

MachairWind Offshore Windfarm

Appendix 15.1 Airspace Analysis and Radar Modelling



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10 September 2025

CL-6026-RPT-003 DB

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Document Information	
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Document reference and Version	CL-6026-RPT-003 DB
Date of release	10 September 2025

Change History Record

Issue	Change Reference	Date	Details
DA	Initial draft	08 August 2025	Initial draft
DB	2 nd draft	10 September 2025	Removed 'Red Line Boundary' terminology

Abbreviations

AARA	Air-to-Air Refuelling Area
AD	Air Defence
AIP	Aeronautical Information Publication
AMA	Area Minimum Altitude
amsl	above mean sea level
ATC	Air Traffic Control
ATS	Air Traffic Service
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
DA	Danger Area
DTM	Digital Terrain Model
EIAR	Environmental Impact Assessment Report
FIR	Flight Information Region
FL	Flight Level
ft	feet
GIS	Geographic Information System
HIAL	Highlands and Islands Airports Limited
IAC	Instrument Approach Chart
IFP	Instrument Flight Procedure
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
km	kilometres
m	metres
MCA	Maritime and Coastguard Agency
MGN	Marine Guidance Note
MOD	Ministry of Defence
MSA	Minimum Sector Altitude
NATS	National Air Traffic Services
NERL	NATS (En Route) plc
nm	nautical miles
NOTAM	Notice to Aviation
OREI	Offshore Renewable Energy Installation
PSR	Primary Surveillance Radar

RLoS	Radar Line of Sight
RNP	Required Navigation Performance
RRH	Remote Radar Head
RWY	Runway
SAR	Search and Rescue
SSR	Secondary Surveillance Radar
SUA	Special Use Airspace
TAA	Terminal Arrival Altitude
TMZ	Transponder Mandatory Zone
UK	United Kingdom
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
WDA	Windfarm Development Area
WTG	Wind Turbine Generator

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- [1] CAA (2025). UK Aeronautical Information Publication. Available at: <https://nats-uk.ead-it.com/cms-nats/opencms/en/Publications/AIP/> [Accessed 7 May 2026].
- [2] CAA (2016). CAP 764: Policy and Guidelines on Wind Turbines. Available at: <https://www.caa.co.uk/our-work/publications/documents/content/cap-764/> [Accessed 7 May 2026].
- [3] MCA (2021). MGN 654 Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response. Available at: <https://www.gov.uk/government/publications/mgn-654-mf-offshore-renewable-energy-installations-orei-safety-response> [Accessed 7 May 2026].

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1. Introduction

1.1. Overview

- 1.1.1. This document is an appendix to **Chapter 15 Military and Civil Aviation** of the MachairWind Offshore Windfarm ('the Project') Environmental Impact Assessment (EIA) Report (EIAR). It provides detailed airspace analysis and radar modelling and outlines potential mitigation options where required.
- 1.1.2. The Project's Windfarm Development Area (WDA) is located off the west coast of Scotland, to the northwest of Islay and west of Colonsay and would comprise up to 144 Wind Turbine Generators (WTGs) on fixed foundations.

1.2. Impacts of WTGs on Aviation

- 1.2.1. WTGs can be problematic for aviation Primary Surveillance Radars (PSRs) as the characteristics of a moving WTG blade are like an aircraft. The PSR is unable to differentiate between wanted aircraft targets and clutter targets introduced by the presence of WTGs.
- 1.2.2. Secondary Surveillance Radars (SSRs) are less affected by WTGs, but turbine towers can cause physical blanking and diffracting effects and reflections can result in the SSR outputting false targets.
- 1.2.3. The Met Office have a network of radars throughout the United Kingdom (UK) which are used to monitor the weather. WTGs can block radar signals, and the rotation of WTG blades can create clutter and affect Doppler data and wind field measurements.
- 1.2.4. The significance of any radar impacts depends on the airspace usage and the nature of the Air Traffic Service (ATS) provided in that airspace. The classification of the airspace in the vicinity of the Project and the uses of that airspace (civil and military) are set out in this document. WTGs can also have a direct impact on airspace due to their physical presence. The airspace analysis considers the impact WTGs could have as obstacles for aviation activities such as military low flying, Search and Rescue (SAR) operations, and helicopters used in support of lighthouse servicing.
- 1.2.5. Radar impacts may be mitigated by either operational or technical solutions, or a combination of both. In either case, the efficacy and acceptability of any operational and / or technical mitigation options available can only be determined through consultation with the radar operators and ATS providers.
- 1.2.6. Engagement with key aviation stakeholders has been undertaken and this is detailed in **Chapter 15 Military and Civil Aviation, Section 15.3.**

1.3. Technical Data

1.3.1. Radar Data

- 1.3.1.1. All radar parameters used in the assessment have been taken from data held on file by Cyrrus.

1.3.2. Windfarm Development Area

- 1.3.2.1. The WDA is shown in **Figure 1**.

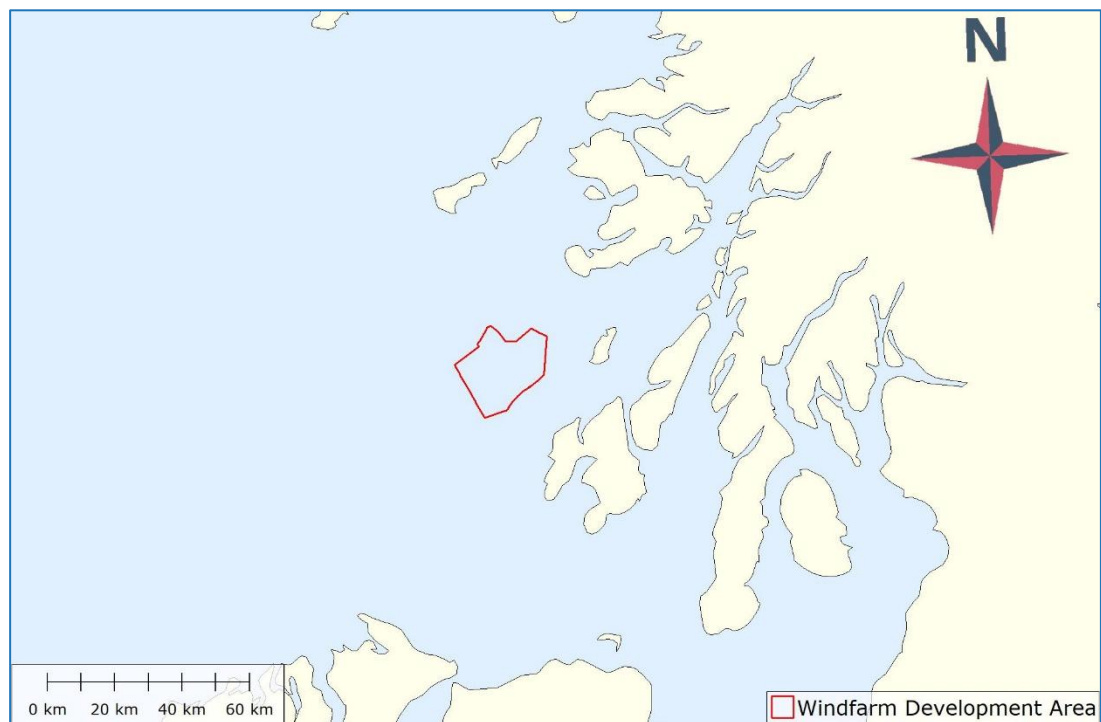


Figure 1 Windfarm Development Area

1.3.3. Wind Turbine Generators

- 1.3.3.1. Three categories of WTG are under consideration for the aviation assessment with various rotor diameters and tip heights. The design parameters for these WTGs are shown in **Table 1**.

Parameter	Wind Turbine Generators		
	Smallest	Mid-Range	Largest
Max rotor diameter	236 metres (m)	276 m	290 m
Max blade tip height above mean sea level (amsl) ¹	278 m	318 m	333 m

¹ Figures rounded up from exact parameters, as detailed in **Table 3.13** of **Chapter 3 Project Description**

Parameter	Wind Turbine Generators		
	Smallest	Mid-Range	Largest
Max number of WTGs	144	97	91

Table 1 WTG Design Parameters

1.3.3.2. Indicative proposed layouts (even spread) for the smallest and largest WTGs are shown in **Figure 2** and **Figure 3** respectively. The indicative locations of two Offshore Substation Platforms are also depicted.

