# **Pentland floating offshore wind farm** Volume 2: Offshore EIAR

Chapter 15: Aviation and Radar

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# **OFFSHORE EIAR (VOLUME 2): MAIN REPORT**

# **CHAPTER 15: AVIATION AND RADAR**

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# **GLOSSARY OF PROJECT TERMS**

Key Terms	Definition
Dounreay Trì Floating Wind Demonstration Project (the 'Dounreay Trì Project')	The 2017 consented project that was previously owned by Dounreay Trì Limited (in administration) and acquired by Highland Wind Limited (HWL) in 2020. The Dounreay Trì Project consent was for two demonstrator floating Wind Turbine Generators (WTGs) with a marine licence that overlaps with the Offshore Development, as defined. The offshore components of the Dounreay Trì Project consent are no longer being implemented.
Highland Wind Limited	The Developer of the Project (defined below) and the Applicant for the associated consents and licences.
Landfall	The point where the Offshore Export Cable(s) from the PFOWF Array, as defined, will be brought ashore.
Offshore Export Cable(s)	The cable(s) that transmits electricity produced by the WTGs to landfall.
Offshore Export Cable Corridor (OECC)	The area within which the Offshore Export Cable(s) will be located.
Offshore Site	The area encompassing the PFOWF Array Area and OECC, as defined.
Onshore Site	The area encompassing the PFOWF Onshore Transmission Infrastructure, as defined.
Pentland Floating Offshore Wind Farm (PFOWF) Array and Offshore Export Cable(s) (the 'Offshore Development')	All offshore components of the Project (WTGs, inter-array and offshore export cables, floating substructures, and all other associated offshore infrastructure) required during operation of the Project, for which HWL are seeking consent. The Offshore Development is the focus of this Environmental Impact Assessment Report.
PFOWF Array	All WTGs, inter-array cables, mooring lines, floating sub-structures and supporting subsea infrastructure within the PFOWF Array Area, as defined, excluding the Offshore Export Cable(s).
PFOWF Array Area	The area where the WTGs will be located within the Offshore Site, as defined.
PFOWF Onshore Transmission Infrastructure (the 'Onshore Development')	All onshore components of the Project, including horizontal directional drilling, onshore cables (i.e. those above mean low water springs), transition joint bay, cable joint bays, substation, construction compound, and access (and all other associated infrastructure) across all project phases from development to decommissioning, for which HWL are seeking consent from The Highland Council.
PFOWF Project (the 'Project')	The combined Offshore Development and Onshore Development, as defined.



# ACRONYMS AND ABBREVIATIONS

AD	Air Defence
agl	above ground level
ANO	Air Navigation Order
ATC	Air Traffic Control
ATS	Air Traffic Services
BAA	British Airports Authority
BOWI	Beatrice Offshore Wind Limited
BT	British Telecom
	Civil Aviation Authority
	Civil Aviation Rublication
	Civil Aviation Publication
DSLP	Design, Specification, and Layout Plan
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
ERCoP	Emergency Response Co-operation Plan
ES	Environmental Statement
FL	Flight Level
ft	feet
HIAL	Highlands and Islands Airports Limited
HMR	Helicopter Main Route
HWL	Highland Wind Limited
IFP	Instrument Flight Procedures
km	kilometre
	Lowest Astronomical Tide
	Low Elving Area
	Low Flying Alea
	metres Maritime and Occurrent Accurrent
MCA	Maritime and Coastguard Agency
MDA	Managed Danger Area
Met	Meteorological
Mil AIP	Military Aeronautical Information Publication
MoD	Ministry of Defence
MSA	Minimum Safe Altitude
MS-LOT	Marine Scotland – Licensing Operations Team
NATS	National Air Traffic Services
nmi	nautical mile
NOTAM	Notice to Airmen
NRTE	Naval Reactor Test Establishment
OFCC	Offshore Export Cable Corridor
Offshore FIAR	Offshore Environmental Impact Assessment Report
	Offshore Penewable Energy Installations
	Distible Relewable Energy Installations
	Practice and Exercise Area
PFOWF	Pentiand Floating Olishore wind Farm
PSR	Primary Surveillance Radar
S. 36	Section 36
SAR	Search and Rescue
SG	Scottish Government
THC	The Highland Council
UK	United Kingdom
UK IAIP	UK Integrated Aeronautical Information Package
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
WTG	Wind Turbine Generator
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# **15 AVIATION AND RADAR**

# **15.1 Introduction**

The potential effects of the Pentland Floating Offshore Wind Farm (PFOWF) Array and Offshore Export Cable(s), hereafter referred to as the 'Offshore Development', during construction, operation and maintenance, and decommissioning on Aviation and Radar receptors are assessed in this chapter. This chapter also includes a review of the potential cumulative impacts with other relevant projects.

In terms of the Offshore Development, only an assessment of effects on the PFOWF Array is considered within this chapter. No impacts pertaining to the Offshore Export Cable(s) within the Offshore Export Cable Corridor (OECC) are identified and thus are not assessed within this chapter.

Coleman Aviation Limited has carried out this impact assessment. Further details of the Project Team's competency including lead authors for each chapter are provided in Volume 3: Appendix 1.1: Details of the Project Team of this Offshore Environmental Impact Assessment Report (Offshore EIAR).

Table 15.1 below provides a list of all the supporting studies which relate to the Aviation and Radar impact assessment. All supporting studies are appended to this Offshore EIAR.

Table 15.1	Supporting	studies
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Details of Study	Locations of Supporting Studies
Cyrrus Limited - Instrument Flight Procedures (IFP) Opinion dated 4 April 2022	Offshore EIAR (Volume 3): Appendix 15.1: IFP Opinion

# 15.2 Legislation, Policy, and Guidance

The following relevant legislation, policies, and guidance relating to Aviation and Radar were consulted in preparing this chapter:

# 15.2.1 Legislation

Civil Aviation Publication (CAP) 393 – Air Navigation, The Order and the Regulations, 2016 (Version 6, 12 February 2021): Contains the Air Navigation Order (ANO) 2016 and Regulations made under the order; and defines the Rules of the Air regarding civil aviation in the United Kingdom (UK).

# 15.2.2 Policy

- CAP 437 Standards for Offshore Helicopter Landing Areas (Version 8.2, 30 July 2021): Provides the criteria applied by the Civil Aviation Authority (CAA) in assessing the standards of offshore helicopter landing areas for worldwide use by helicopters registered in the UK;
- CAP 670 Air Traffic Services Safety Requirements (Issue 3, 7 June 2019): Sets out the safety regulatory framework and requirements associated with the provision of Air Traffic Services (ATS);
- CAP 764 CAA Policy and Guidelines on Wind Turbines (Version 6, February 2016): Provides CAA policy and guidance on a range of issues associated with WTGs and their effect on aviation that need to be considered by aviation stakeholders, wind energy developers and Local Planning Authorities when assessing the viability of WTG developments;
- CAP 774 The UK Flight Information Services (Version 4, 15 December 2021): Details the suite of ATS which (excluding aerodrome services) are the only services provided in Class G airspace within the UK Flight Information Region. This document is equally applicable to civilian and military pilots and air traffic controllers;



- Military Aviation Authority Regulatory Publication 3000 Series: Air Traffic Management Regulations (last updated 20 April 2021): Provides the regulatory framework and instructions to military personnel for the provision of military Air Traffic Control (ATC); and
- Military Aviation Authority Manual of Military Air Traffic Management (last updated 30 September 2019): Provides regulations for military ATC and emergency procedures and utilisation of military-designated airspace.

# 15.2.3 Guidance

- Ministry of Defence (MoD) Obstruction Lighting Guidance (1 January 2020): Sets out the MoD's minimum requirements and standards for installation of aviation lighting of onshore and offshore WTG developments;
- CAA 1:500,000 Visual Flight Rules (VFR) Aviation Chart (2022): Designed to assist in the navigation of aircraft. Enables pilots to determine their position, safe altitude and route to a destination, highlighting navigation aids along the way, alternative landing areas in case of an in-flight emergency, and other useful information such as radio frequencies and airspace boundaries;
- CAP 168 Licensing of Aerodromes (Version 12, 14 January 2022): Sets out the standards required at UK-licensed aerodromes in terms of operational procedures, physical characteristics, assessment and treatment of obstacles, visual aids, rescue and fire-fighting services and medical services;
- > UK Integrated Aeronautical Information Package (UK IAIP) (2022): Provides comprehensive information on UK civilian aerodromes and aviation procedures within UK airspace;
- > UK Military Aeronautical Information Publication (UK Mil AIP) (2022): Provides comprehensive information on UK military aerodromes and guidance to military aircrew on in-flight navigation procedures; and
- Marine Guidance Note 654 Safety of Navigation: Offshore Renewable Energy Installations (OREIs), Guidance on UK Navigational Practice, Safety and Emergency Response (28 April 2021): Highlights issues with assessing the impact on navigational safety and emergency response caused by OREIs in UK internal waters.

