



**NORTH FALLS**

*Offshore Wind Farm*

# **PRELIMINARY ENVIRONMENTAL INFORMATION REPORT**

## **Chapter 17 Aviation and Radar**

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*Date: May 2023*

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## Glossary of Acronyms

AD	Air Defence
ADR	Air Defence Radar
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AIS	Aeronautical Information Service
ALARP	As low as reasonably practicable
amsl	above mean sea level
ANO	Air Navigation Order
ANSP	Air Navigation Service Provider
ASACS	Air Surveillance and Control System
ATA	Aerial Tactics Area
ATC	Air Traffic Control
ATS	Air Traffic Service
ATSOCAS	Air Traffic Services Outside Controlled Airspace
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
cd	candela
CEA	Cumulative Effects Assessment
CNS	Communication, Navigation and Surveillance
CTA	Control Area
DCO	Development Consent Order
EEA	European Economic Area
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ERCoP	Emergency Response and Cooperation Plan
ES	Environmental Statement
FIR	Flight Information Region
FL	Flight Level
ft	feet
GASCo	General Aviation Safety Council
HAT	Highest Astronomical Tide
HMRI	Helicopter Main Routing Indicator
HTZ	Helicopter Traffic Zone
ICAO	International Civil Aviation Organisation
IFP	Instrument Flight Procedure
IFR	Instrument Flight Rules
ILT	Inspectie Leefomgeving en Transport
km	Kilometre
m	metre
MCA	Maritime and Coastguard Agency

MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MoD	Ministry of Defence
NAIZ	Non-Auto Initiation Zone
NATS	National Air Traffic Services
NERL	NATS (En Route) plc
nm	nautical miles
NOTAM	Notice to Airmen
NPS	National Policy Statement
NSL	NATS (Services) Limited
OREI	Offshore Renewable Energy Installation
Pd	Probability of Detection
PEIR	Preliminary Environmental Information Report
PEXA	Practice and Exercise Areas
PSR	Primary Surveillance Radar
RAF	Royal Air Force
RLoS	Radar Line of Sight
SAR	Search and Rescue
SSR	Secondary Surveillance Radar
UK	United Kingdom
VFR	Visual Flight Rules
WTG	Wind Turbine Generator

## Glossary of Terminology

Array areas	The two distinct offshore wind farm areas (including the 'northern array area' and 'southern array area') which together comprise the North Falls offshore wind farm.
Air Navigation Service Provider (ANSP)	A public or private entity managing air traffic on behalf of a company, region or country. NATS is the main ANSP in the UK.
Controlled airspace	Defined airspace within which pilots must follow Air Traffic Control instructions implicitly. In the UK, Classes A, C, D and E are areas of controlled airspace.
Flight Information Region (FIR)	Airspace managed by a controlling authority with responsibility for ensuring air traffic services are provided to aircraft flying within it.
Flight Level (FL)	An aircraft altitude expressed in hundreds of feet at a standard sea level pressure datum of 1013.25 hectopascals.
Offshore project area	The overall area of the array areas and the offshore cable corridor.
Offshore substation platform(s)	Fixed structure(s) located within the array areas, containing electrical equipment to aggregate the power from the wind turbine generators and convert it into a more suitable voltage for export to shore via offshore export cables.
Primary Surveillance Radar (PSR)	A radar system that measures the bearing and distance of targets using the detected reflections of radio signals.
Secondary Surveillance Radar (SSR)	A radar system that transmits interrogation pulses and receives transmitted responses from suitably equipped targets.
The Project or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
Uncontrolled Airspace	Defined airspace in which Air Traffic Control does not exercise exclusive authority but may provide basic information services to aircraft in radio contact. In the UK, Class G is uncontrolled airspace.



## 17 Aviation and Radar

### 17.1 Introduction

1. This chapter of the Preliminary Environmental Information Report (PEIR) considers the likely significant effects of the North Falls offshore wind farm (herein 'North Falls' or 'the Project') on aviation and radar, including the aviation interests of the United Kingdom (UK) Civil Aviation Authority (CAA), Ministry of Defence (MoD), regional airports, local aerodromes, national air traffic services (NATS) (that currently comprises NATS (En Route) plc (NERL) and NATS (Services) Limited (NSL)), and other UK aviation stakeholders. The chapter provides an overview of the existing environment for the North Falls offshore project area, followed by an assessment of likely significant effects for the construction, operation, maintenance, and decommissioning phases of the Project.
2. This chapter has been written by Cyrrus Limited, with the assessment undertaken with specific reference to the relevant legislation and guidance, of which the primary sources are the National Policy Statements (NPS). Details of these and the methodology used for the Environmental Impact Assessment (EIA) and Cumulative Effects Assessment (CEA) are presented in Section 17.4.
3. The assessment should be read in conjunction with following linked chapters (Volume I):
  - Chapter 13: Offshore Ornithology (due to the effect of aviation lighting);
  - Chapter 15: Shipping and navigation (due to marine activities associated with Search and Rescue (SAR) operations);
  - Chapter 18: Infrastructure and other users (which considers military activities); and
  - Chapter 29: Seascape, landscape and visual impact assessment (due to the effect of aviation lighting).
4. Additional information to support the aviation and radar assessment includes:
  - Appendix 17.1 Airspace Analysis and Radar Modelling (Volume III); and
  - Appendix 17.2 London Southend Airport Instrument Flight Procedure Assessment (Volume III).
5. Appendix 17.1 (Volume III) identifies the radars liable to detect the North Falls Wind Turbine Generators (WTGs) and gives details of the Radar Line of Sight (RLoS) analyses. It also sets out a detailed analysis of the airspace occupied by the array areas and summarises the effects that the Project is likely to have on aviation activities in the vicinity.
6. Appendix 17.2 (Volume III) assesses whether any of the North Falls WTGs will infringe the protected areas and surfaces associated with the Instrument Flight Procedures serving Southend Airport.

## 17.2 Consultation

7. Consultation with regard to aviation and radar has been undertaken in line with the general process described in Chapter 6 EIA Methodology (Volume I). The key elements to date have included scoping and ongoing technical consultation. The feedback received has been considered in preparing the PEIR. Table 17.1 provides a summary of how the consultation responses received to date have influenced the approach that has been taken.
8. This chapter will be updated following the consultation on the PEIR in order to produce the final assessment, which will be presented in an Environmental Statement (ES) that will be submitted with the Development Consent Order (DCO) application.

**Table 17.1 Consultation responses**

Consultee	Date / Document	Comment	Response / where addressed in the PEIR
Ministry of Defence	16 August 2021 Scoping Response	The scoping report identifies that the turbines have the potential to be detectable to, and to have an effect on, the Air Defence Radar (ADR) at RAF Trimmingham. The MOD agree both with this assessment, and that the applicant will need to address the effect of the development on the radar as part of progressing the scheme toward application.	Impact confirmed in Section 17.6.2.1 and discussed in Sections 17.6.2.1.5 and 17.6.2.1.6.
Ministry of Defence	16 August 2021 Scoping Response	The potential impact of the development on military low flying, specifically the creation of physical obstructions to aircraft and the associated potential restriction of access to the project area is mentioned within the report at 2.12.2. It is acknowledged that this will be addressed in future submissions. As a minimum MoD will require that appropriate data is submitted to allow accurate charting of the development and that MoD accredited aviation safety lighting is fitted to wind turbine generators and ancillary offshore infrastructure as may be applicable.	Notification of data to the MoD and lighting requirements addressed in paragraphs 22 and 28 respectively.
The Planning Inspectorate	26 August 2021 Scoping Opinion	The assessment of the effects on military low flying arising from operation of the project in the ES should be undertaken using accurate charting of the WTGs. Where the final layout / height mix of WTGs has not been decided, the worst case scenario(s) should be assessed.	Realistic worst-case scenarios considered for the assessment are summarised in Table 17.2.
The Planning Inspectorate	26 August 2021 Scoping Opinion	The Scoping Report states that the assessment will be supported by desk based studies in parallel with relevant stakeholder consultation bodies. No reference is made to a defined study area (other than a list of airports with their distance from the scoping boundary) and / or methodology that will be used to establish the baseline and assess impacts, nor is any criteria presented to identify how significance of	The study area is defined in Section 17.3.1. Assessment methodology and impact significance is addressed in Section 17.4.3. Relevant guidance is referenced in Section 17.4.1.

