the other basic junction points.

AIP (Aeronautical Information Publication) is a publication promulgated to provide operators with aeronautical information of a lasting character essential to air navigation. It contains details of regulations, procedures and other information pertinent to flying and operation of aircraft. In Australia, the AIP may be issued by CASA or Airservices Australia.

Air routes exist between navigation aid equipped aerodromes or waypoints to facilitate the regular and safe flow of aircraft operating under Instrument Flight Rules (IFR).

Airservices Australia is the Australian government-owned corporation providing safe and environmentally sound air traffic management and related airside services to the aviation industry.

Altitude is the vertical distance of a level, a point or an object, considered as a point, measured from mean sea level.

AMSL (Above Mean Sea Level) is the elevation (on the ground) or altitude (in the air) of any object, relative to the average sea level datum. In aviation, the ellipsoid known as World Geodetic System 84 (WGS 84) is the datum used to define mean sea level.

ATC (Air Traffic Control) service is a service provided for the purpose of:

c. preventing collisions:

   1. between aircraft; and

   2. on the manoeuvring area between aircraft, vehicles and obstructions; and

d. expediting and maintaining an orderly flow of air traffic.

CASA (Civil Aviation Safety Authority) is the Australian government authority responsible under the *Civil Aviation Act 1988* for developing and promulgating appropriate, clear and concise aviation safety standards. As Australia is a signatory to the ICAO *Chicago Convention,* CASA adopts the

standards and recommended practices established by ICAO, except where a difference has been notified.

CASR (Civil Aviation Safety Regulations) are promulgated by CASA and establish the regulatory framework *(Regulations)* within which all service providers must operate.

Civil Aviation Act 1988 (the Act) establishes the CASA with functions relating to civil aviation, in particular the safety of civil aviation and for related purposes.

ICAO (International Civil Aviation Organization) is an agency of the United Nations which codifies the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth. The ICAO Council adopts standards and recommended practices concerning air navigation, its infrastructure, flight inspection, prevention of unlawful interference, and facilitation of border-crossing procedures for international civil aviation. In addition, the ICAO defines the protocols for air accident investigation followed by transport safety authorities in countries signatory to the Convention on International Civil Aviation, commonly known as the *Chicago Convention*. Australia is a signatory to the *Chicago Convention.*

IFR (Instrument Flight Rules) are rules applicable to the conduct of flight under IMC. IFR are established to govern flight under conditions in which flight by outside visual reference is not safe. IFR flight depends upon flying by reference to instruments in the flight deck, and navigation is accomplished by reference to electronic signals. It is also referred to as, “a term used by pilots and controllers to indicate the type of flight plan an aircraft is flying,” such as an IFR or VFR flight plan.

IMC (Instrument Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, less than the minimum specified for visual meteorological conditions.

LSALT (Lowest Safe Altitudes) are published for each low level air route segment. Their purpose is to allow pilots of aircraft that suffer a system failure to descend to the LSALT to ensure terrain or obstacle clearance in IMC where the pilot cannot see the terrain or obstacles due to cloud or poor visibility conditions. It is an altitude that is at least 1,000 feet above any obstacle or terrain within a defined safety buffer region around a particular route that a pilot might fly.

MOS (Manual of Standards) comprises specifications *(Standards)* prescribed by CASA, of uniform application, determined to be necessary for the safety of air navigation.

NASAG (National Airports Safeguarding Advisory Group) set up in May 2010 to implement the Australian Government’s National Aviation Policy White Paper, *Flight Path to the Future* initiatives relating to safeguarding airports and surrounding communities from inappropriate development. NASAG comprises representatives from state and territory planning and transport departments, the Civil Aviation Safety Authority (CASA), Airservices Australia, the Department of Defence and the Australian Local Government Association (ALGA) and is chaired by the Department of Infrastructure and Transport (DoIT).

NASF (National Airports Safeguarding Framework) is the published guidelines from the NASAG.

NOTAMs (Notices to Airmen) are notices issued by the NOTAM office containing information or instruction concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to persons concerned with flight operations.

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.

OLS (Obstacle Limitation Surfaces) are a series of planes associated with each runway at an aerodrome that defines the desirable limits to which objects may project into the airspace around the aerodrome so that aircraft operations may be conducted safely.

PANS-OPS (Procedures for Air Navigation Services - Aircraft Operations) is an Air Traffic Control term denominating rules for designing instrument approach and departure procedures. Such procedures are used to allow aircraft to land and take off under Instrument Meteorological Conditions (IMC) or Instrument Flight Rules (IFR). ICAO document 8168-OPS/611 (volumes 1 and 2) outlines the principles for airspace protection and procedure design which all ICAO signatory states must adhere to. The regulatory material surrounding PANS-OPS may vary from country to country.