# **15.3 Scoping and Consultation**

Scoping and consultation have been ongoing throughout the Environmental Impact Assessment (EIA) process and have played an important role in ensuring the scope of the baseline characterisation and impact assessment are appropriate with respect to the Offshore Development given the requirements of the regulators and their advisors.

Relevant comments from the Environmental Impact Assessment (EIA) Scoping Opinion, the Scoping Opinion Addendum, and other consultations specific to Aviation and Radar provided by Marine Scotland – Licensing Operations Team (MS-LOT), The Highland Council (THC), Aberdeen/Glasgow Airports, Highlands and Islands Airports Limited (HIAL), MoD, and National Air Traffic Services (NATS) are summarised in Table 15.2 below, which provides a high-level response on how these comments have been addressed within this Offshore EIAR.

Consultee	Comment / Issue Raised	Offshore Development Approach and Section ID
Scoping Opinion		
MS-LOT (on behalf of Scottish Ministers)	The Scottish Ministers agree with the impacts proposed to be scoped in however, advise that the representations from THC, MoD, HIAL, and British Telecom (BT) must be fully addressed by the Developer.	HWL agrees with the need to address the representations from THC, MoD, and HIAL in terms of Aviation and Radar. Assessment of relevant effects is presented within Section 15.6. Representations from BT are not relevant to Aviation and Radar and are

Table 15.2 Summary of consultation responses specific to Aviation and Radar



Consultee	Comment / Issue Raised	Offshore Development Approach and Section ID
		covered within Chapter 18: Other Users of the Marine Environment.
MS-LOT (on behalf of Scottish Ministers)	The Scottish Ministers advise that as the construction process has the potential to impact the Instrument Flight Procedures (IFPs) for Wick Airport, this must be scoped in during the construction phase and refer the Developer to HIAL's representation for details on the approved organisations for undertaking these assessments. In addition, as surveillance is proposed to be introduced to Wick Airport this must also be scoped in and considered once the type and location of surveillance is defined.	HWL has since been in consultation with HIAL regarding their proposed introduction of surveillance at Wick Airport and any potential impact on Wick Airport's IFPs. HIAL confirmed (email 7th March 2022) that they have not significantly progressed their surveillance strategy and that this aspect can be discounted from the EIAR. As a result of this consultation with HIAL, the introduction of surveillance at Wick Airport has been scoped out of this Offshore EIAR. In terms of Wick Airport's IFPs, HIAL requested that an IFP assessment be carried out by a CAA-accredited procedure design company. HWL subsequently commissioned
		an IFP assessment to be carried out by Cyrrus Limited. The assessment indicated that Wick Airport's IFPs will not be affected by WTGs within the PFOWF Array Area. HIAL reviewed the assessment and confirmed that they are content that the PFOWF Array Area will not adversely impact Wick Airport's IFPs. Consequently, HIAL confirmed (email 7 April 2022) that they will not object, nor request any planning conditions, regarding the potential impact of WTGs within the PFOWF Array Area on Wick Airport's IFPs.
		However, HIAL also requested details on the construction strategy in terms of whether the WTGs will be assembled onshore and towed offshore or constructed onsite within the PFOWF Array Area. HWL confirmed (email 7th April 2022) that provided the construction site is more than 30 nautical miles (nm) from Wick or Kirkwall Airport, HIAL would be content with a statement to that effect and no objection would be lodged; however, if the WTGs are to be assembled onshore within 30 nm of Wick or Kirkwall Airport, the construction site should also be subject to an IFP impact assessment. Should a construction port be identified that is within 30 nm of Wick or Kirkwall Airport, HWL has accepted that a further IFP assessment would need to be conducted.
		Assessment of the potential impact on Wick Airport's IFPs is presented within Section 15.6.



Consultee	Comment / Issue Raised	Offshore Development Approach and Section ID
MS-LOT (on behalf of Scottish Ministers)	With regards to the impact on interference with military low flying operations, the Scottish Ministers highlight the recommendation from the MoD and request that the Proposed Development is fitted with MoD accredited aviation safety lighting in accordance with the Civil Aviation Authority, Air Navigation Order 2016, in the interests of air safety. HIAL also supports this recommendation.	HWL agrees that appropriate aviation lighting should be installed on the Offshore Development's WTGs. Aviation lighting requirements are presented within Section 15.5.5.
MS-LOT (on behalf of Scottish Ministers)	With regards to the community assets and aviation interests set out in THC representation, the Developer should demonstrate what interests it has identified and the results of consultations with the relevant authorities, including those identified by THC, in the EIA Report and explain how the conclusion was reached.	HWL agrees that representations of THC regarding aviation interests and consultations with the relevant authorities should be addressed. Assessment of potential impacts on aviation interests is presented within Section 15.6. Results of consultation with relevant authorities are presented within this table.
THC	The EIAR needs to recognise community assets that are currently in operation for example TV, radio, tele-communication links, aviation interests including radar, MoD safeguards, etc. In this regard the Applicant, when submitting a future application, will need to demonstrate what interests they have identified and the outcomes of any consultations with relevant authorities such as Ofcom, NATS, British Airports Authority (BAA), CAA, MoD, HIAL, etc. through the provision of written evidence of concluded discussions/ agreed outcomes.	HWL agrees that the EIAR needs to recognise potential impacts on aviation interests (including radar and MoD safeguarding) and that consultations with BAA, CAA, HIAL, MoD, and NATS should be carried out. Assessment of potential impacts on aviation interests is presented within Section 15.6. Results of consultation with relevant authorities are presented in this table. Representations from Ofcom are not relevant to the Aviation and Radar chapter and are covered in Chapter 18: Other Users of the Marine Environment.
THC	There should be continued dialogue with HIAL over the impact on radar at airports in the area.	HWL agrees that dialogue with HIAL should continue over the potential impact on ATC radars at airports in the area. Results of consultation with relevant authorities are presented in this table.
THC	If there are no predicted effects on communication links as a result of the development, the EIAR should still address this matter by explaining how this conclusion was reached.	HWL agrees that the EIAR needs to recognise potential impacts on aviation interests (including radar and MoD safeguarding). The assessment of potential impacts on aviation interests is presented within Section 15.6. Impacts on communication links are not relevant to the Aviation and Radar chapter and are assessed in Chapter 18: Other Users of the Marine Environment.
Aberdeen and Glasgow Airports	The proposal is located outwith Aberdeen and Glasgow Airports' consultation zones. No need to be consulted further.	No response required.
HIAL	In regards to the scope of the EIA, lighting requirements as per the CAA, CAP 393, The ANO 2016 should be considered.	HWL agrees that lighting requirements as laid out in CAA, CAP 393, The ANO 2016 should be considered. Implementation of aviation lighting requirements is presented within Section 15.5.5.



Consultee	Comment / Issue Raised	Offshore Development Approach and Section ID
HIAL	The construction process/cranes have potential to impact on the Wick Airport IFPs. An IFP impact assessment can only be conducted by, and accepted from, an Approved Procedure Design Organisation as approved by the CAA.	HWL agrees that the potential impact on Wick Airport's IFPs should be scoped in for the construction phase. Assessment of the potential impact on Wick Airport's IFPs is presented within Section 15.6.
HIAL	Wick Airport does not currently have surveillance, however, this is proposed to be introduced. HIAL cannot include surveillance in its current safeguarding criteria as type and location are undefined. However, once confirmed, surveillance safeguarding will become a criterion that would require consideration.	HWL has consulted with HIAL on the proposed introduction of surveillance at Wick Airport and HIAL has confirmed that they have not significantly progressed their surveillance strategy and that this aspect can be discounted for the EIAR. As a result, the introduction of surveillance at Wick Airport has been scoped out of this Offshore EIAR.
MoD	The Applicant has prepared a Scoping Report of the Proposed Development. This recognises the principal defence issues that will be of relevance to the progression of the Proposed Development.	No response required.
MoD	Potential interference with military ATC and Air Defence (AD) radars during both construction and operational phases has been scoped out. We agree with this, the Proposed Development will not affect military radar systems.	No response required.
MoD	Impact on military low flying has been scoped in and the Applicant states in the Scoping Report that they are committed to lighting and charting the turbines. In the interests of air safety, the MoD would request that the development be fitted with MoD accredited aviation safety lighting in accordance with the CAA, ANO 2016.	HWL agrees that appropriate aviation lighting should be installed on the Offshore Development's WTGs. Aviation lighting requirements are presented within Section 15.5.5.
MoD	MOD has concerns with the Proposed Development's proximity to the Vulcan Naval Reactor Test Establishment (NRTE) and its surrounding sea approaches in terms of security.	It is recognised that the Vulcan NRTE will be entering into decommissioning in forthcoming years. There are limited details available on these decommissioning activities.
		Any impacts relating to the safe navigation of vessels are addressed in Chapter 14: Shipping and Navigation.
		HWL will continue to engage with Vulcan NRTE to further understand any upcoming decommissioning activities and to agree on procedures to reduce any disruption.
		HWL will also continue to engage with the MoD regarding any security concerns.
NATS	The Proposed Development does not conflict with NATS safeguarding criteria. Accordingly, NATS has no safeguarding objection to the proposal.	No response required.