Consultee	Date / Document	Comment	Response / where addressed in the PEIR
		effect will be determined. The ES should be clear how the assessment has been undertaken, taking into relevant guidance and aspect specific methodology.	
The Planning Inspectorate	26 August 2021 Scoping Opinion	The Scoping Report identifies potential impacts to military and civil aviation, including through physical components of the project limiting access and on radar systems. The potential for inter relationships with other aspects e.g. infrastructure and other users, tourism and socioeconomics, should also be assessed in the ES if a significant effect is likely.	The inter-relationship with Offshore Ornithology, Shipping and Navigation, Infrastructure and Other Users, and Seascapes, Landscape and Visual is discussed in Section 17.10. Inter-relationships with other aspects are not considered likely.
The Planning Inspectorate	26 August 2021 Scoping Opinion	The Inspectorate considers that there may be a requirement for aviation safety lighting to mitigate potential significant effects to military low flying from the presence of WTGs and other offshore infrastructure. The Applicant should seek to agree the specification of any aviation safety lighting with relevant consultation bodies. Any significant effects associated with the lighting on ecological receptors should also be assessed in the ES.	Marking and lighting requirements are address in Section 17.3.3.2. Effects associated with lighting on ecological receptors are considered in the Chapter 13 Offshore Ornithology (Volume I).
NATS	07 September 2021 Scoping Response	Southern Turbines: No impact expected Northern Turbines: Cromer - The turbines are expected to be visible Debden - The turbines are expected to be visible approx. 5% of the time	Impact confirmed in Section 17.6.2.1 and discussed in Sections 17.6.2.1.1, 17.6.2.1.2 and 17.6.2.1.6.
Noordzee Helikopters Vlaanderen (NHV) Group	17 June 2022 Consultation response	We have no comments.	Noted.
Southend Airport	24 June 2022 Online meeting	The Airport requested an assessment of the potential impact of the North Falls WTGs on the Airport's Instrument Flight Procedures (IFPs).	An IFP assessment was undertaken, as presented in Appendix 17.2 (Volume III), which shows that North Falls WTGs will have no impact on Southend Airport's existing published IFPs. There are two Required Navigation Performance IFPs currently with the CAA awaiting approval. Once approved, these IFPs will also require assessment.
Ministry of Defence	02 September 2022 Pre-application advice – Northern array	The turbines will be 84.7km from and detectable by the Air Traffic Cover (ATC) radar at Honington. The turbines will be 66.2km from and detectable by the ATC radar at Wattisham. The turbines will be 83.8km from and detectable by the Air Defence (AD)	Modelling in Appendix 17.1 (Volume III) shows that WTGs within the northern array area will not be in RLoS of Honington radar. Consultation with MoD is ongoing to confirm radar detection. Modelling in Appendix 17.1 (Volume III) confirms that WTGs within the northern array area will be in RLoS and detected by

Consultee	Date / Document	Comment	Response / where addressed in the PEIR
		<p>radar at Air Surveillance and Control System (ASACS) Neatishead.</p> <p>The turbines will be 104.1km from and detectable by the Air Defence (AD) radar at ASACS Trimmingham.</p>	<p>Wattisham radar; Neatishead radar; and</p> <p>Trimingham radar.</p> <p>The impact of WTGs on radars is discussed in Section 17.6.2.1 together with possible mitigations.</p>
Ministry of Defence	02 September 2022 Pre-application advice – Southern array	<p>The turbines will be 72.6km from and detectable by the ATC radar at Wattisham.</p> <p>The turbines will be 105.8km from and detectable by the AD radar at ASACS Neatishead.</p> <p>The turbines will be 126.1km from and detectable by the AD radar at ASACS Trimmingham.</p>	<p>Modelling in Appendix 17.1 (Volume III) confirms that WTGs within the southern array area will be in RLoS and detected by Wattisham radar.</p> <p>Modelling in Appendix 17.1 (Volume III) shows that WTGs within the southern array area will not be in RLoS of Neatishead radar and Trimmingham radar.</p> <p>Consultation with MoD is ongoing to confirm radar detection.</p> <p>The impact of WTGs on radars is discussed in Section 17.6.2.1 together with possible mitigations.</p>
Ministry of Defence	02 September 2022 Pre-application advice	The applicant should be advised to take account of the current published MoD Practice and Exercise Areas (PEXA) in preparation of their development proposal. The MoD has highly surveyed areas which may be relevant to the installation of the export cables & associated infrastructure. The MoD would like to be consulted at the next stage of this application.	The existing military environment is described in Section 17.5.3. All areas of Special Use Airspace are well removed from the North Falls array areas. The Ministry of Defence is a prescribed consultee for the North Falls DCO application and is being consulted on this PEIR.
Ministry of Defence	02 September 2022 Pre-application advice	<p>Fixed Wing military low flying training takes place throughout the United Kingdom down to a height of 250ft above ground level and in certain designated areas down to a height of 100ft above ground level. A turbine development of the height and at the location you propose may have an impact on low flying operations. We have produced a map which indicates areas in the UK where the MOD is more likely or less likely to object to wind turbine planning applications on the grounds of interference with low flying operations.</p> <p>Regardless of whether we object to your proposal, it is probable the MoD will request the turbines be fitted with MoD accredited visible or infrared aviation safety lighting.</p>	<p>The potential impact on military low flying is considered in Sections 17.6.1.2, 17.6.2.2 and 17.6.3.2.</p> <p>Lighting addressed in Section 17.3.3.2.</p>
Ministry of Defence	02 September 2022 Pre-application advice	The Met Office is now a statutory consultee for planning relating to their technical infrastructure, therefore the MoD has not informed the Met Office of this pre-application. If your development falls within any of the Met Office safeguarded zones you will need to contact the Met Office directly.	The North Falls array areas are outside all Met Office consultation zones.

## 17.3 Scope

### 17.3.1 Study area

9. The study area for aviation and radar has been defined on the basis of the potential for WTGs within the North Falls array areas to have an impact on civil and military radars, taking into account required radar operational ranges. The study area includes the North Falls array areas and the airspace between the array areas and the UK mainland, extending from the NERL radar facility at Cromer to the north, to Southend Airport to the south and Stansted Airport to the west (Figures 17.1 and 17.2, Volume II).

10. The following receptors within the study area have been identified:

#### 17.3.1.1 *Civil aerodromes*

11. Civil Aviation Publication (CAP) 764: Policy and Guidelines on Wind Turbines (CAA, 2016) states the distances from various types of aerodromes where consultation should take place. These distances include:

- Aerodromes with a surveillance radar – 30km;
- Non-radar equipped licensed aerodromes with a runway of more than 1,100m – 17km;
- Licensed aerodromes where the WTGs will lie within airspace coincidental with any published Instrument Flight Procedure (IFP);
- Unlicensed aerodromes with runways of more than 800m – 4km;
- Unlicensed aerodromes with runways of less than 800m – 3km;
- Gliding sites – 10km; and
- Other aviation activity such as parachute sites and microlight sites within 3km.

12. CAP 764 goes on to state that these distances are for guidance purposes only and do not represent ranges beyond which all WTG developments will be approved or within which they will always be objected to. For example, aerodromes may utilise their radars at ranges considerably in excess of 30km.

13. As well as examining the technical impact of WTGs on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations using the criteria laid down in CAP 168: Licensing of Aerodromes (CAA, 2022) to determine whether the project will breach obstacle clearance criteria.

#### 17.3.1.2 *Ministry of Defence*

14. It is necessary to take into account the aviation and air defence activities of the MoD. This includes:

- MoD airfields, both radar and non-radar equipped;
- MoD Air Defence (AD) radars; and
- MoD Danger Areas.

#### 17.3.1.3 *NERL facilities*

15. It is necessary to take into account the possible effects of WTGs upon NERL radar systems – a network of primary and secondary radars and navigation facilities around the country.

#### 17.3.1.4 *Other aviation activities*

- General military low-flying training operations; and
- Military and civilian ‘off-route’ fixed-wing and helicopter operations, including SAR missions.

### 17.3.2 Realistic worst case scenario

16. The final design of North Falls will be confirmed through detailed engineering design studies that will be undertaken post-consent. In order to provide a precautionary but robust impact assessment at this stage of the development process, realistic worst case scenarios have been defined in terms of the potential effects that may arise. This approach to EIA, referred to as the Rochdale Envelope, is common practice for developments of this nature, as set out in Planning Inspectorate Advice Note Nine (2018). The Rochdale Envelope for a project outlines the realistic worst case scenario for each individual impact, so that it can be safely assumed that all other scenarios within the design envelope will have less impact. Further details are provided in Chapter 6 EIA Methodology (Volume I).
17. The realistic worst case scenarios for the likely significant effects scoped into the EIA for the aviation and radar assessment are summarised in Table 17.2. These are based on North Falls parameters described in Chapter 5 Project Description (Volume I), which provides further details regarding specific activities and their durations.

**Table 17.2 Realistic worst case scenarios**

Potential Impact	Parameter	Notes
<b>Construction</b>		
Impacts on civil and military radar systems due to high construction vessels / cranes and partially complete structures.	40 WTGs with a maximum blade tip height of 397m above Mean High Water Springs (MHWS), or 72 WTGs with a maximum blade tip height of 310m above MHWS. The final scenario is likely to be between 40 and 72 WTGs with tip heights between 310m and 397m above MHWS. The assessment of impacts is robust for any combination of WTG parameters within these ranges. High crane installation vessels.	Maximum number of the tallest WTGs, or Maximum number of WTGs for North Falls. (Either of the above scenarios could be worst case and both have been assessed for all impacts). Impact starting from a point of zero infrastructure present to full presence over a 36-month period.
Creation of aviation obstacle environment.	40 WTGs with a maximum blade tip height of 397m above MHWS, or 72 WTGs with a maximum blade tip height of 310m above MHWS. The final scenario is likely to be between 40 and 72 WTGs with tip heights between 310m and 397m above MHWS. The assessment of impacts is robust for any combination of WTG parameters within these ranges. Maximum of two offshore substation platforms. High crane installation vessels.	Maximum number of the tallest WTGs, or Maximum number of WTGs for North Falls. (Either of the above scenarios could be worst case and both have been assessed for all impacts). Maximum physical obstruction to aviation operations due to size and number of above sea level infrastructure within the North Falls array areas. Impact starting from a point of zero infrastructure present to full presence over a 39-month period.
Increased air traffic in the area related to wind farm activities.	Maximum number of 100 helicopter return trips per year during WTG installation.	Helicopter trips as a result of being engaged in works on North Falls causing increased likelihood of aircraft to aircraft collision.
<b>Operation</b>		
WTGs causing permanent interference on civil and military radars.	40 WTGs with a maximum blade tip height of 397m above MHWS, or 72 WTGs with a maximum blade tip height of 310m above MHWS. The final scenario is likely to be between 40 and 72 WTGs with tip heights between 310m and 397m above MHWS. The assessment of impacts is robust for any combination of WTG parameters within these ranges.	Maximum number of the tallest WTGs, or Maximum number of WTGs for North Falls. (Either of the above scenarios could be worst case and both have been assessed for all impacts). Impact present for operational lifetime of 30 years.
Creation of aviation obstacle environment.	40 WTGs with a maximum blade tip height of 397m above MHWS, or 72 WTGs with a maximum blade tip height of 310m above MHWS.	Maximum number of the tallest WTGs, or Maximum number of WTGs for North Falls.