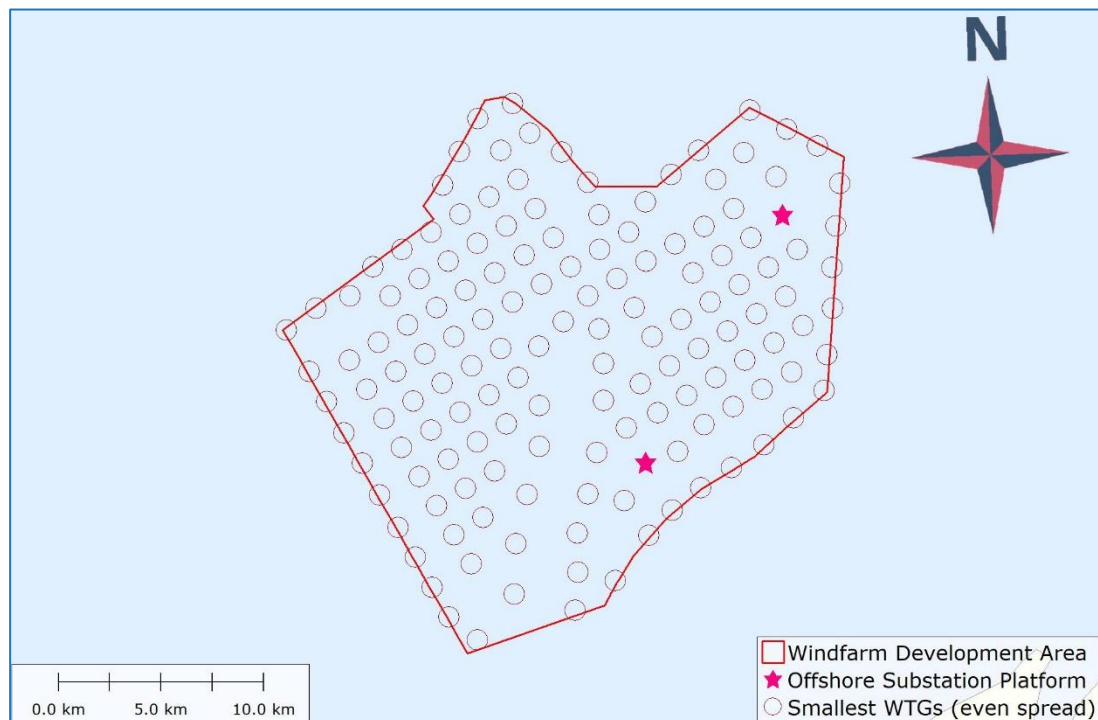


Figure 2 Indicative WTG Proposed Even Spread Layout – Smallest WTGs

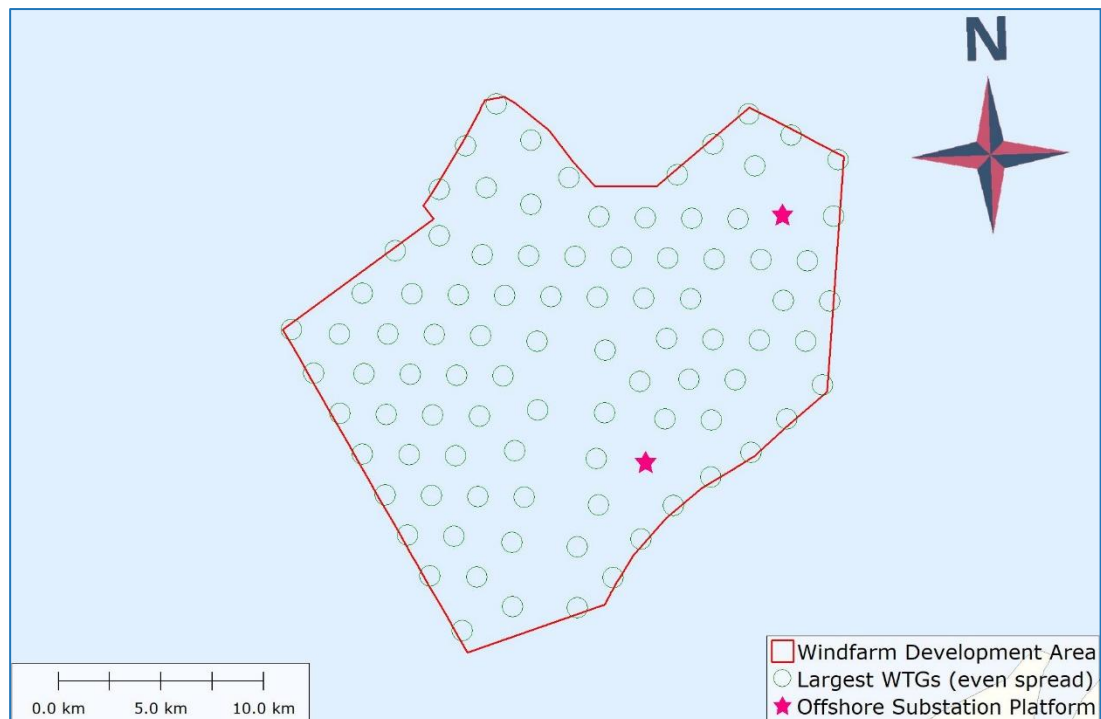


Figure 3 Indicative WTG Proposed Even Spread Layout – Largest WTGs

1.3.4. Terrain Data

1.3.4.1. The following terrain data is used for the radar modelling:

- NextMap Great Britain 25 m Digital Terrain Model (DTM).

1.3.5. Analysis Tools

1.3.5.1. The following software is used for the airspace analysis and radar modelling:

- Blue Marble Global Mapper V26.1.3 Geographic Information System (GIS).

1.3.6. Mapping Datum

1.3.6.1. UTM Zone 29N (ETRS89 datum) is used as a common working datum for all mapping and geodetic references.

1.3.6.2. Where necessary, mapping datum transformations are made using Global Mapper or Grid Inquest II Coordinate Transformation Program.

1.3.6.3. All heights stated in this document are above mean sea level (amsl) (Newlyn datum) unless otherwise stated.

2. Airspace Analysis

2.1. Introduction

- 2.1.1. This analysis is a review of potential impacts on aviation arising from the presence of WTGs located within the WDA. Airspace altitudes are expressed in feet (ft), so for the purposes of this assessment a maximum blade tip height of 1,100 ft amsl for the WTGs has been assumed, the equivalent of 333 m rounded up to the nearest 100 ft.
- 2.1.2. All airspace data has been referenced from the UK Aeronautical Information Publication (AIP) available online from source and is therefore the latest information available (Civil Aviation Authority (CAA), 2025) ^[1].
- 2.1.3. The purpose of this assessment is to identify areas of potential impact; it does not draw any conclusions. Likely significant effects on airspace receptors are assessed in **Chapter 15 Military and Civil Aviation, Section 15.10**.

2.2. Scope

- 2.2.1. The scope of the assessment includes the WDA and the surrounding airspace within 60 nautical miles (nm) relating to aviation, its use and potential impacts. The types of airspace and limitations on its use are identified.

2.3. Airspace Classification

- 2.3.1. In general, airspace can be characterised as either controlled or uncontrolled airspace. Aircraft in controlled airspace are being positively managed by Air Traffic Control (ATC) the entire time they are within that designated area (i.e. ATC are controlling the aircraft as opposed to providing advice and information on other traffic). This type of airspace is generally used by airlines and corporate aviation. Aircraft in uncontrolled airspace are operating within a framework of rules but are not being controlled by ATC, although many pilots flying in this environment may choose to report their position, altitude, and intentions to ATC to benefit from the enhanced situational awareness that brings. Users of this airspace tend to be small aircraft engaged in training or private (social) flying.
- 2.3.2. In addition, Special Use Airspace (SUA) is airspace designated for specific operations, such as military training or exercises, such that limitations on airspace access may be imposed on other non-participatory aircraft. Examples of such airspace are Prohibited Areas, Restricted Areas or Danger Areas (DAs).
- 2.3.3. There are five classes of airspace in the UK, namely Classes A, C, D, E and G. Classes A to E are types of controlled airspace, while Class G is uncontrolled airspace. Class A is the most strictly regulated controlled airspace whereby aircraft are positively controlled by ATC, compliance with ATC clearance is mandatory, and aircraft are flown and navigated solely with reference to aircraft instruments. Certain onboard equipment is also a prerequisite. Aircraft in controlled airspace may be required to fly along ATS Routes, a network of airways that aircraft navigate via a combination of ground-based electronic aids and Global Navigation Satellite System waypoints. Flight in Class G airspace is generally visual, meaning pilots fly and navigate with reference to the natural horizon and terrain features they see

outside. Pilots are required to maintain minimum distances from notified obstacles, including WTGs, and may only fly within the minimum weather and visibility criteria.