Consultee	Comment / Issue Raised	Offshore Development Approach and Section ID	
Scoping Opinion Addendum			
MS-LOT (on behalf of Scottish Ministers)	Within table 7.1 of the Scoping Report the Developer summarises the potential impacts to aviation and radar associated with the change in parameters. The Scottish Ministers agree with the additional impacts proposed to be scoped in, however, advise that the representations from THC, MOD and HIAL, must be fully addressed by the Developer. The Scottish Ministers further advise that the Developer approaches HIAL to discuss how best to address/mitigate any impacts to HIAL, as per its representation.	Noted and responses to other consultees comments are addressed within this table. HWL has consulted with HIAL on the proposed introduction of surveillance at Wick Airport and HIAL has confirmed that they have not significantly progressed their surveillance strategy and that this aspect can be discounted for the EIAR. As a result, the introduction of surveillance at Wick Airport has been scoped out of this Offshore EIAR.	
	The Scottish Ministers highlight the representation from THC which advises that the WTGs may be in proximity to both the launch zone and projected route of launch vehicles using the Sutherland Spaceport. The Scottish Ministers therefore consider that this must be scoped in and considered within the aviation and radar chapter of the EIA Report.	As described in Chapter 18: Other Users of the Marine Environment, the launch vehicles for the Space Hub Sutherland project (approximately 38 km [21 nm] south-west of the Offshore Site) will be between 7 degrees east of due north and 8 degrees west of due north. An overflight launch exclusion zone will be activated prior to and during launches that will be active for approximately six hours per launch, and there are expected to be approximately 12 launches per year. The PFOWF Array Area is located 28 km (15 nm) outside the lateral limits of the Space Hub Sutherland launch exclusion zone; therefore, the Offshore Site will not overlap with the launch exclusion zone. No impact is expected with respect to Aviation and Radar.	
Aberdeen International Airport	This proposal is located outwith our consultation zone. As such we have no comment to make and need not be consulted further.	No response required.	
САА	PFOWF is an offshore array of up to ten floating WTGs connected to one another by subsea inter-array cables supported by floating structures. Up to two offshore export cables will carry the power generated by the PFOWF to a landfall location at the Dounreay coast. The project parameters that have changed of particular interest to the CAA are the potential increase in maximum hub height, maximum blade tip height and maximum rotor diameter. We note the section on aviation and radar and the potential impact on Wick's IFP and the inclusion in the scope of a possible new Wick surveillance system. The CAA has no comments to add.	Assessment of the potential impacts on Wick Airport's IFPs, and potential introduction of surveillance at Wick Airport, is presented within this table and Section 15.6.	



Consultee	Comment / Issue Raised	Offshore Development Approach and Section ID
HIAL	HIAL reviewed the scoping material and found the aviation assessment had already highlighted the potential impacts to HIAL, during the construction and operational phases, and therefore did not respond further. It is assumed that the developer will be approaching HIAL, at an appropriate juncture, to discuss and address/mitigate any impacts to HIAL.	HWL has consulted with HIAL on the proposed introduction of surveillance at Wick Airport and HIAL has confirmed that they have not significantly progressed their surveillance strategy and that this aspect can be discounted for the EIAR. As a result, the introduction of surveillance at Wick Airport has been scoped out of this Offshore EIAR.
MoD	The use of airspace for defence purposes in the vicinity of the Proposed Development have been appropriately identified and considered. The Scoping Report considers aviation and radar systems that may be affected by the proposed wind farm. The MoD is correctly identified as a relevant receptor in section 9.4 Aviation and Radar of the Scoping Report. Potential interference with military ATC and AD radars during both construction and operational phases has been scoped out. We agree with this, the proposed Offshore Development will not affect military radar systems.	No response required.
MoD	Impact on military low flying has been scoped in and the Applicant states in the Scoping Report that they are committed to lighting and charting the turbines. In the interests of air safety, the MoD would request that the development be fitted with MoD accredited aviation safety lighting in accordance with the Civil Aviation Authority, Air Navigation Order 2016.	HWL agrees that appropriate aviation lighting should be installed on the Offshore Development's WTGs. Aviation lighting requirements are presented within Section 15.5.5.
NATS	NATS has reviewed and has no disagreement with the Applicant's section of the addendum (Section 7) devoted to Aviation and Radar.	No response required.
THC	It is our understanding that the turbines may be in proximity to the launch zone and projected route of the launch vehicles utilising the Sutherland Spaceport. As this is the case, it is considered appropriate that this should be scoped into the EIAR and assessed in this chapter.	As described in Chapter 18: Other Users of the Marine Environment, the launch vehicles for the Space Hub Sutherland project (approximately 38 km [21 nm] south-west of the Offshore Site) will be between 7 degrees east of due north and 8 degrees west of due north. An overflight launch exclusion zone will be activated prior to and during launches that will be active for approximately six hours per launch, and there are expected to be approximately 12 launches per year. The PFOWF Array Area is located 28 km (15 nm) outside the lateral limits of the Space Hub Sutherland launch exclusion zone; therefore, the Offshore Site will not overlap with the launch exclusion zone. No impact is expected in respect to Aviation and Radar.



Consultee	Comment / Issue Raised	Offshore Development Approach and Section ID
Additional Consultation	on	
HIAL	On review of the IFP assessment carried out by Cyrrus Limited, HIAL has confirmed that they are content that there will be no impact on Wick's IFPs. Consequently, HIAL is content that there is no impact to Wick Airport's operations and that they will not object nor request any planning conditions. HIAL further confirmed that they have not significantly progressed their surveillance strategy and that this aspect can be discounted for the EIAR.	The introduction of surveillance at Wick Airport and any potential impact on Wick Airport's IFPs have been scoped out of this Offshore EIAR.
Cumulative Projects L	ist	
THC	Having reviewed the submitted document, I would suggest the following projects are also included in the cumulative assessment: Spacehub Sutherland (in all chapters of the EIAR not just the SLVIA Section)	As described in Chapter 18: Other Users of the Marine Environment, the launch vehicles for the Space Hub Sutherland project (approximately 38 km [21 nm] south-west of the Offshore Site) will be between 7 degrees east of due north and 8 degrees west of due north. An overflight launch exclusion zone will be activated prior to and during launches that will be active for approximately six hours per launch, and there are expected to be approximately 12 launches per year. The PFOWF Array Area is located 28 km (15 nm) outside the lateral limits of the Space Hub Sutherland launch exclusion zone; therefore, the Offshore Site will not overlap with the launch exclusion zone. No cumulative impact is expected with respect to Aviation and Radar.

# **15.4 Baseline Characterisation**

Information on Aviation and Radar was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 15.3 below.

The desktop review was conducted using comprehensive aviation documentation and charts to identify potential aviation receptors during the construction, operation and maintenance, and decommissioning phases of the Offshore Development. Supporting information was also drawn from a review of data sources; in particular, the UK Integrated Aeronautical Information Package (IAIP) and consultee responses as outlined in Table 15.2.

# 15.4.1 Study Area

The Aviation and Radar study area has been determined by the presence of potentially affected aviation receptors; in particular, ATC, and Air Defence (AD) Primary Surveillance Radars (PSRs).



The following areas are referred to in this impact assessment:

- > PFOWF Array Area: The area where the Wind Turbine Generators (WTGs) will be located within the Offshore Site; and
- > Aviation and Radar Cumulative Study Area: Includes the area within 50 kilometres (km) of the PFOWF Array Area.

The Aviation and Radar Study Area includes any radars that could potentially detect WTGs within the PFOWF Array Area; with the extent of the Aviation and Radar Study Area defined by the furthest potential aviation receptor. The operating range of these radars can be up to 200 nm however, as WTG visibility to radar is the determining factor relating to the potential impact on PSR systems, only radars that have coverage over the PFOWF Array Area will be considered in the assessment. This ensures that only the relevant radars, and stakeholders, affected by the Offshore Development are identified.