Potential Impact	Parameter	Notes
	The final scenario is likely to be between 40 and 72 WTGs with tip heights between 310m and 397m above MHWS. The assessment of impacts is robust for any combination of WTG parameters within these ranges. Maximum of two offshore substation platforms.	(Either of the above scenarios could be worst case and both have been assessed for all impacts). Maximum physical obstruction to aviation operations due to size and number of above sea level infrastructure within the North Falls array areas. Impact present for operational lifetime of 30 years.
Increased air traffic in the area related to wind farm activities.	Maximum number of 100 helicopter return trips per year required for offshore operation and maintenance activities.	Helicopter trips as a result of being engaged in works on North Falls causing increased likelihood of aircraft to aircraft collision.
<b>Decommissioning</b>		
Impacts on civil and military radar systems due to high construction vessels / cranes and partially dismantled structures..	No decision has yet been made regarding the final decommissioning arrangements for the offshore project infrastructure. It is also recognised that legislation and industry best practice change over time. However, the following infrastructure is likely be removed, reused or recycled where practicable:	Impact starting from a point of full presence of infrastructure described above to zero presence over the decommissioning period. Decommissioning arrangements will be detailed in a Decommissioning Programme, which will be drawn up and agreed with the Department for Energy Security and Net Zero (DESNZ) prior to decommissioning.
Removal of aviation obstacle environment.	<ul style="list-style-type: none"> <li>• WTGs including monopile, steel jacket and GBS foundations;</li> <li>• OSPs including topsides and steel jacket foundations;</li> </ul>	
Increased air traffic in the area related to wind farm activities.	<p>The following infrastructure is likely to be decommissioned in situ depending on available information at the time of decommissioning:</p> <ul style="list-style-type: none"> <li>• Scour protection;</li> <li>• Offshore cables likely to be left in situ; and</li> <li>• Crossings and cable protection.</li> </ul> <p>The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator. For the purposes of the worst case scenario, it is anticipated that the impacts will be no greater than those identified for the construction phase.</p>	



### 17.3.3 Summary of mitigation embedded in the design

18. As part of the North Falls design process a number of mitigation measures are proposed to reduce the potential for impacts on civil and military aviation. These measures include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements.

#### 17.3.3.1 *Information, notifications and charting*

19. North Falls will create an obstacle environment which can effectively be mitigated by compliance with appropriate international and national requirements for the promulgation of the obstacle locations on charts and in aeronautical documentation, together with the permanent marking and lighting of obstacles.
20. Measures will be adopted at the commencement of works on North Falls to ensure that the aviation sector is made aware of the creation of a further aviation obstacle environment in the southern North Sea, namely North Falls. These measures will include issuing Notices to Airmen (NOTAMs) and Aeronautical Information Circulars (AICs), warning of the establishment of obstacles within the North Falls array area and publicity in such aviation publications as Safety Sense and the General Aviation Safety Council (GASCo) Flight Safety magazine.
21. At various points during the development details of the position, height above mean sea level (amsl) and lighting of each of the completed permanent structures will be forwarded to the NATS Aeronautical Information Service (AIS) for inclusion in the UK Aeronautical Information Publication (AIP) and on relevant aeronautical charts, as notifiable permanent obstructions. This permanent information will replace the short-term NOTAMs that will continue to be issued to cover the Project until construction has been completed.
22. En route navigation charts will be updated as the site construction proceeds. All obstacles over 300ft (91.4m) amsl must be notified to the CAA for inclusion in the UK AIP (Section ENR5.4) and on aeronautical maps, and to the Defence Geographic Centre for inclusion in MoD databases.

#### 17.3.3.2 *Marking and lighting*

23. The international marking and lighting requirement, set out in the International Civil Aviation Organisation (ICAO) Annex 14: Aerodrome Design and Operations, specifies that:
  - “a wind turbine shall be marked and / or lighted if it is determined to be an obstacle.”; and
  - “the rotor blades, nacelle and upper 2/3 of the supporting mast of wind turbines should be painted white, unless otherwise indicated by an aeronautical study.”
24. UK regulations adopt ICAO Annex 14’s requirements as to lighting of WTGs but do not require that WTGs follow the ICAO recommendation as to paint colour, although CAP 764 does set out the ICAO recommendation by way of guidance. In terms of marking the WTGs, in keeping with recent practice for offshore wind farms, it is anticipated that Trinity House will require all structures to be painted

yellow from the level of Highest Astronomical Tide (HAT) to a height directed by Trinity House, and above the yellow section all WTGs will be painted submarine grey.

25. North Falls will be lit in accordance with the Air Navigation Order (ANO). ANO Article 222 defines an 'en route obstacle' as any building, structure or erection, the height of which is 150m or more above ground level and requires these to be lit. Article 223 modifies the Article 222 requirement with respect to offshore WTGs, requiring these to be lit where they exceed 60m above HAT with a medium intensity (2000 candela (cd)) steady red light mounted on the top of each nacelle and requires for limited downward spillage of light. Article 223 allows for the CAA to permit that not all WTGs are so lit. The CAA will require that all WTGs on the periphery of any wind farm need to be equipped with aviation warning lighting and such lighting, where achievable, shall be spaced at longitudinal intervals not exceeding 900m. There is no current routine requirement for offshore obstacles to be fitted with intermediate vertically spaced aviation lighting.
26. CAA guidance has been subject to coordination with maritime agencies to avoid confusion with maritime lighting. To that end, the CAA has indicated that the use of a flashing red Morse Code letter 'W' is likely to be approved to resolve potential issues for the maritime community.
27. The Maritime and Coastguard Agency (MCA) is seeking that WTG blade tips are marked in red, together with markings down the blade, to provide a SAR helicopter pilot with a hover reference point as set out in the Offshore Renewable Energy Installations (OREI) SAR Requirements document. The MCA also seeks a lighting scheme comprising 200cd red / infra-red lights on the nacelles of non-Article 223 WTGs, to be operated on demand during SAR operations and a WTG shutdown protocol to be applied during rescue situations. An Emergency Response and Cooperation Plan (ERCoP) will be developed and implemented for all phases of the Project, based upon the MCA's standard template. Appropriate lighting will be utilised to facilitate heli-hoisting if undertaken within the North Falls array area, as outlined in CAP 437.
28. To satisfy MoD requirements, the WTGs will also be required to be fitted with infra-red lighting in combination with the ANO Article 223 lights. MoD lighting guidance indicates that provided combination infra-red / 2000cd visible red lights are used to light the WTGs required to be lit under ANO Article 223, this satisfies the MoD operational requirement.

#### 17.3.3.3 *Regulatory requirements*

29. When construction is complete, given that the North Falls array areas will occupy uncontrolled (Class G) airspace (below approximately 6,500ft / 2000m amsl), the responsibility for avoiding other traffic and obstacles rests with captains of civilian and military aircraft. Thus, logically a pilot will avoid the charted areas, and individually lit WTGs and any other obstacles, laterally or vertically, by the legislated standard minimum separation distance. This is outlined in CAA Official Record Series 4 No. 1496: (UK) Standardised European Rules of the Air – Exceptions to the Minimum Height Requirements (CAA, 2021), which sets out that to avoid persons, vessels, vehicles and structures, pilots must give clearance of a minimum distance of 500ft (152m). This applies equally to the avoidance of WTGs and any other structure.

30. Military operations are subject to separate rules sponsored by the MoD. Pilots of military aircraft will be required to ensure that a Minimum Separation Distance of 250ft (76m) from any person, vessel, vehicle, or structure exists whilst operating in the vicinity of the North Falls array areas. The charting and lighting of North Falls should also be taken into account by MoD low flying units and SAR operators.
31. It is assumed that aviation stakeholders will adhere to all relevant CAA and MoD safety guidance in the conduct of their specific operations to ensure safe operations for all users of the airspace above North Falls.