2.4. Aircraft Vertical Reference

- 2.4.1. An aircraft's vertical reference above the ground or sea can either be an altitude amsl or, above a designated altitude, a Flight Level (FL). An aircraft's altitude, expressed in feet, is based on the last known verified local barometric pressure while a FL, expressed in 100 ft increments, is based on a common international barometric pressure setting of 1013.2 hectopascals. With aircraft using a common vertical datum safe separation can be achieved by either ATC or between pilots of different aircraft.
- 2.4.2. The airspace where vertical reference changes from altitude to FL and vice versa is known as the Transition Layer and consists of a (lower) Transition Altitude and (higher) Transition Level. In UK airspace the Transition Altitude is set at 3,000 ft amsl except in certain specified airspace where it is higher.
- 2.4.3. The vertical limits of airspace are defined in terms of either altitudes or FLs, with airspace commonly having a lower limit expressed as an altitude and an upper limit expressed as a FL.

2.5. Current Airspace Baseline

- 2.5.1. The WDA lies within the Scottish Flight Information Region (FIR), which is airspace that is regulated by the UK CAA. The Scottish FIR is adjacent to the Shannon FIR and the Shanwick Oceanic FIR, airspace regulated by the Irish Aviation Authority and UK CAA respectively. The boundary between the Scottish FIR and the Shannon FIR is approximately 62 kilometres (km) southwest (as shown in **Figure 4**) and between the Scottish FIR and the Shanwick Oceanic FIR is approximately 192 km west of the WDA at its closest points.
- 2.5.2. National Air Traffic Services (NATS) (En Route) plc (NERL) provides en route civil ATS within the Scottish FIR, supported by a network of radar facilities which provide information on airborne traffic for both civil and military ATC.
- 2.5.3. Immediately surrounding the WDA is uncontrolled Class G airspace, extending vertically from sea level to FL 195 (approximately 19,500 ft amsl). This airspace is used by both civil and military aircraft, predominantly for low-level flight operations and generally by aircraft flying under Visual Flight Rules (VFR).
- 2.5.4. Aircraft operate under one of two flight rules: VFR or Instrument Flight Rules (IFR). VFR flight is permitted when the weather satisfies Visual Meteorological Conditions (VMC) and is conducted with visual reference to the natural horizon. VMC are weather conditions expressed in terms of visibility, distance from cloud, and cloud ceiling height equal to or better than specified minima. When flying under VFR the pilot is responsible for maintaining a safe distance from terrain, obstacles, and other aircraft.
- 2.5.5. Aircraft must be flown under IFR in Class A controlled airspace and in other classes of airspace when weather restricts visibility, known as Instrument Meteorological Conditions (IMC). IMC exists when the weather conditions are less than the minima specified for VMC. IFR flight requires reference solely to aircraft instrumentation.

- 2.5.6. Above FL 195 all airspace within the Scottish FIR is notified as Class C controlled airspace. The airspace between FL 245 (approximately 24,500 ft amsl) and FL 660 (approximately 66,000 ft amsl) is known as the Upper Airspace Control Area and is designated as Free Route Airspace. Within Free Route Airspace the ATS route structure is removed, allowing aircraft to flight plan their own routes between specific airspace entry, exit and published intermediate waypoints.
- 2.5.7. Laterally, the closest controlled airspace to the WDA is the Argyll Control Area (Argyll CTA). The Argyll CTA comprises CTAs 1 to 5. CTAs 1 to 3 are Class E airspace, while CTAs 4 and 5 are above FL 195 and are therefore Class C airspace. Argyll CTA 2 extends vertically from FL 115 (approximately 11,500 ft amsl) to FL 195 and is the nearest element to the WDA, approximately 19 km to the north. Argyll CTA 2 facilitates air traffic transiting along Lower ATS Routes L602 and Y958. Scottish FIR airspace up to FL 195 in the vicinity of the WDA is depicted in **Figure 4**.

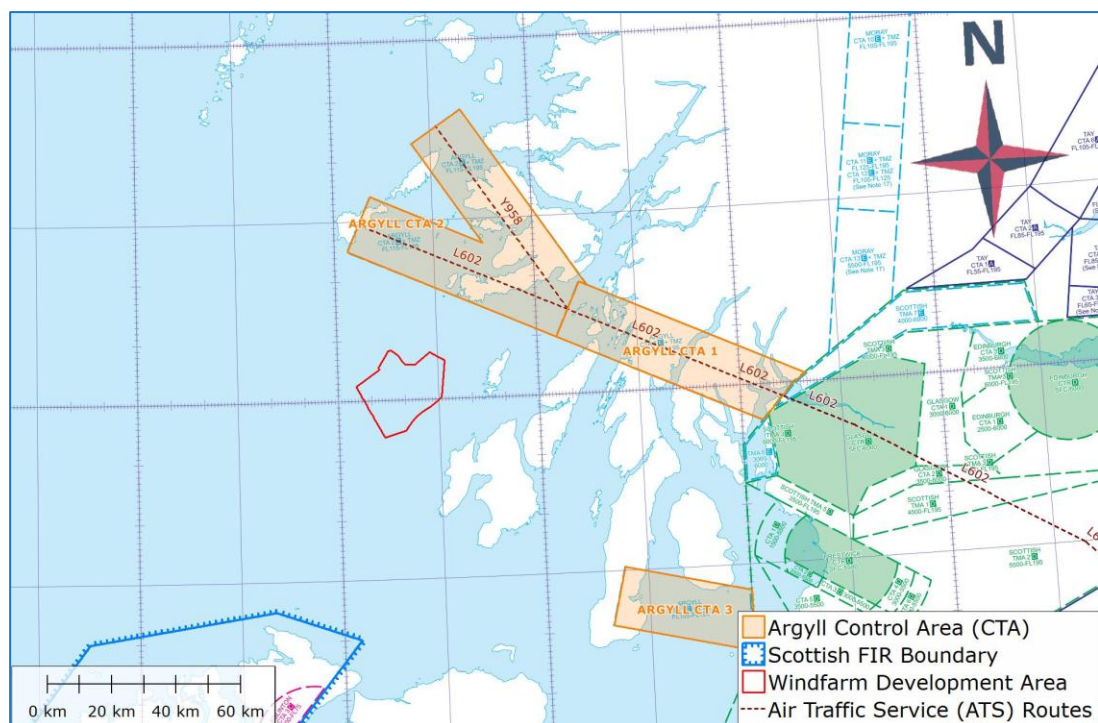


Figure 4 Scottish FIR Airspace up to FL 195

- 2.5.8. Argyll CTAs 1 to 3 are Transponder Mandatory Zones (TMZs). Within a TMZ the carriage and operation of aircraft transponder equipment is necessary. This enables such aircraft to be detected and tracked by SSR facilities.
- 2.5.9. Given the maximum blade tip height of 1,100 ft amsl and the base of controlled airspace in the vicinity of the WDA, WTG structures would have no impact on aircraft operations within controlled airspace.

2.6. Special Use Airspace (SUA)

- 2.6.1. Above the northern boundary of the WDA is the Fast Jet Area South DA, EGD713, as shown in **Figure 5**. This DA has vertical limits from FL 245 to FL 550 (approximately 24,500 to 55,000 ft amsl) and is used solely in support of Exercise Joint Warrior, a biannual multinational military training exercise that takes place in the spring and autumn. High energy manoeuvres and ordnance, munitions and explosives activities take place within EGD713.
- 2.6.2. The next nearest DAs to the WDA are the Hebrides DAs, comprising EGD701A to EGD701Y and EGD704, 51 km to the west of the WDA at the closest point (see **Figure 5**). Hebrides EGD701 airspace extends vertically from the surface to an unlimited upper limit, while Hebrides EGD704 airspace extends from the surface to an upper limit of 10,000 ft amsl. Activities within the Hebrides DAs may include target towing, unmanned aircraft systems, high energy manoeuvres, ordnance, munitions and explosives, parachute dropping, balloons and electronic/optical hazards.
- 2.6.3. DA airspace is not permanently active but rather is activated on request and notified by appropriate agencies such as the Ministry of Defence (MOD) or CAA through the issue of a NOTAM (Notice to Aviation).
- 2.6.4. Also shown in **Figure 5** is an Air-to-Air Refuelling Area (AARA) known as AARA Area 14, 14 km west of the WDA. Area 14 has vertical limits from FL 180 to FL 240 (approximately 18,000 to 24,000 ft amsl). Within AARA airspace, fuel is transferred from tanker aircraft to receiver aircraft under a Radar Control Service provided by military controllers based at Swanwick.