The Aviation and Radar Study Area also considers airspace designations including Low Flying Areas (LFA) and military practice areas in the immediate vicinity of the PFOWF Array Area; and airspace, as necessary, used by fixed-wing aircraft or helicopters operating on Helicopter Main Routes (HMR) in the vicinity of the PFOWF Array Area.

Figure 15.1 displays all aeronautical information within the bounds of the figure, however, only airspace designations relevant to the PFOWF Array Area are labelled.





Figure 15.1 Aviation and Radar Study Area and receptor locations



# **15.4.2 Sources of Information**

A review was undertaken of the literature and data relevant to this assessment relating to Aviation and Radar and was used to give an overview of the existing environment. The primary data sources used in the preparation of this chapter are listed below in Table 15.3.

Title	Source	Year	Author
CAA 1:500,000 VFR Aviation Chart	CAA	2022	САА
UKIAIP	CAA	2022	CAA
UK MILAIP	MoD	2022	MOD
NATS Self-Assessment Maps	NATS	2022	NATS
Scottish Government (SG) Sectoral Marine Plan for Offshore Wind Energy	SG	2020	SG
HIAL Air Traffic Management Strategy 2030	HIAL	2018	HIAL
Beatrice Offshore Wind Farm Ltd (BOWL) Environmental Statement (ES)	BOWL	2012	BOWL
Moray East Offshore Wind Farm (Moray East) ES	Moray East	2012	Moray East
Moray West Offshore Wind Farm (Moray West) EIA Report	Moray West	2018	Moray West
Dounreay Trì ES	Dounreay Trì Ltd	2016	Dounreay Trì Ltd

# 15.4.3 Site-specific Surveys

An Instrument Flight Procedures (IFP) assessment, carried out by Cyrrus Ltd, confirmed that WTGs within the PFOWF Array Area would not impact Wick Airport's IFPs. No other site-specific surveys have been undertaken to inform the EIA for Aviation and Radar. This is because the baseline characterisation developed through existing data sources, coupled with ongoing consultation with relevant stakeholders is considered sufficient to inform this chapter.

# **15.4.4 Baseline Description**

A desk-based review of the literature and available data sources (see Table 15.3) has been undertaken to support this Offshore EIAR. The key Aviation and Radar receptors potentially impacted by offshore wind farm developments are:

- > Civil airport IFPs;
- > Military aerodrome IFPs;
- > Civil ATC radar;
- > Military ATC radar;
- > Military AD radar;
- > LFAs (including Search and Rescue [SAR]);
- > HMRs;
- > Offshore helicopter installations (oil and gas platforms);
- Local Airspace Restrictions (Prohibited/Restricted/Danger Areas and Military Practice and Exercise Areas (PEXAs); and
- > Meteorological (Met) Office radar.



There are a number of civilian and military aviation interests within the vicinity of the PFOWF Array Area (see Figure 15.1) and can be described as follows:

#### 15.4.4.1 Airspace

The PFOWF Array Area is located approximately 4 nm (7.5 km) off the north coast of Scotland and approximately 25 nm (46 km) north-west of Wick Airport. In aviation terms, the PFOWF Array Area environment is situated in a relatively uncomplicated piece of airspace but with an active HMR (HMR YANKEE) located approximately 3 nm (5.5 km) outside the eastern boundary of the PFOWF Array Area.

#### 15.4.4.2 Civil airports

The nearest major civil airports to the PFOWF Array Area are Wick Airport, 25 nm (46 km) to the south-east, and Kirkwall Airport, at 35 nm (65 km) to the north-east; both of which are operated by HIAL. The published obstacle safeguarding area for airports of this nature is 30 nm (56 km); therefore, any potential impact on airport IFPs within this range needs to be assessed. The Offshore Development WTGs are outside the safeguarding area for Kirkwall Airport however, they are within the safeguarding area for Wick Airport. An IFP assessment has been carried out by Cyrrus Limited, a CAA-accredited procedure design company, and the results of this assessment are covered in Section 15.3.

#### 15.4.4.3 Civil ATC radars

There are no existing civil ATC radars that will be affected by the Offshore Development WTGs as confirmed in the NATS scoping response (see Table 15.2). However, in terms of future operations, HIAL announced in 2018 their proposed Air Traffic Management Strategy 2030 which could involve the implementation of a combined surveillance system at several HIAL airports, including Wick and Kirkwall Airports. This is something that has been continuously monitored by Highland Wind Limited (HWL) and following consultation with HIAL (see Table 15.2), the type, location and timescale for a future surveillance system are not yet decided.

#### 15.4.4.4 Military ATC and AD radars

No military ATC or AD radars will be affected by the Offshore Development WTGs as confirmed in the MoD scoping response (see Table 15.3).

#### 15.4.4.5 Low flying (including UK SAR)

The PFOWF Array Area is located in LFA 14, which covers Scotland to the north of the Scottish central belt. Military aircraft can fly down to a minimum of 250 feet (ft) above ground level (agl) throughout the LFA. Helicopters normally operate down to 100 ft agl but due to the nature of their task, and for specific training purposes, are occasionally permitted to fly lower.

When conducting an operational mission, UK SAR helicopters are not constrained by the normal rules of the air and operate in accordance with their Aircraft Operator Certificate; this allows them flexibility to manoeuvre, as required, for the mission being carried out. An Emergency Response Co-operation Plan (ERCoP) will be compiled in conjunction with the Maritime and Coastguard Agency (MCA) as a likely consent condition requirement of the Offshore Development and this would need to be in place prior to the construction phase of the Offshore Development. Additionally, a detailed Lighting and Marking Plan (LMP) for the WTGs will be developed in conjunction with the relevant aviation stakeholders and agreed prior to the construction of the Offshore Development.

#### 15.4.4.6 HMRs

HMRs are established to support the transport of personnel and logistics to offshore oil and gas installations. HMRs provide a network of offshore routes used by civilian helicopters to facilitate an obstacle-free zone for safe flight when in-flight Visual Meteorological Conditions (VMC) cannot be met. The HMR structure, therefore, provides both an identification of common flight paths and a safe means of traffic flow. HMR YANKEE is the nearest HMR to the PFOWF Array Area located approximately 3 nm (5.5 km) outside the eastern boundary of the PFOWF Array Area; it is primarily used for helicopter flights from Aberdeen, via Wick, to the offshore installations in the Atlantic Rim to the west of the Shetland Islands.



#### 15.4.4.7 Offshore helicopter installations (oil and gas platforms)

CAA recommend that wind farm developers consult with the owners/operators of offshore helicopter installations when the development is within 9 nm (17 km) of a proposed development. No offshore helicopter installations are within 9 nm of the PFOWF Array Area boundaries.

#### 15.4.4.8 Local airspace restrictions (Prohibited/Restricted/Danger Areas and Military PEXAs)

The PFOWF Array Area lies underneath Danger Area D712C which is part of the Northern Managed Danger Area (MDA) complex established from Flight Level (FL) 245 (24,500 ft) up to FL 660 (66,000 ft). Distinct areas within the Northern MDA are activated when required by MoD. Promulgated activity within the Northern MDA includes air combat and training exercises and supersonic flight.

To the west of the PFOWF Array Area is military danger area complex D801, 802 and 803, which are activated periodically, from the surface up to FL 550 (55,000 ft), for air-to-ground bombing exercises. D802 is the nearest of these danger areas to the PFOWF Array Area and is approximately 20 nm (37 km) outside the eastern boundaries of the danger area complex.

#### 15.4.4.9 Met Office radar

The closest Met Office radar systems are located at Druim a'Starraig near Stornoway, Isle of Lewis and Hill of Dudwick near Ellon, Aberdeenshire. They are located 146 km and 174 km, respectively, from the PFOWF Array Area, which is outside the 20-km safeguarding area for radars of this nature.

### **15.4.5 Future Baseline**

There are no planned changes to the airspace environment that are expected to affect any future baseline for Aviation and Radar. Therefore, the future baseline for Aviation and Radar is not expected to differ from the current baseline as presented in Section 15.4.4.

# **15.4.6 Summary of Baseline Environment**

The key sensitive Aviation and Radar receptors identified from the baseline characterisation study, that are the focus of the impact assessment are as follows:

- Potential impact on Wick and Kirkwall Airport IFPs (depending on the location of the WTG construction port (see Table 15.2); and
- > Potential impact on military low flying and UK SAR helicopter operations.

Potential receptors and impacts scoped into the assessment and impacts scoped out are provided in Section 15.5 along with justification.