## 17.4 Assessment methodology

### 17.4.1 Legislation, guidance and policy

#### 17.4.1.1 National Policy Statements

32. The assessment of likely significant effects upon aviation and radar has been made with specific reference to the relevant National Policy Statements (NPS). These are the principal decision making documents for Nationally Significant Infrastructure Projects (NSIPs). Those relevant to aviation and radar, and the Project are:
  - Overarching NPS for Energy (EN-1) (Department of Energy and Climate Change (DECC) 2011a);
  - NPS for Renewable Energy Infrastructure (EN-3) (DECC 2011b);
  - Draft Overarching NPS for Energy (EN-1) (BEIS 2022a); and
  - Draft NPS for Renewable Energy Infrastructure (EN-3) (BEIS 2022b).
33. The specific assessment requirements for aviation and radar, as detailed in the NPS, are summarised in Table 17.3 together with an indication of the section of the PEIR chapter where each is addressed. A review of the draft versions has been undertaken and where there are significant changes in a requirement's wording the draft requirement has been added to the table and the relevant wording highlighted in bold.

**Table 17.3 NPS assessment requirements**

NPS Requirement	NPS Reference	PEIR Reference
<b>Overarching NPS for Energy (EN-1)</b>		
<p>If the project could have an effect on civil and military aviation, then the assessment should:</p> <ul style="list-style-type: none"> <li>• Consult the MoD, CAA, NATS and any aerodrome – licensed or otherwise – likely to be affected by the proposed project in preparing an assessment of the proposal on aviation or other defence interests;</li> <li>• Include potential impacts of the Project upon the operation of Communication, Navigation and Surveillance (CNS) infrastructure, flight patterns (both civil and military), other defence assets and aerodrome operational procedures; and</li> <li>• Assess the cumulative effects of the Project with other relevant projects in relation to aviation and defence.</li> </ul>	<p>Paragraphs 5.4.10 to 5.4.13</p>	<p>Effects on civil and military aviation during the construction, operation and decommissioning phases are assessed and presented in Sections 17.6.1 to 17.6.3.</p> <p>Cumulative effects are assessed in Section 17.8.</p>

NPS Requirement	NPS Reference	PEIR Reference
If there are conflicts between the Government's energy and transport policies and military interests in relation to the application, the Secretary of State should expect the relevant parties to have made appropriate efforts to work together to identify realistic and pragmatic solutions to the conflicts. In so doing, the parties should seek to protect the aims and interests of the other parties as far as possible.	Paragraph 5.4.15	See Table 17.1, Section 17.6.2 and Appendix 17.1 (Volume III).
There are statutory requirements concerning lighting to tall structures. Where lighting is requested on structures that goes beyond statutory requirements by any of the relevant aviation and defence consultees, the Secretary of State should satisfy itself of the necessity of such lighting taking into account the case put forward by the consultees. The effect of such lighting on the landscape and ecology may be a relevant consideration.	Paragraph 5.4.16	Marking and lighting requirements are discussed in Section 17.3.3.2.
<p>Where, after reasonable mitigation, operational changes, obligations and requirements have been proposed, the decision maker considers that:</p> <ul style="list-style-type: none"> <li>• A development would prevent a licensed aerodrome from maintaining its licence;</li> <li>• The benefits of the project are outweighed by the harm to aerodromes serving business, training or emergency service needs, taking into account the relevant importance and need for such aviation infrastructure; or</li> <li>• The development would significantly impede or compromise the safe and effective use of defence assets or significantly limit military training;</li> <li>• The development would have an impact on the safe and efficient provision of en route air traffic control services for civil aviation, in particular through an adverse effect on the infrastructure required to support communications, navigation or surveillance systems;</li> </ul> <p>consent should not be granted.</p>	Paragraph 5.4.17	The Project has the potential to generate clutter on radar displays and thus have a potential impact on the safe and efficient provision of en route air traffic control services for civil aviation. However, mitigation options are available, as discussed in Sections 17.6.2.1.1 to 17.6.2.1.6 and set out in detail in Appendix 17.1 (Volume III).
<b>NPS for Renewable Energy Infrastructure (EN-3)</b>		
Where a wind farm potentially affects other infrastructure or activity, a pragmatic approach should be employed by the Secretary of State. The Secretary of State should expect the applicant to minimise negative impacts and reduce risks to as low as reasonably practicable (ALARP).	Paragraph 2.6.183	Potential effects during the various phases are assessed in Sections 17.6.1 to 17.6.3.
The Secretary of State should be satisfied that the site selection and design of the wind farm has avoided or minimised disruption or economic loss or any adverse effects on safety to other offshore industries. The Secretary of State should not consent applications which pose unacceptable risks to safety after mitigation measures have been considered.	Paragraph 2.6.184	Mitigation measures proposed as part of the North Falls design process to reduce the potential impacts on aviation are detailed in Section 17.3.3 and possible mitigation measures for radar impacts are outlined in Sections 17.6.2.1.1 to 17.6.2.1.6.
Where schemes have been carefully designed and the necessary consultation has been undertaken at an early stage, mitigation measures may be possible to negate or reduce effects on other offshore	Paragraph 2.6.186	Mitigation measures proposed as part of the North Falls design process to reduce the potential impacts on aviation are detailed in Section 17.3.3 and possible mitigation measures for

NPS Requirement	NPS Reference	PEIR Reference
infrastructure to a level sufficient to enable the Secretary of State to grant consent.		radar impacts are outlined in Sections 17.6.2.1.1 to 17.6.2.1.6.
Detailed discussions between the applicant and the relevant consultees should have progressed as far as reasonably possible prior to the submission of an application. As such, appropriate mitigation should be included in any application and ideally agreed between relevant parties. In some circumstances, the Secretary of State may wish to consider the potential to use conditions involving arbitration as a means of resolving how adverse impacts on other commercial activities will be addressed.	Paragraphs 2.6.187 to 2.6.188	Further engagement with NATS, the MoD and other relevant aviation stakeholders will continue throughout the EIA process. Consultation to date is summarised in Section 17.2.
Aviation and navigation lighting should be minimised to avoid attracting birds, taking into account impacts on safety.	Paragraph 2.6.107	Proposed lighting is discussed in Section 17.3.3.2.
<b>Draft NPS for Renewable Energy Infrastructure (EN-3)</b>		
The Secretary of State should be satisfied that the site selection and design of the wind farm has avoided or minimised disruption or economic loss or any adverse effects on safety to other offshore industries. <b>Applicants will be required to demonstrate that risks to safety will be reduced to ALARP.</b> The Secretary of State should not consent applications which pose unacceptable risks to safety after mitigation measures have been considered.	Paragraph 2.34.11	Mitigation measures proposed as part of the North Falls design process to reduce the potential impacts on aviation to ALARP are detailed in Section 17.3.3 and possible mitigation measures for radar impacts are outlined in Sections 17.6.2.1.1 to 17.6.2.1.6.
Aviation and navigation lighting should be minimised <b>and/or on demand</b> to avoid attracting birds, taking into account impacts on safety.	Paragraph 2.29.5	Proposed lighting is discussed in Section 17.3.3.2. In accordance with ANO Article 223, lighting intensity will be reduced at and below the horizontal and further reduced when visibility in all directions from every WTG is more than 5km.

#### 17.4.1.2 Other legislation, policy and guidance

34. In addition to the NPS, there are a number of pieces of legislation, policy and guidance applicable to the assessment of aviation and radar. These include:

- CAP 168: Licensing of Aerodromes sets out the standards required at UK licensed aerodromes relating to management systems, operational procedures, physical characteristics, assessment and treatment of obstacles and visual aids. (CAA, 2022);
- ANO 2016 sets out the Rules of the Air and includes the application of lighting to WTGs in UK territorial waters (Articles 222 and 223). (CAA, 2022);
- CAP 764: Policy and Guidelines on Wind Turbines details the CAA policy and guidelines associated with wind turbine impacts on aviation that aviation stakeholders and wind energy developers need to consider when assessing a development's viability. (CAA, 2016);
- CAP 670: Air Traffic Services (ATSS) Safety Requirements sets out the safety regulatory framework and highlights the requirements to be met by providers of civil ATSS and other services in the UK in order to ensure that those services are safe for use by aircraft. (CAA, 2019);

- CAP 1616: Airspace Change explains the CAA’s regulatory process for changes to airspace. (CAA, 2021);
  - CAP 437: Standards for Offshore Helicopter Landing Areas provides the criteria applied by the CAA in assessing offshore helicopter landing areas for worldwide use by helicopters registered in the UK, and includes winning area ‘best practice’ design criteria for wind turbine platforms. (CAA, 2021);
  - CAP 032: UK AIP is the main resource for information on facilities, services and flight procedures at all licensed UK airports, as well as UK airspace rules, regulations and restrictions, en route procedures, charts and other air navigation information. (CAA, 2022);
  - UK Military AIP is the main resource for information and flight procedures at all military aerodromes. (MoD, 2022);
  - Military low flying in the United Kingdom: the essential facts. (MoD, 2017);
  - MoD Obstruction Lighting Guidance details MoD requirements for the lighting of offshore developments. (Low Flying Operations Flight, 2020);
  - MCA Marine Guidance Note (MGN) 654 Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response highlights issues to consider when assessing navigational safety and emergency response, caused by OREI developments. (MCA, 2021);
  - MCA document: Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for SAR and Emergency Response forms part of MGN 654 Annex 5. (MCA, 2021); and
  - ICAO Annex 14: Aerodrome Design and Operations includes recommendations for marking and lighting of wind turbines. (ICAO, 2022).
35. Further detail is provided in Chapter 3 Policy and Legislative Context (Volume I).

#### 17.4.2 Data sources

36. The data and information sources listed in Table 17.4 have been used in undertaking the aviation and radar assessments.