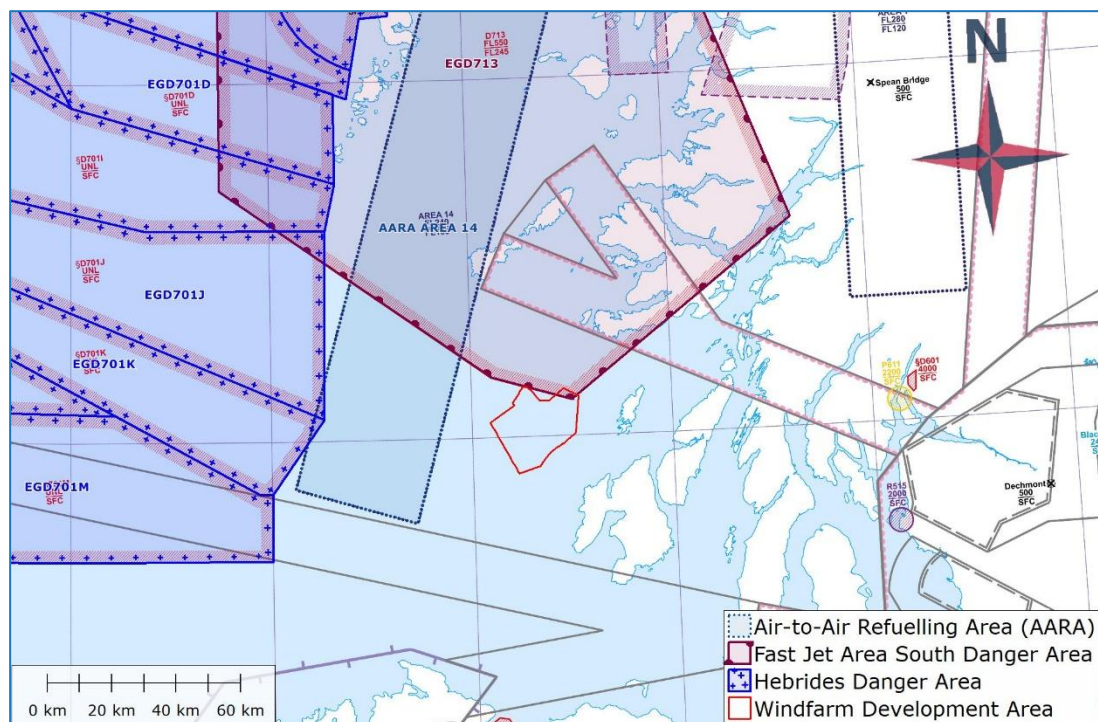


Figure 5 SUA

2.7. Offshore Helidecks

- 2.7.1. To help achieve a safe operating environment, a 9 nm (16.7 km) consultation zone for planned obstacles exists around offshore helicopter destinations. As detailed in Civil Aviation Publication (CAP) 764: Policy and Guidelines on Wind Turbines (CAA, 2016) ^[2], within 9 nm, obstacles such as WTGs can potentially impact upon the feasibility of helicopters to safely fly low visibility or missed approach procedures at the associated helideck site.
- 2.7.2. There are no offshore oil and gas helidecks within 9 nm of the WDA. However, the Dubh Artach lighthouse is in the vicinity of the WDA northern boundary and has an associated helipad adjacent to the tower that is just above sea level. Helicopter access is only available at low tide. Normal lighthouse helicopter support operations are conducted under day VFR. The WDA northern boundary has been refined to provide a 2 nm (3.7 km) buffer around the Dubh Artach helipad, as shown in **Figure 6**. This buffer was at the request of the Northern Lighthouse Board and, as assessed within **Appendix 15.2 Dubh Artach Lighthouse Technical Note**, is considered sufficient for helicopter operations to continue at the Dubh Artach Lighthouse with the Project constructed.

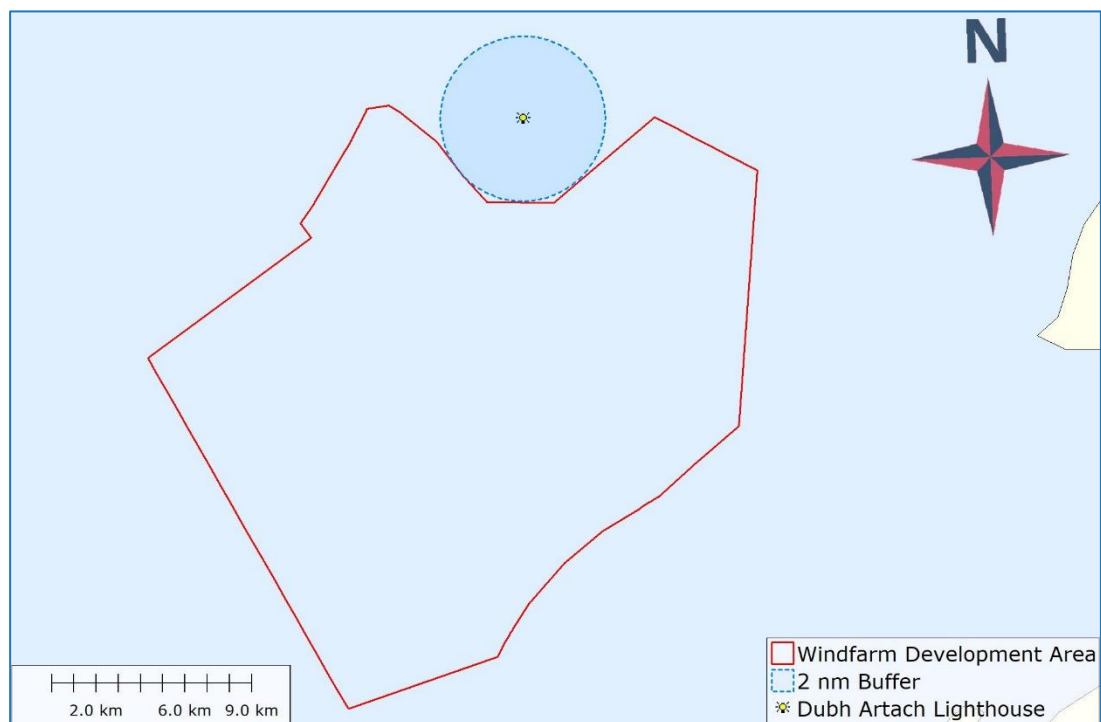


Figure 6 Dub Artach Lighthouse

2.8. Search and Rescue (SAR)

- 2.8.1. SAR operations are a highly specialised undertaking involving not only aviation assets, but also small boats, ships, and shore-based personnel. SAR operations are generally carried out in extremely challenging conditions and at all times of the day and night. There are ten helicopter SAR bases, incorporating 22 aircraft, around the UK with Bristow Helicopters currently providing helicopters and aircrew on behalf of the Maritime and Coastguard Agency (MCA).
- 2.8.2. The nearest SAR base is at Prestwick Airport, 130 km east-southeast of the WDA. Its helicopters provide rescue services for both offshore and onshore incidents up to approximately 460 km from their base.
- 2.8.3. The random nature of people, watercraft or aircraft in distress makes it very difficult to determine the routes taken by SAR aircraft. Fixed wing SAR aircraft would tend to stay at higher altitudes in a command-and-control role during major incidents, whilst helicopters would be used in a low-level role, sometimes in support of small rescue boats.
- 2.8.4. For SAR operations to be carried out safely and efficiently, the Project would be designed in accordance with MCA requirements regarding WTG spacing, marking and lighting as detailed in Marine Guidance Note (MGN) 654 Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021) ^[3].