#### **15.4.7 Data Gaps and Uncertainties**

The data used in this chapter are detailed in Section 15.4.2. The data used are the most up-to-date publicly available information which can be obtained from the applicable data sources as cited. Data has also been provided through consultation, as detailed in Table 15.2. It is considered that the data employed in the assessment are robust and sufficient for the purposes of the impact assessment presented.

# **15.5 Impact Assessment Methodology**

### **15.5.1 Impacts Requiring Assessment**

This assessment covers all impacts identified through the scoping process, as well as any further potential impacts that have been highlighted as the EIA has progressed. It should be noted that impacts are not necessarily relevant to all stages of the Offshore Development.

Table 15.4 below indicates the potential direct and indirect impacts assessed with regard to Aviation and Radar and indicates the Offshore Development stages to which they relate. Cumulative impacts are discussed in Section 15.7.



Potential Impact	Description			
Construction				
Potential impact on Wick Airport IFPs	Potential infringement of the airport safeguarded area due to the presence of obstacles. An assessment of this impact is provided in Section 15.6.1.1.			
Potential impact on military low flying and UK SAR helicopter operations	Increased collision risk for aircraft operating at a low level due to the presence of obstacles. An assessment of this impact is provided in Section 15.6.1.2.			
Operation and Maintenance				
Potential impact on Wick Airport IFPs	Potential infringement of the airport safeguarded area due to the presence of obstacles. An assessment of this impact is provided in Section 15.6.2.1.			
Potential impact on military low flying and UK SAR helicopter operations	Increased collision risk for aircraft operating at a low level due to the presence of obstacles. An assessment of this impact is provided in Section 15.6.2.2.			
Decommissioning				
No impacts identified	n/a			

Table 15.4 Impacts requiring assessment

The assessment of impacts on Aviation and Radar was a desk-based exercise making use of existing studies and datasets; these are summarised in Table 15.3. The desktop review was conducted using comprehensive aviation documentation and charts to identify potential aviation receptors during the construction, operation and maintenance, and decommissioning phases of the Offshore Development. Supporting information was also drawn from a review of data sources; in particular, the UK IAIP and consultee responses and data sources as outlined in Table 15.2.

# **15.5.2 Impacts Scoped Out of the Assessment**

The following impacts were scoped out of the assessment during EIA scoping:

- > Offshore Export Cable(s): No impacts identified pertaining to the OECC;
- > Military Aerodrome IFPs: MoD confirmed in their scoping response (see Table 15.2) no impact on military aerodrome operations;
- > Civil ATC radar: NATS confirmed in their scoping response (see Table 15.2) no conflict with NATS safeguarding criteria. HIAL confirmed that their surveillance strategy has not significantly progressed (Table 15.2).
- Military ATC radar: MoD confirmed in their scoping response (see Table 15.2) no impact on military ATC radar systems;
- Military AD radar: MoD confirmed in their scoping response (see Table 15.2) no impact on military AD radar systems;
- HMRs: CAA guidance is that 2 nm (4 km) on either side of an HMR should be kept obstacle-free. HMR YANKEE is the nearest HMR located approximately 3 nm (5.5 km) outside the eastern boundary of the PFOWF Array Area. Furthermore, the ground track of HMR YANKEE is outside the lateral boundaries of the PFOWF Array Area as a whole. Consequently, helicopter operations on HMR YANKEE will not be affected;
- Offshore helicopter installations (oil and gas platforms): No offshore helicopter installations are located within 9 nm (17 km) of the PFOWF Array Area boundaries, which is CAA's recommended distance for wind farm developers to consult with offshore platform operators;



- Local Airspace Restrictions (Prohibited/Restricted/Danger Areas and Military PEXAs): The PFOWF Array Area is situated outside the boundaries of any active military Danger Areas. Consequently, there will be no impact on MoD operations within restricted airspace; and
- > Met Office radar: The PFOWF Array Area is outside the 20-km safeguarding area for Met Office radars.

# **15.5.3 Assessment Methodology**

The EIA process and methodology are described in detail in Chapter 6: EIA Methodology.

Project-specific criteria have been developed for the sensitivity and vulnerability of the receptor and the likelihood and magnitude of impact as detailed below.

#### 15.5.3.1 Defining impact magnitude

Defining impact magnitude requires consideration of how the following factors will impact on the baseline conditions:

- > Spatial Extent: The area over which the impact will occur;
- > Duration: The period of time over which the impact will occur;
- > Frequency: The number of times the impact will occur over the Offshore Development's life-cycle;
- > Intensity: The severity of the impact;
- > Likelihood: The probability that the impact will occur and the probability that the receptor will be present; and
- > Reversibility: The ability for the receiving environment / exposed receptor to return to baseline conditions.

Based on these parameters, and expert judgement, a summarised description on the assignment of magnitude criteria is provided in Table 15.5.

Magnitude	Criteria		
High	The impact occurs over a large spatial extent resulting in widespread, long-term, or permanent changes in baseline conditions or affecting a large proportion of receptor population. The impact is very likely to occur and/or will occur at a high frequency or intensity.		
Moderate	The impact occurs over a local to medium extent with a short- to medium-term change to baseline conditions or affects a moderate proportion of a receptor population. The impact is likely to occur and/or will occur at a moderate frequency or intensity.		
Low	The impact is localised and temporary or short-term, leading to a detectable change in baseline conditions or a noticeable effect on a small proportion of a receptor population. The impact is unlikely to occur or may occur but at low frequency or intensity.		
Negligible	The impact is highly localised and short-term, with full rapid recovery expected to result in very slight or imperceptible changes to baseline conditions or a receptor population. The impact is very unlikely to occur; if it does, it will occur at a very low frequency or intensity.		
No Change	No change from baseline conditions.		
Note: The magnitude of an impact is based on a variety of parameters. The definitions provided above are for			

Table 15.5 Impact magnitude criteria

Note: The magnitude of an impact is based on a variety of parameters. The definitions provided above are for guidance only and may not be appropriate for all impacts. For example, an impact may occur in a very localised area but at a very high frequency / intensity for a long period of time. In such cases, expert judgement is used to determine the most appropriate magnitude ranking as explained through the narrative of the assessment.

#### 15.5.3.2 Receptor sensitivity

Determining receptor sensitivity is part of the significance of effects assessment. Receptor sensitivity is defined as 'the degree to which a receptor is affected by an impact'.

Overall receptor sensitivity is determined by considering a combination of value, adaptability, tolerance, and recoverability. This is achieved by applying known research and information on the status and sensitivity of the receptor under consideration coupled with professional judgement and past experience.

The ability of a receptor to adapt to change, tolerate, and/or recover and the timing for recovery from potential impacts is key in assessing its vulnerability to the impact under consideration. Table 15.6 details the criteria used to define sensitivity in terms of adaptability and recoverability.

Receptor sensitivity	Definition
Very high	The receptor has no capacity to accommodate a particular effect and no ability to recover or adapt.
High	The receptor has a very low capacity to accommodate a particular effect with a low ability to recover or adapt.
Moderate	The receptor has a low capacity to accommodate a particular effect with a low ability to recover or adapt.
Low	The receptor has some tolerance to accommodate a particular effect or will be able to recover or adapt.
Negligible	The receptor is generally tolerant and can accommodate a particular effect without the need to recover or adapt.

Table 15.6 Sensitivity of receptor (ability to recover and adaptability)

Receptor value considers whether, for example, the receptor is rare, has protected or threatened status, and/or importance at the local, regional, national, or international scale. Based on this, receptor value has been defined for Aviation and Radar receptors in Table 15.7 below to aid the overall assessment of receptor sensitivity.

#### Table 15.7 Criteria for value of Aviation and Radar receptor

Value of Receptor	Definition
Very high	Receptor, or the activities of the receptor, is of very high value to the local, regional, or national economy and/or the receptor or the activities of the receptor, is vulnerable to impacts that may arise from the Offshore Development and/or recoverability is low and/or costly.
High	Receptor, or the activities of the receptor, is of high value to the local, regional, or national economy and/or the receptor or the activities of the receptor, is generally vulnerable to impacts that may arise from the Offshore Development and/or recoverability is low and/or costly.
Medium	Receptor, or the activities of the receptor, is of moderate value to the local, regional, or national economy and/or the receptor or the activities of the receptor, is somewhat vulnerable to impacts that may arise from the Offshore Development and/or has moderate to high levels of recoverability.
Low	Receptor, or the activities of the receptor, is of low value to the local, regional, or national economy and/or the receptor or the activities of the receptor, is not generally vulnerable to impacts that may arise from the Offshore Development and/or has high recoverability.
Negligible	Receptor, or the activities of the receptor, is of negligible value to the local, regional, or national economy and/or the receptor or the activities of the receptor, is not vulnerable to impacts that may arise from the Offshore Development and/or has high recoverability.