PANS OPS Surfaces. Like an Obstacle Limitation Surface, the PANS-OPS protection surfaces are imaginary surfaces in space which guarantee the aircraft a certain minimum obstacle clearance. These surfaces may be used as a tool for local governments in assessing building development. Where buildings may (under certain circumstances) be permitted to penetrate the OLS, they cannot be permitted to penetrate any PANS-OPS surface, because the purpose of these surfaces is to guarantee pilots operating under IMC an obstacle free descent path for a given approach.

Protected airspace is an airspace specified in, or ascertained in accordance with, the Regulations, where it is in the interests of the safety, efficiency or regularity of existing or future air transport operations into or out of an airport for the airspace to be protected. The prescribed airspace for an airport is the airspace above any part of either an OLS or a PANS OPS surface for the airport and airspace declared in a declaration relating to the airport.

Regulations (Civil Aviation Safety Regulations)

VFR (Visual Flight Rules) are rules applicable to the conduct of flight under VMC. VFR allow a pilot to operate an aircraft in weather conditions generally clear enough to allow the pilot to maintain visual contact with the terrain and to see where the aircraft is going. Specifically, the weather must be better than basic VFR weather minima. If the weather is worse than VFR minima, pilots are required to use instrument flight rules.

VMC (Visual Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, equal or better than specified minima.

ABBREVIATIONS

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

Abbreviation	Meaning
AC	Advisory Circular (document support CASR 1998)
ACFT	Aircraft
AD	Aerodrome
AHD	Australian Height Datum
AHT	Aircraft height
AIP	Aeronautical Information Publication
Airports Act	Airports Act 1996, as amended
AIS	Aeronautical Information Service
ALA	Aircraft Landing Area
Alt	Altitude
AMSL	Above Minimum Sea Level
A(PofA)R	Airports (Protection of Airspace) Regulations, 1996 as amended
APARs	Airports (Protection of Airspace) Regulations, 1996 as amended
ARP	Aerodrome Reference Point
AsA	Airservices Australia
ATC	Air Traffic Control(ler)
ATM	Air Traffic Management
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
Cat	Category
DAP	Departure and Approach Procedures (charts published by AsA)
DER	Departure End of (the) Runway
DEVELMT	Development
DME	Distance Measuring Equipment
Doc nn	ICAO Document Number nn
DITRDC&A	Department of Infrastructure, Transport, Regional Development, Communications and the Arts.
ELEV	Elevation (above mean sea level)
ENE	East Northeast
ERSA	Enroute Supplement Australia
FAF	Final Approach Fix
FAP	Final Approach Point
ft	feet
GA	General Aviation
GNSS	Global Navigation Satellite System
GP	Glide Path
IAS	Indicated Airspeed

Abbreviation	Meaning
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IHS	Inner Horizontal Surface, an Obstacle Limitation Surface
ILS	Instrument Landing System
ISA	International Standard Atmosphere
km	kilometres
kt	Knot (one nautical mile per hour)
LAT	Latitude
LLZ	Localizer
LONG	Longitude
LSALT	Lowest Safe Altitude
m	metres
MAPt	Missed Approach Point
MDA	Minimum Descent Altitude
MGA94	Map Grid Australia 1994
MOC	Minimum Obstacle Clearance
MOS	Manual of Standards, published by CASA
MSA	Minimum Sector Altitude
SSR	Monopulse Secondary Surveillance Radar
MVA	Minimum Vector Altitude
NASAG	National Airports Safeguarding Advisory Group
NASF	National Airports Safeguarding Framework
NDB	Non Directional Beacon
NE	Northeast
NM or nm	Nautical Mile (= 1.852 km)
nnDME	Distance from the DME (in nautical miles)
NNE	North Northeast
NOTAM	NOtice To AirMen
OAS	Obstacle Assessment Surface
OCA	Obstacle Clearance Altitude
OCH	Obstacle Clearance Height
OHS	Outer Horizontal Surface
OIS	Obstacle Identification Surface
OLS	Obstacle Limitation Surface
PANS-OPS	Procedures for Air Navigation Services – Aircraft Operations, ICAO Doc 8168
PRM	Precision Runway Monitor
PROC	Procedure
PSR	Primary Surveillance Radar
QNH	An altimeter setting relative to height above mean sea level
Rnnn	Restricted Airspace – promulgated in AIP as R with 3 numbers
REF	Reference
RL	Relative Level

Abbreviation	Meaning
RNAV	aRea NAVigation
RNP	Required Navigation Performance
RPA	Rules and Practices for Aerodromes — replaced by the MOS Part 139 — Aerodromes
RPT	Regular Public Transport
RWY	Runway
SFC	Surface
SID	Standard Instrument Departure
SOC	Start Of Climb
SSR	Secondary Surveillance Radar
STAR	Standard ARrival
TAR	Terminal Area Radar
TAS	True Air Speed
THR	Threshold (Runway)
TNA	Turn Altitude
TODA	Take-Off Distance Available
VFR	Visual Flight Rules
V_n	aircraft critical Velocity reference
VOR	Very high frequency Omni directional Range
YPOD	Portland Aerodrome
YMTG	Mount Gambier Aerodrome