2.9. Minimum Altitudes and Obstacle Clearance

- 2.9.1. An Instrument Flight Procedure (IFP) is a detailed, pre-defined set of instructions that pilots use to navigate an aircraft, primarily relying on instruments rather than visual references and especially in conditions where visibility is limited. Many airports publish Instrument Approach Charts (IACs) which are IFPs that pilots follow to enable them to approach and land at an airport under IFR.
- 2.9.2. IACs have associated Minimum Sector Altitudes (MSAs) which define the minimum safe altitude an aircraft can descend to within a sector of radius 25 nm (46.3 km). These sectors provide vertical obstacle clearance protection of at least 1,000 ft to aircraft within that area. This allows pilots of aircraft flying under IFR the reassurance of properly designated obstacle and terrain clearance protection whilst making an approach and landing at an airport in IMC.
- 2.9.3. The nearest airports to the WDA with published IFP charts are Islay Airport, 36 km to the southwest, and Tiree Airport, 41 km to the north. Both airports are owned and maintained by Highlands and Islands Airports Limited (HIAL).

2.10. Islay Airport

- 2.10.1. Islay is located just off the West Coast in Argyll and Bute. Islay Airport operates daily flight to and from Glasgow, Colonsay and Oban and is also used for air ambulances.
- 2.10.2. There are two IACs for Islay Airport published in the AIP: RNP (Required Navigation Performance) RWY (Runway) 12 and RNP RWY 30. The 25 nm (46.3 km) radius MSA associated with these IACs extends over the WDA with a minimum safe altitude of 2,600 ft amsl. With a maximum blade tip height of 1,100 ft amsl for WTGs within the WDA, the MSA would provide more than the required minimum of 1,000 ft vertical clearance above these obstacles.
- 2.10.3. In addition to the MSA, Terminal Arrival Altitudes (TAAs) are associated with RNP procedures. These provide the same 1,000 ft vertical obstacle clearance but are more specific to the 'entry' points into the RNP procedure. The northwestern TAA sector for RNP RWY 12 is 1,900 ft amsl and is shown in **Figure 7** along with a 5 nm obstacle buffer. This buffer is applied when validating the TAA against the highest known obstacles. WTGs within the WDA with a maximum blade tip height of 1,100 ft amsl would require the TAA to be increased to 2,100 ft amsl to maintain the minimum required 1,000 ft obstacle clearance protection.

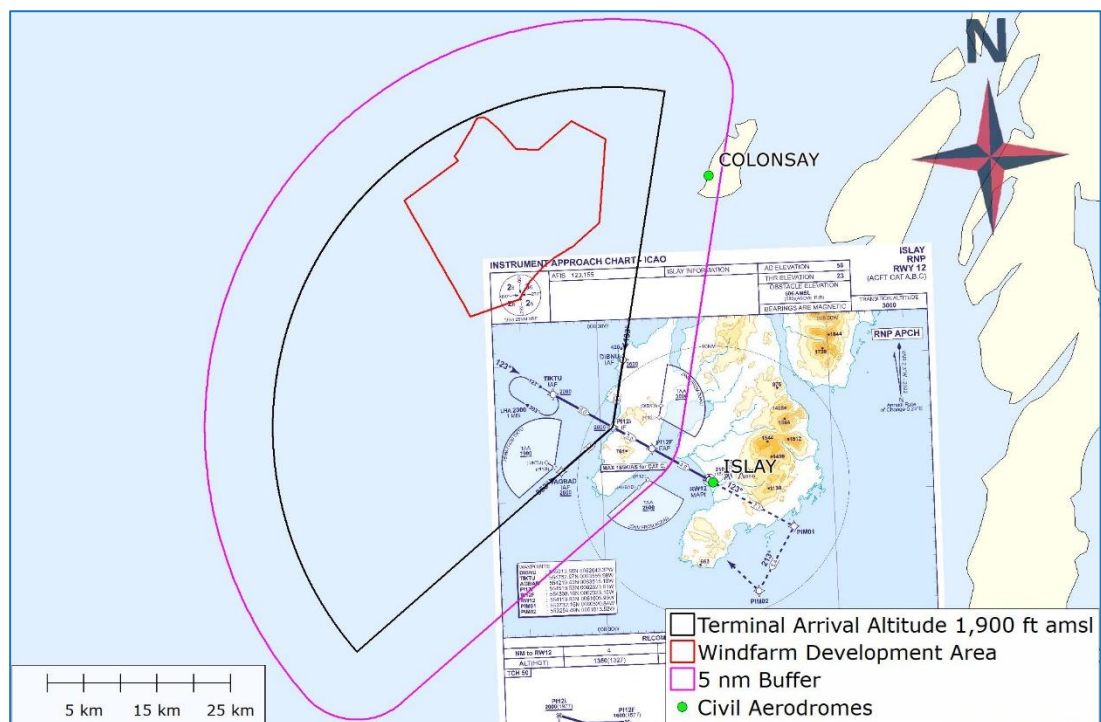


Figure 7 Islay RNP RWY 12

- 2.10.4. The northern and western TAA sectors for RNP RWY 30 also extend across the WDA; however, the minimum TAA is 2,900 ft amsl, which would provide more than the required 1,000 ft obstacle clearance above 1,100 ft amsl tip height WTGs within the WDA.

2.11. Tiree Airport

- 2.11.1. Tiree is the most westerly island in the Inner Hebrides. Tiree Airport operates daily flights to and from Glasgow, Coll and Oban.
- 2.11.2. There are two IACs for Tiree Airport published in the AIP: RNP RWY 05 and RNP RWY 23. The 25 nm (46.3 km) radius MSA associated with these IACs extends over the WDA with a minimum safe altitude of 4,200 ft amsl. With a maximum blade tip height of 1,100 ft amsl for WTGs within the WDA, the MSA would provide more than the required minimum of 1,000 ft vertical clearance above these obstacles.
- 2.11.3. The eastern and southwestern TAA sectors for RNP RWY 05 extend across the WDA. The eastern TAA sector is 2,800 ft amsl, which would provide more than the required 1,000 ft obstacle clearance above 1,100 ft amsl tip height WTGs within the WDA. The southwestern TAA sector, depicted in **Figure 8** along with a 5 nm obstacle buffer, is 1,500 ft amsl. WTGs within the WDA with a maximum blade tip height of 1,100 ft amsl would require the TAA over the WDA to be increased to 2,100 ft amsl to maintain the minimum required 1,000 ft obstacle clearance protection.

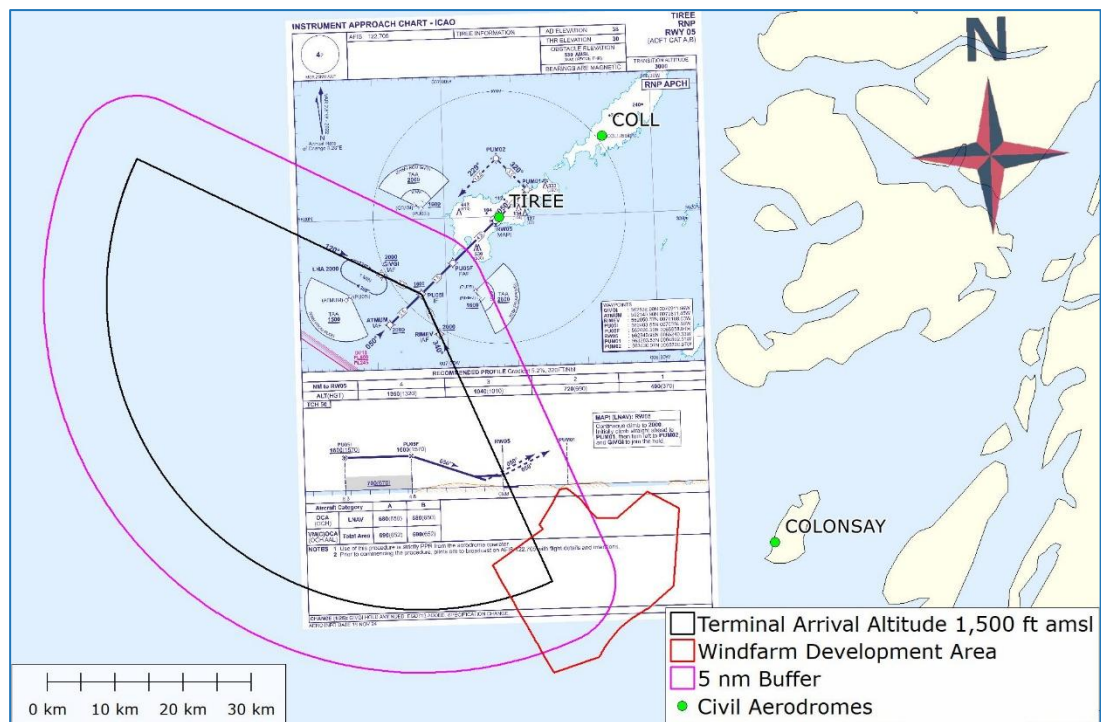


Figure 8 Tiree RNP RWY 05

- 2.11.4. The northeastern and southern TAA sectors for RNP RWY 23 also extend across the WDA; however, the minimum TAA is 4,200 ft amsl, which would provide more than the required 1,000 ft obstacle clearance above 1,100 ft amsl tip height WTGs within the WDA.
- 2.11.5. The IFPs for Islay and Tiree have numerous other associated obstacle protection surfaces in addition to the TAAs which would require a full assessment by an Approved Procedure Design Organisation to understand all the potential impacts of the Project and what mitigations may be available.