The overall sensitivity for Aviation and Radar receptors is thus defined based on professional judgement in line with the above criteria.



#### 15.5.3.3 Evaluation to determine significance of effect

Significance of effect is determined by correlating the magnitude of the impact and the sensitivity of the receptor whilst utilising professional judgement and industry best practice guidance, science, and accepted approaches.

To ensure a transparent and consistent approach throughout this Offshore EIAR, a matrix approach has been adopted to guide the assessment of significance of effects (see Table 15.8). Importantly, latitude for professional judgement in the application of this matrix is permitted where deemed appropriate.

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Significance of Effects Matrix					
Sensitivity of	Magnitude of Impact				
Receptor	No Change	Negligible	Low	Moderate	High
Negligible	Negligible	Negligible	Negligible	Negligible	Minor
Low	Negligible	Negligible	Minor	Minor	Moderate
Moderate	Negligible	Minor	Minor	Moderate	Major
High	Negligible	Minor	Moderate	Major	Major
Very High	Negligible	Minor	Major	Major	Major

Definitions of significance of effect are described in Table 15.9. For this Offshore EIAR, any effect with a significance of moderate or greater is generally considered 'significant' in EIA terms and additional mitigations may be required. Effects identified as minor or negligible are generally considered to be 'not significant' in EIA terms.

Assessment Consequence	Description (consideration of receptor sensitivity and value and impact magnitude)	Significance of Effect
Major Effects	Effects (beneficial or adverse) are likely to be highly noticeable and long-term, or permanently alter the character of the baseline and are likely to disrupt the function and/or status / value of the receptor population. Such adverse effects are a priority for mitigation in order to avoid or reduce the anticipated significance of the effect.	Significant
Moderate Effects	Effects (beneficial or adverse) are likely to be noticeable and result in lasting changes to the character of the baseline and may cause hardship to, or degradation of the receptor, although the overall function and value of the baseline / receptor population are not disrupted. Such adverse effects are a priority for mitigation in order to avoid or reduce the anticipated significance of the effects.	Significant
Minor Effects	Effects (beneficial or adverse) are expected to comprise noticeable changes to baseline conditions, beyond natural variation, but are not expected to cause long-term degradation or hardship or impair the function and value of the receptor. Such adverse effects are typically not contentious and generally will not require additional mitigation but may be of interest to stakeholders.	Not Significant
Negligible	Effects are expected to be either indistinguishable from the baseline or within the natural level of variation. Such effects do not require mitigation and are not anticipated to be a stakeholder concern and/or a potentially contentious issue in the decision-making process.	Not Significant



# 15.5.4 Design Envelope Parameters

As detailed in Chapter 5: Project Description, this assessment considers the Offshore Development parameters which are predicted to result in the greatest environmental impact, known as the 'realistic worst case scenario'. The realistic worst case scenario represents, for any given receptor and potential impact on that receptor, various options in the Design Envelope that would result in the greatest potential for change to the receptor in question.

Given that the realistic worst case scenario is based on the design option (or combination of options) that represents the greatest potential for change, confidence can be held that the development of any alternative options within the design parameters will give rise to no effects greater or worse than those assessed in this impact assessment. Table 15.10 presents the realistic worst case scenario for potential impacts on Aviation and Radar during the construction, operation and maintenance and decommissioning phases of the Offshore Development.

The potential effects of WTGs on Aviation and Radar are widely publicised but, despite innumerable subtleties in the actual effects, two dominant scenarios lead to potential impacts:

- > Physical obstruction: WTG scan present a physical obstruction to aircraft; and
- > Impacts on aviation radar systems and the provision of radar-based ATS: WTGs can create unwanted radar clutter which appears on radar displays and can affect the provision of ATS to pilots.

It should be noted that the potential impact on aircraft due to the presence of physical obstacles needs to be mitigated and resolved prior to commencement of the construction phase. Also, that adverse effects on radar systems are only possible if the WTGs blades are moving; consequently, impact on radar systems applies to the operation and maintenance phase only.

The worst case scenario for Aviation and Radar, therefore, is based on the maximum number of WTGs, maximum blade tip height and maximum rotor diameter (see Table 15.10).

Potential Impact	Design Envelope Scenario Assessed					
Construction, Operation and Maintenance, and Decommissioning Phases						
Potential impact on Wick Airport IFPs due to presence of obstacles (WTGs in construction).	<ul> <li>&gt; 300 m maximum blade tip height above Lowest Astronomical Tide; and</li> <li>&gt; 260 m maximum rotor diameter.</li> </ul>					
Potential impact on low flying (including SAR helicopter operations) due to the presence of obstacles (WTGs in construction).	<ul> <li>&gt; 300 m maximum blade tip height above Lowest Astronomical Tide; and</li> <li>&gt; 260 m maximum rotor diameter.</li> </ul>					

#### Table 15.10 Design parameters specific to Aviation and Radar receptor impact assessment

#### **15.5.5 Embedded Mitigation and Management Plans**

As part of the Offshore Development design process, a number of designed-in measures and management plans have been proposed to reduce the potential for impacts on Aviation and Radar receptors, as summarised in Table 15.11. As there is a commitment to implementing these measures, which will likely be secured through Section 36 (S. 36) Consent and Marine Licence Conditions, they are considered inherently part of the design of the Offshore Development and have therefore been considered in the assessment presented below (i.e. the determination of the magnitude of impact and therefore the significance of effects assumes implementation of these measures). These measures are considered standard industry practice for this type of development.



Table 15.11 Embedded mitigation measures and management plans specific to Aviation and Radar for the Offshore Development

Embedded Mitigation Measures and Management Plans	Justification		
Management Plans			
Approval and implementation of a LMP, which will set out specific requirements in terms of aviation lighting to be installed on the WTGs, as required under CAA (2016).	The LMP will be prepared in consultation with the CAA, MoD, and MCA and will take into account requirements for aviation lighting as specified in Article 223 of the ANO, 2016 and changes to ICAO Annex 14 Volume 2, Chapter 6, paragraph 6.2.4 promulgated in November 2016.		
CAP 393, Air Navigation: The Order and the Regulations (2016).	The production and approval of an LMP will be a condition of the S.36 Consent and Marine Licence. Measures will be adopted to ensure that the potential risk of aircraft collision with the Offshore Development's infrastructure is minimised.		
An ERCoP will be in place for the Offshore Development. The ERCoP will refer to the marking and lighting of the WTGs and will consider helicopters undertaking SAR operations when rendering assistance to vessels and persons in the vicinity of the PFOWF Array Area.	An ERCoP will be produced for the Offshore Development to ensure the emergency response plan for the Offshore Development will provide sufficient information about the project, actions and details required in the event of an emergency. This will ensure that MCA recommended standards and procedures are followed as well as ensuring appropriate lighting and marking are in place to facilitate aeronautical safety during SAR helicopter operations.		
Embedded Mitigations			
All structures of more than 91.4 m in height will be charted on aeronautical charts and reported to the Defence Geographic Centre, which maintains the UK's database of tall structures (Digital Vertical Obstruction File) at least ten weeks prior to construction.	Consultation with the CAA, MCA, MoD and NLB prior to agreement of the LMP and the Design, Specification, and Layout Plan (DSLP). Both the LMP and the DSLP will be conditions of the S.36 Consent and Marine Licence. Measures will be adopted to ensure that the potential risk of aircraft collision with the Offshore Development's infrastructure is minimised.		
Any temporary obstacles associated with wind farms which are of more than 91.4 m in height are to be alerted to aircrews by means of the Notice to Airmen (NOTAM) system.	Consultation with the CAA will be required to ensure that temporary obstacles of more than 91.4 m are identified to aircrews by NOTAM. Notification of temporary obstacles will be a condition of the S.36 Consent and Marine Licence. Measures will be adopted to ensure that the potential risk of aircraft collision with the Offshore Development's infrastructure is minimised.		
CAA will be informed of the locations, heights and lighting status of the WTGs including estimated and actual dates of construction and the maximum heights of any construction equipment to be used, prior to the start of construction.	Consultation with the CAA will be required. Inclusion of locations, heights, and lighting status of the WTGs on aviation charts and in the UK IAIP will be a condition of the S.36 Consent and Marine Licence. Measures will be adopted to ensure that the potential risk of aircraft collision with the Offshore Development's infrastructure is minimised.		