**Table 17.4 Other available data and information sources**

Data Set	Spatial Coverage	Year	Notes
CAP 032: UK AIP (CAA, 2022)	Full coverage across the North Falls aviation study area.	2022	The main resource for information and flight procedures at all licensed UK airports as well as airspace, en route procedures, charts and other air navigation information.
UK Military AIP (MoD, 2022)	Full coverage across the North Falls aviation study area.	2022	The main resource for information and flight procedures at all military aerodromes.
Raytheon equipment brochure	NERL Cromer Primary Surveillance Radar (PSR)	2007	Data on the Raytheon ASR-10SS PSR.
Raytheon equipment brochure	NERL Debden PSR	2007	Data on the Raytheon ASR-23SS PSR.

Data Set	Spatial Coverage	Year	Notes
Lockheed Martin brochure	MoD Trimmingham PSR	2013	Limited data on the TPS-77 PSR. Detailed performance data is covered by International Traffic in Arms Regulations restrictions and therefore not available.

### 17.4.3 Impact assessment methodology

37. Chapter 6 EIA Methodology (Volume I) explains the general impact assessment methodology applied to North Falls. The following sections describe the methods used to assess the likely significant effects on aviation and radar.

#### 17.4.3.1 Significance effect

38. In assessing the significance of the effects from North Falls it was necessary to identify whether or not there will be an impact on aviation operations. The aviation industry is highly regulated and subject to numerous mandatory standards, checks and safety requirements (for example CAP 670), many international in nature and requiring the issue of operating licences. In all cases, the sensitivity or magnitude of the impact on operations can only be identified by the appropriate aviation organisation conforming to the Risk Classification Scheme used to quantify and qualify the severity and likelihood of a hazard occurring. The Risk Classification Scheme is a fundamental element of an aviation organisation's Safety Management System (SMS), which must be acceptable to, and approved by, the UK CAA or the Military Aviation Authority, as appropriate. As such, for the purposes of this assessment, no detailed grading has been made of the magnitude of the impact or sensitivity of the receptor on the basis that any potential reduction in aviation safety cannot be tolerated. Instead, the following definitions of basic significance have been used as defined in Table 17.5. This represents a deviation from the standard methodology presented within Chapter 6 (Volume I).

**Table 17.5 Definition of impact significance**

Significance	Definition
<b>Major Significant</b>	Receptor unable to continue safe operations or safe provision of air navigation services (radar) or effective air defence surveillance in the presence of the WTGs. Technical or operational mitigation of the impact is required.
<b>Moderate Significant</b>	Receptor able to continue safe operations but with some restrictions or non-standard mitigation measures in place.
<b>Not Significant</b>	The Project will have little impact on the aviation receptor, or the level of impact will be acceptable to the aviation receptor.
<b>No Change</b>	The Project will have no impact on the aviation receptor and will be acceptable to the aviation receptor.

### 17.4.4 Cumulative effects assessment methodology

39. The cumulative effects assessment (CEA) considers other plans, projects and activities that may result in cumulation with North Falls. Chapter 6 EIA Methodology (Volume I) provides further details of the general framework and approach to the CEA.
40. For aviation and radar, these activities include other offshore and onshore wind farms. Cumulative effects have been considered with respect to obstacles and

increase in air traffic, and with regards to the extent of radar visibility at WTG heights.

#### 17.4.5 Transboundary effect assessment methodology

41. The transboundary assessment considers the potential for transboundary effects to occur on aviation and radar receptors as a result of North Falls; either those that might arise within the Exclusive Economic Zone (EEZ) of European Economic Area (EEA) states or arising from the interests of EEA states e.g. a non UK fishing vessel. Chapter 6 EIA Methodology (Volume I) provides further details of the general framework and approach to the assessment of transboundary effects.
42. For aviation and radar, the potential for transboundary effects has been assessed in relation to obstacles to flight, increase in air traffic, radar visibility and airspace management.

#### 17.4.6 Assumptions and limitations

43. No overarching assumptions or limitations have been identified that apply to the assessment for aviation and radar. Where routine assumptions have been made in the course of undertaking the assessment, these are noted in Sections 17.6 to 17.8.

### 17.5 Existing environment

44. An initial desktop study was undertaken to determine those aviation stakeholders that were likely to be affected by North Falls, including all radar systems within operational range.
45. The main issue identified is associated with potential WTG interference of PSRs. Due to the physical size of the WTGs proposed, there is also potential for the WTGs to become aviation obstacles or obstructions, particularly to helicopters engaged in offshore operations. This is considered within the impact assessment.
46. CAP 764 advises that WTG effects on Secondary Surveillance Radars (SSRs) can be caused due to the physical blanking and diffracting effects of the WTG towers, depending on the size of the WTGs and the wind farm. However, CAP 764 goes on to say that these effects are only a consideration when the WTGs are located close to the SSR, i.e. less than 10km. As all known SSRs are outside the stipulated parameters by a significant margin they will not be affected by the WTGs and are therefore not considered further.
47. Similarly, there will be no measurable effects upon other terrestrial based aviation Communications, Navigation and Surveillance (CNS) systems as North Falls is considerably outside applicable safeguarding limits pertaining to such CNS infrastructure. Therefore, terrestrial CNS infrastructure (other than PSR) is not considered further, as no sites will be affected.

#### 17.5.1 Radar modelling

48. Computer modelling using a contemporary software modelling tool (HTZ communications) has been undertaken to predict if RLoS exists between PSRs and WTGs within the North Falls array areas, and the likely Probability of



Detection (Pd) of the rotating WTG blades. This exercise identifies those PSRs that could detect the WTGs and has been based on WTGs with a maximum tip height of 400m amsl<sup>1</sup>. The data obtained from the modelling has been analysed and provides a key input into establishing the degree to which aviation and operations in the area of North Falls could be affected and what additional mitigation processes could be employed.

49. The RloS and Pd modelling undertaken is based on generic data as the specific and detailed characteristics of the modelled PSRs are considered commercially sensitive. Therefore, contemporary PSR performance characteristics and publicly available PSR data has been used in lieu. Modelling by radar operators with detailed configuration data may reveal marginally different Pd results however, confidence is high that PSR performance characteristics used have a high level of compatibility with actual PSR performance.
50. Appendix 17.1 (Volume III) details the computer modelling undertaken and uses the outputs of the modelling to determine potential mitigation strategies for inclusion in this document. Where appropriate, final mitigations will be agreed and implemented with aviation and radar stakeholders. Ongoing consultation with stakeholders will continue as part of the design process for North Falls.

#### 17.5.2 Civil aviation

51. North Falls is within the London Flight Information Region (FIR) for ATC, the airspace regulated by the UK CAA. The boundary between the London FIR and the adjacent Amsterdam FIR is approximately 9km south-east of the southern array area at its closest point. Airspace within the Amsterdam FIR is regulated by the Netherlands Inspectie Leefomgeving en Transport (ILT).
52. Airspace is classified as either controlled or uncontrolled and is divided into a number of classes depending on what kind of ATS is provided and under what conditions. In the UK there are five classes of airspace, A, C, D, E and G. (Classes B and F are not used in the UK). The first four are controlled airspace classes while Class G is uncontrolled. Within controlled airspace aircraft are monitored and instructed by ATC, whereas in uncontrolled airspace aircraft are not subject to ATC instruction but rather operate according to a simple set of regulations. ATC may still provide information, if requested, to ensure flight safety.
53. Aircraft operate under one of two flight rules: Visual Flight Rules (VFR) or Instrument Flight Rules (IFR). VFR flight is conducted with visual reference to the natural horizon while IFR flight requires reference solely to aircraft instrumentation.
54. The North Falls array areas lie within uncontrolled Class G airspace with Class A controlled airspace known as the Clacton Control Area (CTA) above that. Class A controlled airspace is the most strictly regulated of the classes whereby aircraft are positively controlled by ATC. Compliance with ATC clearances is

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<sup>1</sup> Radar modelling was based on tip heights amsl as opposed to above MHWS. Within the North Falls array areas MHWS is 1.46m amsl, therefore a tip height of 400m amsl incorporates an additional precautionary height buffer above the maximum tip height of 397m above MHWS.

mandatory and aircraft are flown and navigated solely with reference to aircraft instruments. Certain onboard equipment is also a prerequisite. Flight in Class G airspace is generally visual, meaning that 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.

55. The northern array area lies beneath Clacton CTA 5 which has a lower vertical limit of Flight Level (FL) 85. A FL is an aircraft altitude expressed in hundreds of feet above a standard sea level pressure datum, so FL85 is approximately 8,500ft (2,600m)amsl. The southern array area is beneath Clacton CTA 7 with a lower limit of FL65 (approximately 6,500ft (2,000m) amsl).
56. NERL provides en route civil ATSS within the London FIR from the London Area Control Centre at Swanwick, near Southampton. NERL's closest radars are at Cromer, 107km to the north, and Debden, 109km to the west of the array areas.
57. RloS and Pd modelling indicates that there is a possibility that WTGs with a blade tip height of 400m amsl in the northern half of the northern array area will be detected by Cromer PSR and a small possibility that Debden PSR will detect a single 400m WTG within the northern array area.
58. The nearest licensed aerodromes with surveillance radar are Southend Airport, 80km to the west, Norwich Airport, 85km to the north, and Stansted Airport, 111km to the west.
59. RloS modelling indicates that all North Falls WTGs with a blade tip height of 400m amsl will be visible to and detected by Southend PSR.