2.12. Area Minimum Altitudes

- 2.12.1. A chart of Area Minimum Altitudes (AMAs) across the London and Scottish FIRs is published in the AIP. An AMA provides a minimum obstacle clearance of 1,000 ft within a specified area formed by lines of latitude and longitude in half degree steps. This provides pilots of aircraft flying under IFR the reassurance of properly designated obstacle and terrain clearance protection in poor visibility conditions (IMC).
- 2.12.2. The WDA is within AMA areas of 1,800, 2,100 and 4,500 ft amsl, as shown in **Figure 9**. Note that the AMA altitudes are marked as hundreds of feet on the chart, so 1,800 ft is shown as '18'.
- 2.12.3. WTGs with a maximum tip height exceeding 800 ft amsl would require the 1,800 ft AMA to be increased to maintain the necessary 1,000 ft obstacle clearance protection. If a maximum blade tip height of 1,100 ft amsl is assumed for WTGs within the WDA, then the 1,800 ft AMA would need to be increased to 2,100 ft amsl.

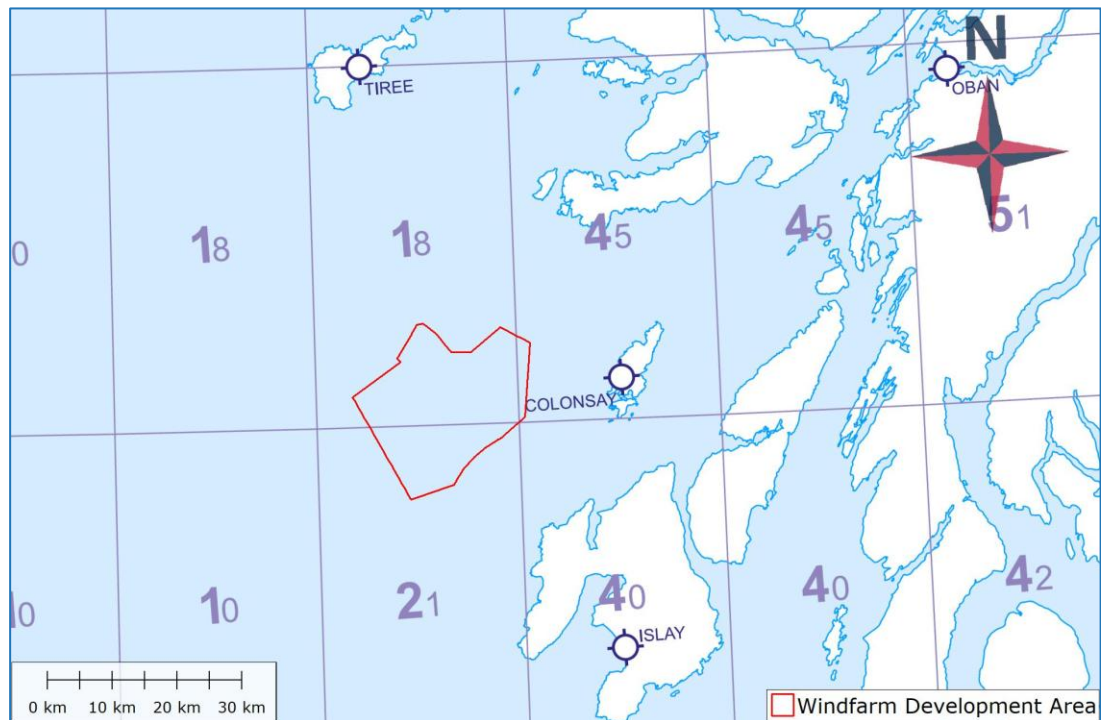


Figure 9 Area Minimum Altitudes

3. Radar Line of Sight Analysis

3.1. Methodology

- 3.1.1. Radar Line of Sight (RLoS) is determined by use of a radar propagation model (Global Mapper) using 3D DTM data with 25 m horizontal resolution, as shown in **Figure 10**. Radar data is entered into the model and RLoS to the WTGs from each radar is calculated.
- 3.1.2. Note that by using a DTM no account is taken of possible further shielding of the WTGs due to the presence of structures or vegetation that may lie between the radar and the WTGs. Thus, the RLoS assessment is a worst-case result.
- 3.1.3. For PSR the principal source of adverse wind farm effects are the WTG blades. RLoS is calculated for the largest and smallest blade tip heights of the WTGs under consideration for the Project, i.e. 333 m and 278 m amsl.

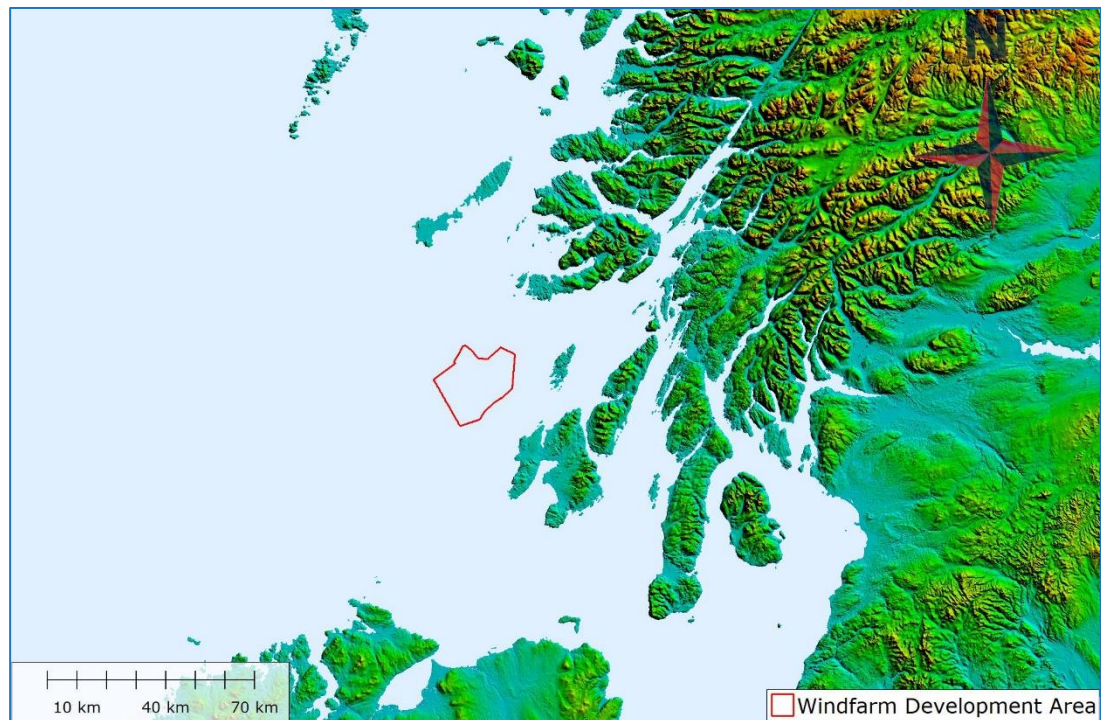


Figure 10 25 m Resolution DTM used for RLoS Modelling

3.2. Civil and Military Airfields with Surveillance Radar

- 3.2.1. In general, PSRs installed on civil and military airfields have an operational range of between 40 nm and 60 nm (between approximately 74 km and 111 km). There are no radar-equipped airfields within 60 nm (111 km) of the WDA.
- 3.2.2. WTGs within the WDA would be beyond the maximum operational ranges of any civil or military airfield PSRs and would have no impact on their performance.