# **15.6 Assessment of Environmental Effects**

# **15.6.1 Effects during Construction**

#### 15.6.1.1 Potential impact on Wick Airport IFPs due to presence of obstacles (WTGs in construction)

The presence of a wind farm within 25 nm (46 km) of a civil airport can impact on that unit's IFPs. In particular, aircraft inbound to an airport fly on published routes and only down to the lowest altitude prescribed on the relevant procedure. Within a 25 nm radius of an airport, the lowest altitude to which aircraft can safely descend is designed such that 1,000 ft vertical separation can be maintained from all terrain and obstacles (such as WTGs); this is known as the Minimum Safe Altitude (MSA). Further descent below this altitude is not authorised until the aircraft is established on the final approach track (usually within 10 nm of the runway).



Although airport MSA's are published out to 25 nm, CAA regulations dictate that, in determining airport MSA, the elevation of terrain and obstacles should be surveyed out to 30 nm. In the case of the Offshore Development, the WTGs will be between 25 and 30 nm from Wick Airport. Consequently, only the MSA could be affected by the Offshore Development and not the IFPs themselves.

MSA is determined by adding 1,000 ft to the altitude of the highest terrain/obstacle within a given sector from the airport; this figure is then rounded up to the nearest 100 ft to create the MSA. In the case of Wick Airport's IFPs, the MSA in the sector within which the PFOWF Array Area is published as being 2,000 ft above mean sea level. As the maximum tip height of WTGs within the PFOWF Array Area is 300 m (985 ft) above Lowest Astronomical Tide, it is not envisaged that the MSA in the vicinity of the PFOWF Array Area will need to change i.e. 985 ft + 1000 ft is 1,985 ft, rounded up to the nearest 100 ft = 2,000 ft. Consequently, Wick Airport's IFPs will not be affected by the Offshore Development.

At the request of HIAL, an IFP assessment has been carried out by Cyrrus Limited, a CAA-accredited procedure design company. The results have confirmed that there will be no impact on Wick Airport's IFPs and HIAL has accepted that there is no impact on Wick Airports' operations and that they will not object nor request any planning conditions (see Table 15.2 and Offshore EIAR [Volume 3]: Appendix 15.1: IFP Opinion).

Wick Airport IFPs are deemed to be of **low sensitivity** to the potential impact caused by the presence of obstacles. The impact is predicted to be direct, of local spatial extent, intermittent and low reversibility. The impact, therefore, is considered to be of **negligible magnitude**. Wick Airport IFPs are considered to be **high-value** receptors, because aviation safety could be affected. It is envisaged that mitigation measures will not be required, however, if mitigation was required, then the MSA could be increased and IFPs re-published. Wick Airport IFPs are considered to have **low vulnerability**, since any impacts are unlikely to affect the long-term functioning of Wick Airport's operations. Therefore, the overall effect is considered to be **negligible** and **not significant**.

15.6.1.2 Potential impact on low flying (including SAR helicopter operations) due to presence of obstacles (WTGs in construction)

Pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter; however, during flight, weather conditions or operational requirements may necessitate route adjustments. In VMC (i.e. good weather conditions), pilots are ultimately responsible for seeing and avoiding obstructions such as WTGs and will be aware of their presence through the notification procedures set out in Table 15.11.

The installation and presence of WTGs pose physical obstructions to aviation operations carried out in the vicinity of wind farms. WTGs can be difficult to see from the air, particularly in poor Meteorological conditions, leading to a potential increase in obstacle collision risk. Furthermore, during the construction phase, the presence and movement of installation vessels (with onboard cranes) could also present a potential obstacle collision risk to aircraft operations. However, in the case of the Offshore Development, the cranes used onsite during the construction phase are not expected to exceed the height of the WTGs (i.e. 300 m). Equally, the WTGs will be installed onto floating structures at the assembly port and then towed to site and attached to the pre-installed moorings.

The presence of construction infrastructure, such as installation vessels towing pre-assembled WTGs, will be alerted to pilots under the NOTAM system (see Table 15.11) which provides details of potential hazards along a flight route, or at a location, that could affect the safety of flight.

In terms of low flying operations, and similar to that described in Section 15.6.1.1, pilots are required to set an MSA in order to identify the lowest altitude, set in areas, that ensures safe separation between their aircraft and known obstacles. MoD outlined in their scoping response (see Table 15.2) that HWL was committed to lighting and charting the WTGs and confirmed that, in the interests of air safety, the Offshore Development should be fitted with MoD accredited aviation safety lighting in accordance with the CAA, The ANO 2016 (see Table 15.11).



In terms of SAR operations, the MCA will be consulted on the lighting and marking arrangements and the WTG layout with the aim of seeking compatibility with SAR helicopter operations in the event of rescue missions within the PFOWF Array Area. Consultation will also be carried out with MCA on their requirements in relation to WTG layout design and SAR lighting and marking and this will continue as WTG layout plans are refined prior to construction (see Table 15.11).

Military low-flying and SAR helicopter operations are deemed to be of **low sensitivity** to the potential risk of collision with obstacles. The impact is predicted to be direct, of local spatial extent, intermittent and low reversibility. The impact, therefore, is considered to be of **low magnitude**. Low flying and SAR helicopter operations are considered to be **high-value** receptors because all aviation impacts are high value. However, implementation of embedded mitigation measures (as described in Table 15.11) ensures that low flying and SAR helicopter operations will have **low vulnerability**, since any impacts are unlikely to affect the long-term functioning of low flying and SAR helicopter operations. Therefore, the overall effect is considered to be **minor** and **not significant**.

#### 15.6.1.3 Summary of effects during construction

A summary of the assessment of effects during construction is provided in Table 15.12.



Summary of Effect	Receptor	Sensitivity	Magnitude of Impact	Rationale	Consequence	Significance of Effect	Additional Mitigation Requirements*	Significance of Residual Effect
Potential impact on Wick Airport IFPs due to the presence of obstacles (WTGs in construction)	Wick Airport IFPs	Low	Negligible	The maximum tip height of 300 m (985 ft) means that the WTGs can be built without affecting existing publishing IFPs.	Negligible Effects	Not Significant	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation listed in Table 15.11 as it was concluded that the effect was not significant.	Not Significant
Potential impact on low flying (including SAR helicopter operations) due to the presence of obstacles (WTGs in construction)	Low Flying and UK SAR helicopter operations	Low	Low	Implementation of embedded mitigation measures (see Table 15.11) ensures that low-flying and SAR helicopter operators will be fully aware of the Offshore Development's infrastructure (cranes, WTGs,) to mitigate any risks of collision.	Minor Effects	Not Significant	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation listed in Table 15.11 as it was concluded that the effect was not significant.	Not Significant

#### Table 15.12 Summary of significance of effects from construction impacts



# **15.6.2 Effects during Operation and Maintenance**

15.6.2.1 Potential impact on Wick Airport IFPs due to presence of obstacles (operational WTGs)

As detailed in Section 15.6.1.1, the presence of a wind farm within 25 nm (46 km) of a civil airport can impact on that unit's IFPs.

Wick Airport IFPs are deemed to be of **low sensitivity** to the potential impact caused by the presence of obstacles. The impact is predicted to be direct, of local spatial extent, intermittent and low reversibility. The impact, therefore, is considered to be of **negligible magnitude**. Wick Airport IFPs are considered to be **high-value** receptors, because aviation safety could be affected. It is envisaged that mitigation measures will not be required, however, if mitigation was required, then the MSA could be increased and IFPs re-published. Wick Airport IFPs are considered to have **low vulnerability**, since any impacts are unlikely to affect the long-term functioning of Wick Airport's operations. Therefore, the overall effect is considered to be **negligible** and **not significant**.

15.6.2.2 Potential impact on low flying (including SAR helicopter operations) due to presence of obstacles (operational WTGs)

As detailed in section 15.6.1.2, pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter; however, during flight, weather conditions or operational requirements may necessitate route adjustments. In VMC (i.e. good weather conditions), pilots are ultimately responsible for seeing and avoiding obstructions such as WTGs and will be aware of their presence through the notification procedures set out in Table 15.11.

The presence of WTGs poses physical obstructions to aviation operations carried out in the vicinity of wind farms. WTGs can be difficult to see from the air, particularly in poor Meteorological conditions, leading to a potential increase in obstacle collision risk.

In terms of low flying operations, and similar to that described in Section 15.6.1.1, pilots are required to set an MSA in order to identify the lowest altitude, set in areas, that ensures safe separation between their aircraft and known obstacles. MoD outlined in their Scoping response (see Table 15.2) that HWL was committed to lighting and charting the WTGs, and confirmed that, in the interests of air safety, the PFOWF Array should be fitted with MoD accredited aviation safety lighting in accordance with the CAA, The ANO 2016; as set out in Table 15.11.