### 17.5.3 Military aviation

60. The closest military stations equipped with ATC radar facilities lie to the north-west and are Army Air Corps Wattisham (64km), Royal Air Force (RAF) Honington (84km), RAF Lakenheath (102km) and RAF Marham (115km).
61. RloS modelling indicates that WTGs with a blade tip height of 400m amsl in the northern array area and in the southern array area will be visible to and detected by Wattisham PSR.
62. RloS modelling indicates that no WTGs within either the northern or southern array areas will be visible to Honington PSR. However, in their pre-application advice, MoD state that WTGs within the northern array area will be detected by Honington PSR.
63. The MoD safeguard a network of long range high powered AD radars used to provide the UK with airspace surveillance and security and to fulfil national and international obligations. The closest AD radar to North Falls is located at Trimmingham, 104km to the north.
64. RloS modelling indicates that all WTGs with a blade tip height of 400m amsl in the northern array area will be visible to and detected by Trimmingham PSR.
65. The MoD has plans to relocate the Trimmingham radar to a new inland site at Neatishead. This move is expected to be completed by the end of 2023.
66. RloS modelling of the proposed new radar position indicates that WTGs with a blade tip height of 400m amsl in the northern array area will be visible to and detected by Neatishead PSR.

67. Although RIoS modelling indicates that WTGs within the southern array area will not be visible to Trimingham and Neatishead PSRs, in their pre-application advice MoD state that WTGs within the southern array area will also be detected by these radars.
68. Approximately 35km west of the southern array area are the Shoeburyness Danger Areas D136 and D138A to D138D where ordnance, munitions and explosives activities take place.
69. Approximately 38km north of the northern array area is Area 9, an Air to Air Refuelling Area with a lower limit of 2,000ft (610m) amsl within which it is assumed that refuelling of military helicopters takes place.
70. The Aerial Tactics Area (ATA) Lakenheath South is approximately 23km north of the northern array, airspace designated for air combat training.
71. The above areas of Special Use Airspace are all well removed from the North Falls array areas.

#### 17.5.4 Helicopter Main Routing Indicators

72. Helicopter Main Routing Indicators (HMRI) are routes typically and routinely flown by helicopters operating to and from offshore destinations and are promulgated for the purpose of highlighting concentrations of helicopter traffic to other airspace users. HMRI promulgation does not predicate the flow of helicopter traffic. Whilst HMRI have no airspace status and assume the background airspace classification within which they lie (in the case of the southern North Sea, Class G), they are used by the Air Navigation Service Provider (ANSP) and helicopter operators for flight planning and management purposes. In summary, HMRI are recognised routes to assist in regularising routings and effectively managing traffic safely and do not comprise controlled airspace.
73. HMRI have no promulgated lateral dimensions although CAP 764 states that there should be no obstacles within 2 nautical miles (nm) either side of the route centreline. The 2nm distance is based upon operational experience, the accuracy of navigation systems, and practicality. Such a distance provides time and space for helicopter pilots to descend safely to an operating altitude below the icing level.
74. HMRI 20 extends vertically from 500ft (152m) amsl to 2,000ft (610m) amsl inclusive, between Lowestoft and the Greater Gabbard and Galloper offshore wind farms, presumably to allow helicopter traffic to access those sites. HMRI 20 passes through both the northern and southern array areas. The planned maximum WTG tip height of 400m amsl is equivalent to 1,400ft amsl rounded up to the nearest 100ft so the North Falls WTGs will be significantly taller obstacles than the existing WTGs in this area. The planned height of the North Falls WTGs means helicopters operating within the vertical limits of HMRI 20 will have less than the required 1,000ft (305m) obstacle clearance when crossing the North Falls array areas in poor meteorological conditions.
75. Planned obstacles within 2nm should be consulted upon with the helicopter operators and the ANSP (though it is noted in the AIP that there are no ATS provision arrangements to support operations on this HMRI). CAP 764 suggests that, for the purpose of transiting WTG developments under VFR and facilitating

construction or maintenance flights within the boundaries of the wind farm, 'flight corridors' may be introduced within the design of the site.

#### 17.5.5 Flight procedures and ATS provided

76. In Class G (uncontrolled) airspace, aircraft are not obliged to be in receipt of an ATS, although it is open to pilots to seek ATSS outside Controlled Airspace (ATSOCAS) from the designated ATS provider: the extent of the ATSOCAS supplied will depend on the CNS capability of the ATS provider, its workload and any regulatory provisions relating to the carriage of CNS equipment by aircraft (for example, transponders). All aircraft above FL100 (circa 10,000ft (3,050m) amsl) in the London FIR are required to carry and operate transponders in accordance with national regulations.
77. To gain access to controlled airspace, a pilot must comply with various mandatory requirements. This includes establishing two-way radio communications with the designated ATC authority for the specified airspace and obtaining permission to enter it. The pilot then must comply with instructions received. In this way, the controllers know of all the air traffic in the defined airspace. The controllers can then take appropriate measures to ensure that standard separation minimums are maintained between all known aircraft by using various techniques that may or may not include the use of PSR.
78. Flight procedures in the vicinity of North Falls are conducted in accordance with national UK CAA and MoD Standards and Recommended Practices (SARPs) as promulgated in the UK AIP.
79. Given that all aircraft operating above FL100 (circa 10,000ft (3,050m) amsl) are required to be equipped with and operate transponders, the significance of primary radar for the provision of an ATS is more acute in the lower airspace outside of controlled airspace and is especially relevant to helicopter operators.

#### 17.5.6 Search and Rescue

80. 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 10 helicopter SAR bases, incorporating 22 aircraft, around the UK with Bristow Helicopters providing helicopters and aircrew.
81. The nearest SAR base is at Lydd Airport, approximately 99km south-west of the North Falls array area and its helicopters can provide rescue services up to approximately 460km away from base.
82. 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.

#### 17.5.7 Future trends in baseline conditions

83. Although the aviation industry is under long-term pressure to reduce its contribution to climate change, there will be no implications related to climate

and natural trends on the aviation and radar baseline parameters discussed above.

84. There is no anticipated increase in manned aviation traffic, however an increase in low-level autonomous drone traffic can be foreseen.

## 17.6 Assessment of significance

### 17.6.1 Potential effects during construction

#### 17.6.1.1 *Impact 1: Impacts on civil and military radar systems due to high construction vessels / cranes and partially complete structures*

85. WTGs and other tall obstacles have the potential to affect radar which would in turn affect the effectiveness of surveillance services due to interference on radar displays, as radar operators are unable to distinguish between those primary radar returns generated by the obstacles and aircraft. As a general rule, controllers are required to provide 5nm lateral separation between traffic receiving an ATS and 'unknown' primary radar returns in class G airspace.
86. To discriminate wanted aircraft targets from unwanted clutter, radars ignore static objects and only display moving targets. The rotating blades of WTGs impart a Doppler frequency shift to the reflected radar pulse, which the radar receiver 'sees' as a moving target; these targets are then presented on the radar display as primary radar returns, indistinguishable from those returns originating from aircraft. This is not a steady effect but has dependency on the axis of rotation of the turbine in relation to the radar. Such unwanted radar returns are known as 'clutter'.
87. Until such time as WTG blades are allowed to rotate at operational speeds, PSRs will not detect the partially completed structures. In the same way, high construction vessels and cranes that are in RLoS will not be moving fast enough to generate PSR clutter.

#### 17.6.1.1.1 Significance of effect

88. As a result of non-detection of obstacles during the construction phase, the impact significance is no change.

#### 17.6.1.2 *Impact 2: Creation of an aviation obstacle environment*

89. Construction of the wind farm will involve the installation of infrastructure above sea level which could pose a physical obstruction to aircraft utilising the airspace in the vicinity of the North Falls array areas.
90. From a starting point of no infrastructure within the North Falls array areas, the infrastructure outlined in Table 17.2 will gradually be installed over a period of 36 months.
91. Specifically, for North Falls, permanent or temporary obstacles can increase risk to:
  - General military low flying training and operations;
  - Helicopters utilising HMRI 20 to and from the Greater Gabbard and Galloper offshore wind farms; and
  - Other offshore fixed-wing and helicopter operations, including those undertaking SAR missions, over the Southern North Sea.

92. In compliance with international and national SARPs with respect to notification, marking and lighting, as outlined in Section 17.3.3, to make pilots aware of the addition of infrastructure to the site, the impact on the aviation sector during the construction of North Falls will be reduced to an acceptable level. For SAR missions an ERCoP will be developed and implemented for all phases of the Project.
93. Although HMRI routes in the southern North Sea are rarely used, the planned maximum WTG tip height means that helicopters operating along HMRI 20 will have less than the required 1,000ft (305m) obstacle clearance if crossing the North Falls array areas in poor weather. Helicopters can re-route in order to comply with obstacle clearance requirements. Consultation with relevant helicopter operators is ongoing to determine whether a mitigation plan for HMRI 20 is required.

#### 17.6.1.2.1 Significance of effect

94. The impact has been assessed to be not significant.

#### 17.6.1.3 Impact 3: Increased air traffic in the area related to wind farm activities

95. The use of helicopters to support construction activities within the North Falls array areas could impact on existing traffic in the area. It is possible that helicopters could be used for transferring people or equipment to the site on a daily basis for the construction period.
96. The possible increase in air traffic associated with construction support activities brings with it a potential increased risk of aircraft collision in the airspace around North Falls.
97. The increase in air traffic will be managed by the existing ATS infrastructure, provided in accordance with national procedures, and pilots will be expected to operate in accordance with regulatory requirements.