3.3. NERL Radars

- 3.3.1. Most en route radars operated by NERL are required to provide coverage at ranges in excess of 60 nm (111 km). The closest NERL radars to the WDA are at Tiree, 37 km to the north-northwest, and Lowther Hill, 185 km to the east-southeast. NERL radar facilities are combined PSR and SSR systems. NERL only consider the impact of WTGs on their SSR facilities when they are within 15 nm, approximately 28 km.

3.4. Tiree

- 3.4.1. Tiree PSR is a Raytheon ASR-23SS system with an operational range of between 80 nm (148 km) and 180 nm (333 km).
- 3.4.2. Tiree RLoS coverage for a blade tip height of 333 m is shown in **Figure 11**.

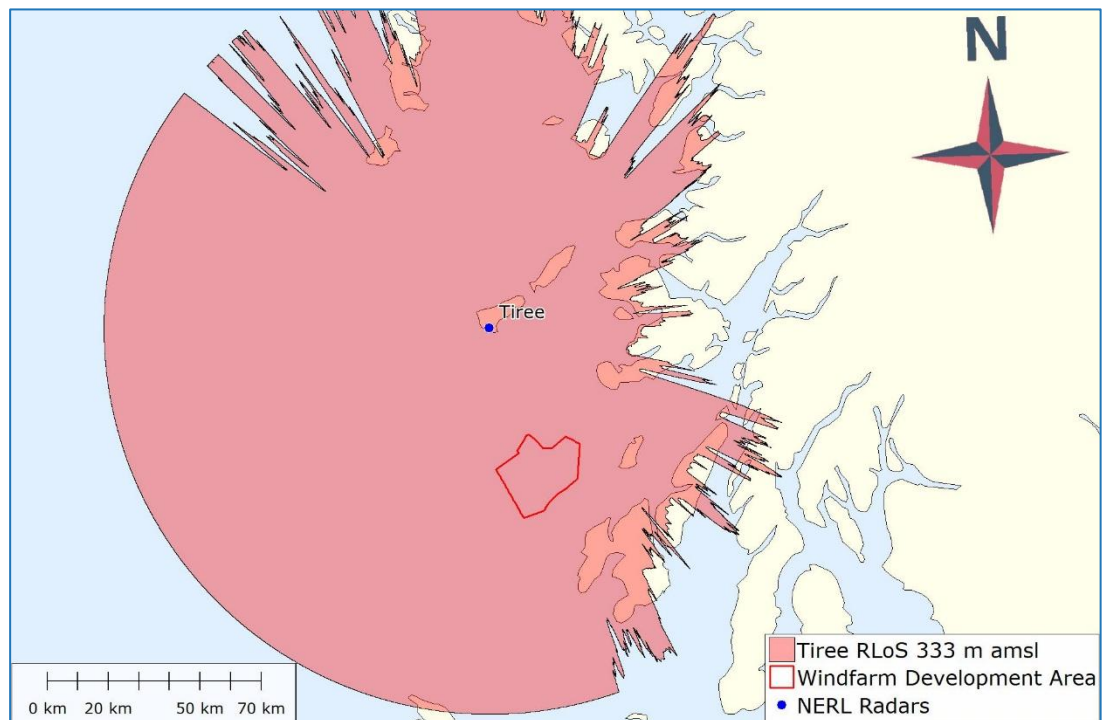


Figure 11 Tiree RLoS 333 m amsl

3.4.3. All WTGs within the WDA with a maximum blade tip height of 333 m would be in RLoS of Tiree PSR and highly likely to be detected.

3.4.4. Tiree RLoS coverage for a blade tip height of 278 m is shown in **Figure 12**.

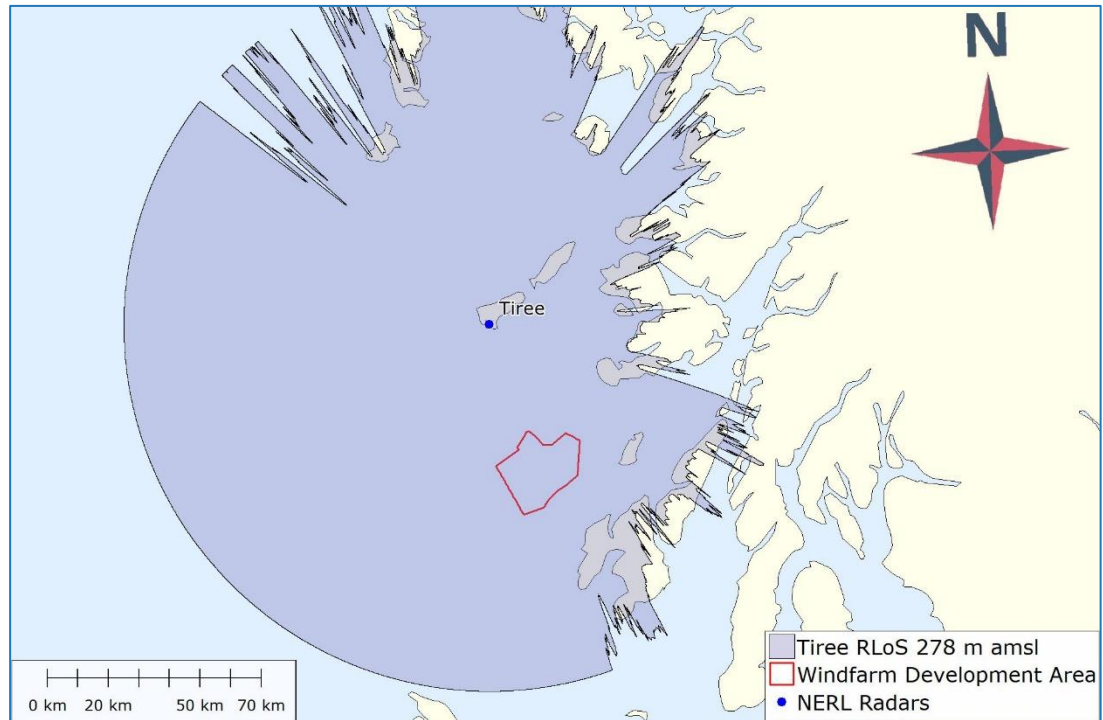


Figure 12 Tiree RLoS 278 m amsl

3.4.5. All WTGs within the WDA with a maximum blade tip height of 278 m would be in RLoS of Tiree PSR and highly likely to be detected.

3.5. Lowther Hill

3.5.1. Lowther Hill PSR is an Indra Lanza 3D PSR system with an operational range of up to 150 nm (278 km).

3.5.2. Lowther Hill RLoS coverage for a blade tip height of 333 m is shown in **Figure 13**.

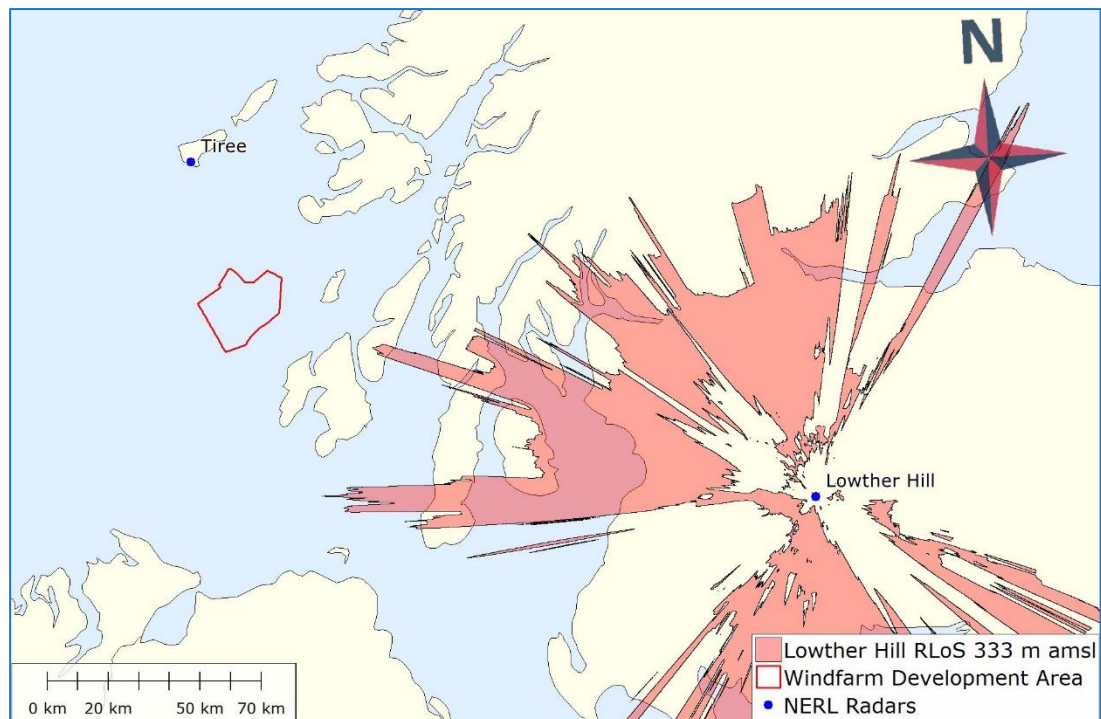


Figure 13 Lowther Hill RLoS 333 m amsl

- 3.5.3. None of the WTGs within the WDA with a maximum blade tip height of 333 m would be in RLoS of Lowther Hill PSR. WTGs within the WDA are highly unlikely to be detected by Lowther Hill PSR.