In terms of SAR operations, the MCA will be consulted on the lighting and marking arrangements and the WTG layout with the aim of seeking compatibility with SAR helicopter operations in the event of rescue missions within the PFOWF Array Area. Consultation will also be carried out with MCA on their requirements in relation to WTG layout design and SAR lighting and marking and this will continue as WTG layout plans are refined prior to construction (see Table 15.11).

Military low-flying and SAR helicopter operations are deemed to be of **low sensitivity** to the potential risk of collision with obstacles. The impact is predicted to be direct, of local spatial extent, intermittent and low reversibility. The impact, therefore, is considered to be of **low magnitude**. Low flying and SAR helicopter operations are considered to be **high-value** receptors because all aviation impacts are high value. However, implementation of embedded mitigation measures (as described in Table 15.11) ensures that low flying and SAR helicopter operations will have **low vulnerability**, since any impacts are unlikely to affect the long-term functioning of low flying and SAR helicopter operations. Therefore, the overall effect is considered to be **minor** and **not significant**.

15.6.2.3 Summary of effects during operation and maintenance

A summary of the assessment of effects during Operation and Maintenance is provided in Table 15.13.



Summary of Effect	Receptor	Sensitivity	Magnitude of Impact	Rationale	Consequence	Significance of Effect	Additional Mitigation Requirements*	Significance of Residual Effect
Potential impact on Wick Airport IFPs due to the presence of obstacles (operational WTGs).	Wick Airport IFPs	Low	Negligible	The maximum tip height of 300 m (985 ft) means that the WTGs can be built without affecting existing publishing IFPs.	Negligible Effects	Not significant	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation listed in Table 15.11 as it was concluded that the effect was not significant.	Not significant
Potential impact on low flying (including SAR helicopter operations) due to the presence of obstacles (operational WTGs).	Low Flying and UK SAR helicopter operations	Low	Low	Implementation of embedded mitigation measures (see Table 15.11) ensures that low-flying and SAR helicopter operators will be fully aware of the Offshore Development's infrastructure (cranes, WTGs) to mitigate any risks of collision.	Minor Effects	Not significant	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation listed in Table 15.11 as it was concluded that the effect was not significant.	Not significant

#### Table 15.13 Summary of significance of effects from operation and maintenance impacts



# **15.6.3 Effects during Decommissioning**

No adverse effects were identified in this phase. Any impacts will be the same, or less, than those identified during the construction phase.

# **15.7 Assessment of Cumulative Effects**

# **15.7.1 Introduction**

The consideration of projects which could result in potential cumulative effects when considered alongside the Offshore Development is based on the results of the Offshore Development specific impact assessment together with the expert judgement of the specialist consultant and consultation with relevant aviation stakeholders.

The approach to the assessment of projects includes:

- Quantitative assessment of projects submitted to Scoping up to six months prior to PFOWF application submission;
- > Qualitative assessment of projects submitted to Scoping up to five months prior to PFOWF application submission; and
- > Acknowledgement of projects submitted to Scoping between five and two months prior to PFOWF application submission.

This approach was shared and agreed upon with MS-LOT, and the agreement was confirmed via email on 6th December 2021. The approach to the cumulative assessment is set out in the Offshore EIA (Volume 3): Appendix 6.1: Cumulative Projects Approach. The approach and list of cumulative projects screened into the assessment were provided to MS-LOT and consultees and comments were received on 16 May 2022.

There are limited project details for the sites awarded Option Agreements within the ScotWind leasing round or for Offshore Wind Leasing Round 4 Projects in English waters. As noted above, the cut-off date for a qualitative assessment of projects in the Scoping stage was February 2022, therefore, the ScotWind projects are acknowledged but no assessment was conducted.

The sites with the greatest potential to act cumulatively with the Offshore Development include the West of Orkney Windfarm (within the N1 Plan Option [PO]) as well as other sites along the north, north-east, and east coasts of Scotland (e.g. those sites within the N2, N3, NE2, NE3, and NE4 POs). These projects will undertake more detailed cumulative assessments with the Offshore Development to support their application for development consent.

In terms of assessing aviation cumulative effects, the impact on any aviation receptor is generally treated as a standalone impact. Whilst other WTG developments may be located in close proximity, the impact on each receptor is considered on a case-by-case basis and any significant effect is sufficient to trigger an objection from the relevant aviation stakeholder. However, if one wind farm has an unacceptable effect on an aviation receptor, it will not impact on any other wind farm. In terms of mitigation, an agreement for one development through consultation with a relevant stakeholder may be of relevance to a neighbouring development, however, it is still necessary for negotiations and discussions with aviation stakeholders on these mitigation measures to be carried out under separate arrangements.

The predicted effects from the Offshore Development on Aviation and Radar receptors are considered to be localised to within the footprint of the PFOWF Array Area. Given that the Offshore Development WTGs are not considered detectable by any radar system, the Offshore Development will not present any cumulative effect on radar systems. Furthermore, given the distance of the PFOWF Array Area from known offshore and onshore developments, the Offshore Development is also not considered to present any cumulative effect on military low flying or SAR helicopter operations in the region.



There is no potential for the predicted impacts to interact with impacts from other projects and activities in the Aviation and Radar Study Area that can lead to a cumulative effect on receptors. Consequently, no further assessment with respect to cumulative effects is required.

# **15.8 Assessment of Transboundary Effects**

In terms of the impacts on Aviation and Radar receptors, impacts will be localised to within the footprint of the PFOWF Array Area Given the intervening distance to neighbouring European Economic Area states, there is no potential for transboundary impacts and resultant effects to occur.

# **15.9 Assessment of Impacts Cumulatively with the Onshore Development**

The Onshore Development components are summarised in Chapter 5: Project Description. These Project aspects have been considered in relation to the impacts assessed within this chapter.

Due to the nature of the potential impacts identified for Aviation and Radar (i.e. WTGs creating physical obstacles to aircraft in flight), and following consideration of the onshore project components, it has been concluded no impacts or resultant effects are expected on Aviation and Radar receptors cumulatively with the Onshore Development activities.

# 15.10 Mitigation and Monitoring Requirements

There is no requirement for additional mitigation over and above the embedded measures for the Offshore Development proposed in Section 15.5.5. However, following consultation with HIAL, the location of the turbine construction port needs to be monitored. Should a construction port be identified that is within 30 nm of Wick or Kirkwall Airport, HWL has accepted that a further IFP assessment would need to be carried out and any resultant mitigation measures are implemented.

# 15.11 Inter-relationships

Interrelated effects describe the potential interaction of multiple project impacts upon one receptor which may interact to create a more significant impact on a receptor than when considered in isolation. Interrelated effects may have a temporal or spatial element and may be short-term, temporary, or longer-term over the lifetime of the Offshore Development.

In line with the Scoping Opinion and Scoping Addendum Opinion received, this chapter has assessed all impacts that are relevant to Aviation and Radar receptors during the construction, operation and maintenance, and decommissioning phases of the Offshore Development. Therefore, it is considered that the assessment and conclusions presented in Section 15.6 provide a complete and robust assessment of all potential impacts relevant to Aviation and Radar receptors. The assessment has also considered the potential for inter-related effects in relation to Aviation and Radar, and no additional inter-related effects beyond those presented in Section 15.6 have been identified.

# 15.12 Summary and Residual Effects

The summary of the residual effects for Aviation and Radar is provided in Table 15.14.



Predicted Effect	Receptor	Assessment Consequence	Significance	Mitigation Identified	Significance of Residual Effect				
Construction									
Potential impact on Wick Airport IFPs due to the presence of obstacles (WTGs).	Wick Airport IFPs	Negligible Effects	Not Significant	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation listed in Table 15.11 as it was concluded that the effect was not significant.	Not Significant				
Potential impact on low flying (including SAR) helicopter operations due to the presence of obstacles (WTGs).	Low Flying and UK SAR helicopter operations	Minor Effects	Not Significant	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation listed in Table 15.11 as it was concluded that the effect was not significant.	Not Significant				
Operation and Maintena	ance								
Potential impact on Wick Airport IFPs due to the presence of obstacles (WTGs).	Wick Airport IFPs	Negligible Effects	Not significant	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation listed in Table 15.11 as it was concluded that the effect was not significant.	Not Significant				
Potential impact on low flying (including SAR) helicopter operations due to the presence of obstacles (WTGs).	Low Flying and UK SAR helicopter operations	Minor Effects	Not Significant	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation listed in Table 15.11 as it was concluded that the effect was not significant.	Not Significant				
Decommissioning									

No adverse effects were identified in this phase. Any impacts will be the same, or less, than those identified during the construction phase.

#### Cumulative

No cumulative impact was identified.



# 15.13 References

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