#### 17.6.1.3.1 Significance of effect

98. Due to the predicted low number of movements caused by the construction of North Falls and assuming compliance with regulatory requirements and national procedures, the impact to aircraft operators in the vicinity of North Falls is considered to be not significant.

### 17.6.2 Potential effects during operation

#### 17.6.2.1 Impact 1: WTGs causing permanent interference on civil and military radars

99. The North Falls array areas will be within the operational range of radar systems serving both civil and military agencies. Radar modelling detailed in Appendix 17.1 (Volume III) shows that at least some WTGs with a tip height of 400m amsl within the North Falls array areas will be theoretically detectable by the NERL PSRs at Cromer and Debden, the MoD Trimmingham / Neatishead AD PSR, and the ATC PSRs at Wattisham and Southend. Although contrary to the Appendix 17.1 (Volume III) RloS assessments, the MoD have stated that WTGs within the northern array area will be detected by the ATC PSR at Honington. Discussions are ongoing with the MoD to confirm this. The final number of WTGs detected by these radars will depend on the maximum tip heights of individual WTGs and the detailed wind farm configuration selected.
100. When operational (in other words, with blades fitted and rotating), WTGs have the potential to generate 'clutter' (or false targets) upon radar displays because

current generation PSRs are unable to differentiate between the moving blades of WTGs and aircraft. As a consequence, radar operators can be unable to distinguish between primary radar returns generated by WTGs and those generated by aircraft. As a general rule controllers are required to provide 5nm lateral separation between traffic receiving an ATS and 'unknown' primary radar returns in Class G airspace. This may therefore produce an adverse impact on the provision of safe and effective ATS by those ANSPs that utilise the Cromer, Debden, Wattisham, Honington and Southend ATC PSRs, and could compromise the ability of the MoD to undertake its Air Defence role utilising the Trimmingham / Neatishead AD PSR.

101. Mitigation will be required if the wind farm design, based upon parameters outlined in Table 17.2, shows a Pd of the WTGs above the PSR system threshold levels that allows the WTG blades to be presented on PSR displays and the airspace is operationally significant to the PSR operator. Mitigation should only be required for so long as PSRs do not have the inherent capability to distinguish WTG returns from aircraft returns: increasingly, "next generation" PSRs are looking to provide this functionality.
102. The interim additional mitigation that may be required for affected PSRs is discussed below:

#### 17.6.2.1.1 Cromer PSR

103. Mitigation in respect of Cromer PSR may involve:

- Blanking the relevant impacted areas of the North Falls array areas (either at the radar head or in the radar display system) so as to remove the PSR data containing the WTG returns from the radar data presented to controllers;
- In addition to radar blanking, an airspace change proposal may be pursued with the CAA to determine an appropriate level of mitigation; or
- Using alternative PSRs (for example NERL's Bovingdon facility) to provide infill coverage for the provision of ATS in the North Falls array areas.

#### 17.6.2.1.2 Debden PSR

104. Given that there is only a small probability of a single 400m WTG being detected by Debden PSR, NERL may decide that the impact is acceptable in which case no mitigation will be required. However, if necessary, the mitigation options proposed for Cromer PSR will also be available for Debden PSR.

#### 17.6.2.1.3 Southend PSR

105. The Designated Operational Coverage for Southend Airport's ATC radar service is 40nm, while the minimum distance between Southend PSR and the North Falls array areas is 43nm. Although Southend PSR is highly likely to detect all WTGs with a blade tip height of 400m amsl within the North Falls array areas, it is considered unlikely that Southend ATC will be providing a radar control service for aircraft in this airspace. The impact on Southend PSR is therefore not considered to be operationally significant.
106. Should Southend Airport provide evidence of the potential for significant effects from North Falls on their PSR then similar methods of engagement with the CAA to those used for existing offshore wind farms are available to Southend to deliver effective mitigation solutions.

#### 17.6.2.1.4 Wattisham PSR

107. The northern array area and the north-western corner of the southern array area lie within the 40nm radar vectoring range of Wattisham PSR, therefore consultation with the MoD is required to determine the operational significance of the North Falls WTGs' impact.
108. The existing Wattisham Watchman PSR was due to be upgraded to a Thales STAR NG system in 2020 as part of the Project Marshall ATC radar upgrade project. In February 2023 the MoD confirmed that this radar upgrade is on the verge of final acceptance into service. The new radar is known to have enhanced capability for filtering out WTG clutter. Once commissioned, the radar can potentially be configured to mitigate the impact of WTGs. An alternative mitigation could involve blanking the impacted area and using another existing or new radar as a source of infill data.

#### 17.6.2.1.5 Trimingham / Neatishead PSR

109. In respect of the TPS-77 PSR at Trimingham / Neatishead, the most common WTG mitigation technique applied for previous wind farm developments was the application of a Non-Auto Initiation Zone (NAIZ) in the TPS-77's lowest beam over the footprint of any detectable WTGs. However, on 24 August 2018 the MoD issued a statement indicating that the TPS-77 NAIZ mitigation had not performed to expectations at flight trials over two offshore wind farms and as a result immediately paused the receipt and assessment of any technical mitigation reports or submissions relating to TPS-77 radars and multi-turbine wind farms.
110. An update to this statement was issued in June 2019 in which the MoD stated, *"The MoD will continue to work with industry to resolve the current issues and will, on a case by case basis, consider certain developments where impact on operational capability is deemed to be acceptable. TPS-77-based mitigation reports will now be considered where suitable mitigation can be adequately modelled. The MoD will continue to receive and assess TPS-77 based mitigation reports for single turbine developments following the results of a previous trial relating to these developments. The MoD will also consider alternative ADR mitigation proposals should developers wish to submit them."*
111. In March 2020 the MoD Defence and Security Accelerator launched an innovation competition to reduce and remove the impact of wind farms on the UK's AD surveillance systems. Phase 2 of the competition was launched in April 2021<sup>2</sup>.
112. Engagement with the MoD will continue throughout the application process to agree a suitable mitigation for the impact of North Falls WTGs on Trimingham PSR.

#### 17.6.2.1.6 Significance of effect

113. CAP 764 outlines other mitigation options which could be applied either singly or in combination to optimise the effectiveness of any mutually agreed solution. Due to the promising developments currently being advanced by industry in this area of technology, consultation on technical measures will continue as a

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<sup>2</sup> [Windfarm Mitigation for UK Air Defence - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/684242/Windfarm_Mitigation_for_UK_Air_Defence_-_GOV.UK_(www.gov.uk).pdf)



development might emerge that proves to be more suitable for adoption and implementation during the development of North Falls.

114. Without additional mitigation, the impacts on receptors receiving changes to their operational environment have been assessed to be major significant. However, it is anticipated that the potential risk posed to aviation and MoD operations can be wholly and successfully mitigated through various technical solutions applied to current generation PSRs. It is anticipated that, during the operational life of North Falls, the MoD and NERL will procure “next generation” PSRs which should not require the application of mitigation measures to allow them to provide an appropriate surveillance picture in the presence of WTGs. Following the application of additional mitigation, the residual impact on radars is assessed to be not significant.

#### 17.6.2.2 *Impact 2: Creation of an aviation obstacle environment*

115. During the operation phase of the Project the infrastructure outlined in Table 17.2 will be present within the North Falls array areas. This could pose a physical obstruction to aircraft utilising the airspace in the vicinity of North Falls.
116. Specifically, for North Falls, permanent or temporary obstacles can increase risk to:
- General military low flying training and operations;
  - Helicopters utilising HMRI 20 to and from the Greater Gabbard and Galloper offshore wind farms; and
  - Other offshore fixed-wing and helicopter operations, including those undertaking SAR missions, over the Southern North Sea.
117. In compliance with international and national SARPs with respect to notification, marking and lighting, as outlined in Section 17.3.3, to make pilots aware of the addition of infrastructure to the site, the impact on the aviation sector during the operation phase of North Falls will be reduced to an acceptable level. For SAR missions an ERCoP will be developed and implemented for all phases of the Project.
118. Although HMRI routes in the Southern North Sea are rarely used and helicopters can re-route around obstacles as required, any mitigation plan agreed for HMRI 20 will remain in place during the North Falls operation phase.
119. An IFP assessment presented in Appendix 17.2 (Volume III) shows that WTGs will have no impact on Southend Airport’s existing published IFPs. There are two Required Navigation Performance IFPs currently with the CAA awaiting approval. Once approved, these IFPs will also require assessment, although no impact is anticipated.

#### 17.6.2.2.1 *Significance of effect*

120. The impact has been assessed to be not significant.

#### 17.6.2.3 *Impact 3: Increased air traffic in the area related to wind farm activities*

121. The operation phase of North Falls will likely see an increase in helicopter traffic above the current baseline level engaged in support operations in the area.
122. The possible increase in air traffic associated with support activities brings with it a potential increased risk of aircraft collision in the airspace around North Falls.
123. The safety of aircraft operating in uncontrolled airspace ultimately resides with the aircrew who will be expected to operate in accordance with regulatory

requirements and who may request the provision of an ATS that will be provided in accordance with national procedures.