3.6. MOD Air Defence Radars

- 3.6.1. The closest Air Defence (AD) radar to the WDA is at Remote Radar Head (RRH) Benbecula, 170 km to the north-northwest.

3.7. RRH Benbecula

- 3.7.1. Benbecula AD PSR is a Lockheed Martin TPS-77 system with a maximum operational range of up to 250 nm (463 km).
- 3.7.2. Benbecula RLoS coverage for a blade tip height of 333 m is shown in **Figure 14**.

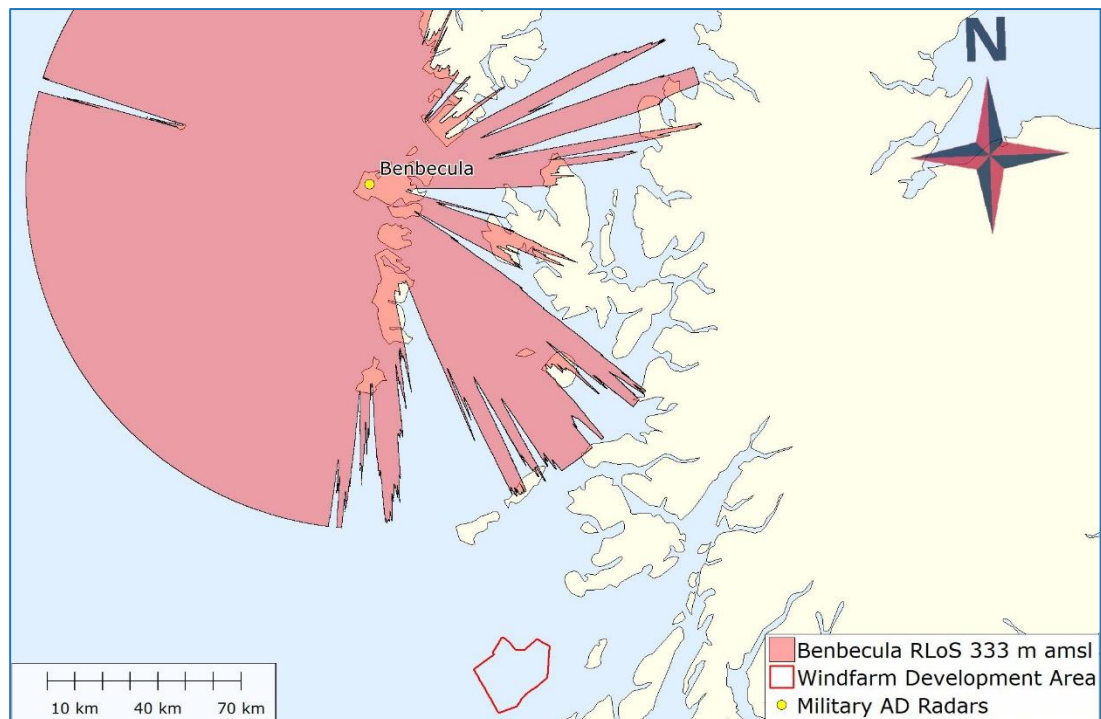


Figure 14 Benbecula RLoS 333 m amsl

- 3.7.3. None of the WTGs within the WDA with a maximum blade tip height of 333 m would be in RLoS of Benbecula AD PSR. WTGs within the WDA are highly unlikely to be detected by Benbecula AD PSR.

3.8. Met Office Radar

- 3.8.1. The closest Met Office radar to the WDA is at Holehead, 140 km to the east. WTGs at ranges in excess of 100 km from weather radars have the potential to have an impact on weather radar data.

3.9. Holehead

- 3.9.1. Holehead weather radar is a C-band Doppler system.
- 3.9.2. Holehead RLoS coverage for a blade tip height of 333 m amsl is shown in **Figure 15**.

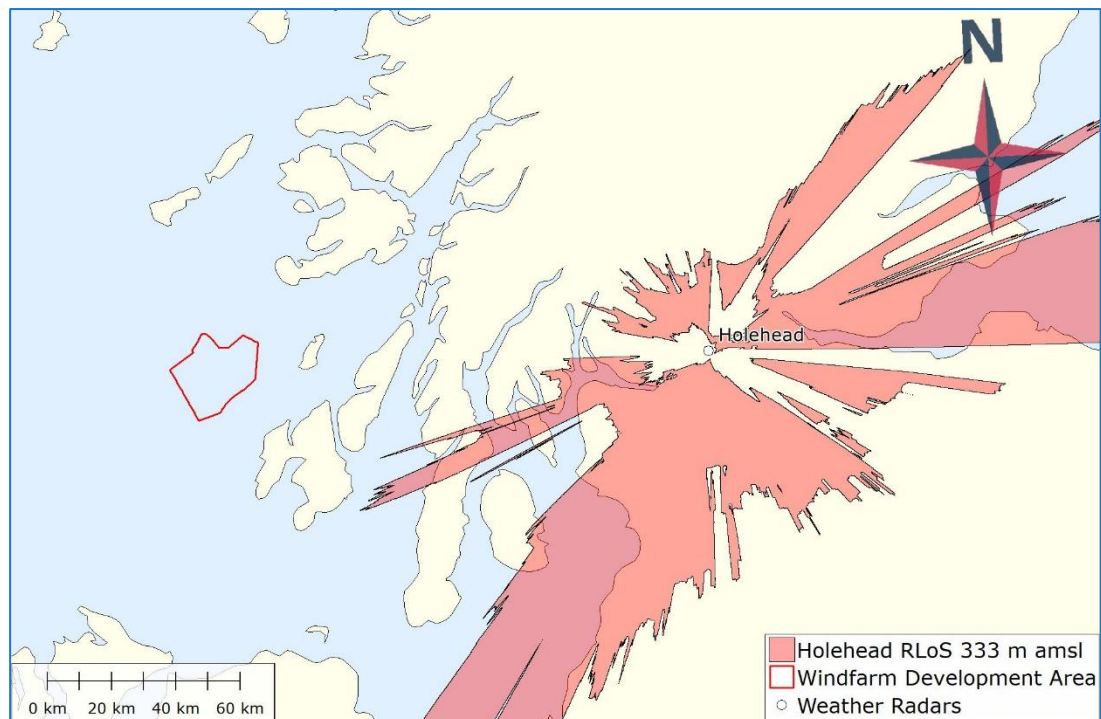


Figure 15 Holehead RLoS 333 m amsl

- 3.9.3. None of the WTGs within the WDA with a maximum blade tip height of 333 m would be in RLoS of Holehead weather radar. WTGs within the WDA are highly unlikely to have an impact on Holehead weather radar.

3.10. Radar Mitigation – NERL Radars

- 3.10.1. NATS has recently awarded Indra with a contract to upgrade the network of NERL operated en route radars with new state-of-the-art systems. The PSRs at each of the ten existing NERL sites, including Tiree, will be replaced with an Indra PSR3D. The PSR3D incorporates advanced algorithms that give it the capability to mitigate the adverse effects of WTGs. NATS has confirmed that the “Indra solution” will be used as the radar mitigation for MachairWind, and that the mitigation will be acceptable to MOD users of Tiree PSR.



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