#### 17.6.2.3.1 Significance of effect

124. Due to the predicted low number of movements during the operation phase of North Falls and assuming compliance with regulatory requirements and national procedures, the impact to aircraft operators in the vicinity of North Falls is considered to be not significant.

### 17.6.3 Potential effects during decommissioning

125. Offshore decommissioning will most likely involve removal of all of the WTG components, part of the WTG foundations (down to 1m below the seabed), platforms and associated foundations, and sections of inter-array and export cables.

126. For the decommissioning phase, the implementation of standard aviation safety management processes will be applicable and a risk assessment based on the appropriate aviation requirements pertinent at the time will be required.

#### 17.6.3.1 Impact 1: WTGs causing permanent interference on civil and military radars

127. During the gradual decommissioning of above sea level infrastructure in the North Falls array areas the impact on radar will be removed. Firstly, WTGs are made inoperative, and the blades of WTGs will cease rotating, before being removed from the site. In addition, all mitigations applicable during the operation phase (to the extent they are still required) will remain in place during the decommissioning phase until such time as all WTG blades are removed.

#### 17.6.3.1.1 Significance of effect

128. The impact significance on radar during decommissioning is considered to be no change as the site is returned to pre-development conditions.

#### 17.6.3.2 Impact 2: Removal of aviation obstacle environment

129. During the decommissioning of North Falls, the above sea level infrastructure outlined in Table 17.2 will be removed over a period of c. 3 years. This will gradually reduce the physical obstruction to aircraft utilising the airspace in the vicinity of North Falls.

130. Specifically, for North Falls, permanent or temporary obstacles can increase risk to:

- General military low flying training and operations;
- Helicopters utilising HMRI 20 to and from the Greater Gabbard and Galloper offshore wind farms; and
- Other offshore fixed-wing and helicopter operations, including those undertaking SAR missions, over the Southern North Sea.

131. The environmental mitigation in the form of international and national SARPs with respect to notification, marking and lighting, as outlined in Section 17.3.3, will be retained until decommissioning has been completed. Any mitigation plan agreed for HMRI 20 will remain in place during the North Falls decommissioning phase. The impact on the aviation sector during the decommissioning phase of North Falls will be reduced to pre-development conditions.

#### 17.6.3.2.1 Significance of effect

132. The impact significance has been assessed to be no change.

#### 17.6.3.3 Impact 3: Increased air traffic in the area related to wind farm activities

133. The use of helicopters during the decommissioning phase of North Falls could impact on existing traffic in the area. It is possible that helicopters could be used for transferring people and / or equipment to the array areas on a daily basis during the decommissioning of site infrastructure.

134. The possible increase in air traffic associated with decommissioning support activities brings with it a potential increased risk of aircraft collision in the airspace around North Falls.

135. The safety of aircraft operating in uncontrolled airspace ultimately resides with the aircrew who will be expected to operate in accordance with regulatory requirements and who may request the provision of an ATS that will be provided in accordance with national procedures.

#### 17.6.3.3.1 Significance of effect

136. Due to the predicted low number of movements during the decommissioning period of North Falls and assuming compliance with regulatory requirements and national procedures, the impact to aircraft operators in the vicinity of North Falls is considered to be not significant.

### 17.7 Potential monitoring requirements

137. No monitoring relevant to this chapter is anticipated, however any potential requirements will be agreed with stakeholders prior to construction taking into account the final detailed design of North Falls.

### 17.8 Cumulative effects

#### 17.8.1 Identification of potential cumulative effects

138. The first step in the CEA process is the identification of which residual effects assessed for North Falls on their own have the potential for a cumulative effect with other plans, projects and activities. This information is set out in Table 17.6, together with a consideration of the confidence in the data that is available to inform a detailed assessment and the associated rationale. Only potential impacts assessed in Section 17.6 as not significant or above are included in the CEA (i.e. those assessed as “no change” are not taken forward as there is no potential for them to contribute to a cumulative effect).

**Table 17.6 Potential cumulative effects**

Impact	Potential for cumulative effect	Rationale
<b>Construction</b>		
Creation of an aviation obstacle environment.	Yes	WTGs associated with other developments create aviation obstacles, restricting the available airspace.
Increased air traffic in the area related to wind farm activities.	Yes	Air traffic activities associated with other developments have the potential to cumulatively increase the risk of aircraft collision.
<b>Operation</b>		

Impact	Potential for cumulative effect	Rationale
WTGs causing permanent interference on civil and military radars.	Yes	Other wind farm developments could impact radars over a larger area.
Creation of an aviation obstacle environment.	Yes	WTGs associated with other developments create aviation obstacles, restricting the available airspace.
Increased air traffic in the area related to wind farm activities.	Yes	Air traffic activities associated with other developments have the potential to cumulatively increase the risk of aircraft collision.
<b>Decommissioning</b>		
Increased air traffic in the area related to wind farm activities.	Yes	Air traffic activities associated with other developments have the potential to cumulatively increase the risk of aircraft collision.

### 17.8.2 Other plans, projects and activities

139. The second step in the cumulative assessment is the identification of the other plans, projects and activities that may result in cumulative effects for inclusion in the CEA (described as 'project screening'). This information is set out in Table 17.7 below, together with a consideration of the relevant details of each, including current status (e.g. under construction), planned construction period, closest distance to North Falls, status of available data and rationale for including or excluding from the assessment.
140. The project screening has been informed by the development of a CEA Project List which forms an exhaustive list of plans, projects and activities within the study area (Section 17.3.1) relevant to North Falls. The list has been appraised, based on the confidence in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out.

**Table 17.7 Summary of projects considered for the CEA in relation to Aviation and Radar (project screening)**

Project	Status	Construction period	Closest distance from the array areas (km)	Confidence in data	Included in the CEA (y/n)	Rationale
Gallopier Offshore Wind Farm	Operational	N/A	0	High	Y	Proximity to North Falls.
Greater Gabbard Offshore Wind Farm	Operational	N/A	0	High	Y	Proximity to North Falls.
London Array Offshore Wind Farm	Operational	N/A	19	High	Y	Proximity to North Falls.
Thanet Offshore Wind Farm	Operational	N/A	24	High	Y	Proximity to North Falls.
Gunfleet Sands Offshore Wind Farm	Operational	N/A	37	High	Y	Proximity to North Falls.
East Anglia ONE Offshore Wind Farm	Operational	N/A	38	High	Y	Proximity to North Falls.
East Anglia TWO Offshore Wind Farm	Consented	2023 to 2026	15	High	Y	Proximity to North Falls.
East Anglia ONE NORTH Offshore Wind Farm	Consented	2023 to 2026	45	High	Y	Proximity to North Falls.
Five Estuaries Offshore Wind Farm	Pre-Planning	2028 to 2030	0	High	Y	Proximity to North Falls.

### 17.8.3 Assessment of cumulative effects

141. Having established the residual effects from North Falls with the potential for a cumulative effect (Table 17.6), along with the other relevant plans, projects and activities (Table 17.7), the following sections provide an assessment of the level of effect significance that may arise.

#### 17.8.3.1 *WTGs causing permanent interference on civil and military radars*

142. There is potential for a cumulative effect where radars detect the rotating blades of WTGs from multiple offshore wind developments that are in their operational phase. This could result in a significant increase in clutter being generated on radar displays over a larger area.

143. With no mitigation in place the potential cumulative effect is considered to be major significant.

144. However, all offshore wind farms must have the necessary radar mitigations in place before becoming operational, and any potential radar impacts from North Falls will be similarly mitigated. With such mitigation implemented the potential for cumulative effects on civil and military radars is assessed to be not significant.

#### 17.8.3.2 *Creation of an aviation obstacle environment*

145. Construction of the wind farm will involve the installation of infrastructure above sea level which could pose a physical obstruction to military low flying and offshore fixed-wing and helicopter operations, including helicopters utilising HMRI 20. There is potential for cumulative effects when also considering the infrastructure associated with other offshore projects.

146. Specifically for HMRI 20, any required mitigation plan deemed necessary following consultation with the relevant helicopter operator should take account of potential obstacles associated with the adjacent Five Estuaries Offshore Wind Farm that is currently in pre-planning.

147. The potential cumulative effect of maritime and aviation obstacle lighting creating confusing lighting configurations to both sectors has been addressed and CAA guidance has been subject to coordination with maritime agencies. There should be no cumulative effects on the impact of surface obstacles on aviation operations as compliant markings and lighting will be provided.

148. Through the use of embedded environmental measures such as effective lighting, reliance on pilots who are required to avoid any obstacle by legislated minimum distances, and consideration of charted obstacles, the cumulative effect from the creation of an obstacle environment is considered to be not significant.

#### 17.8.3.3 *Increased air traffic in the area related to wind farm activities.*

149. During the construction, operation and decommissioning phases of North Falls there is likely to be an increase in helicopter air traffic over the current baseline levels due to the use of helicopters in the provision of support in the airspace around North Falls.

150. The predicted number of daily helicopter movements is considered to be low, however the cumulative effect of this activity and similar activities associated

with the projects included in the CEA will create a greater potential risk of mid-air collision between aircraft engaged in such operations and / or aircraft in transit across the study area.

151. The increase in air traffic will be managed by the existing ATS infrastructure, provided in accordance with national procedures, and pilots will be expected to operate in accordance with civil and military regulatory requirements. The cumulative effect is therefore considered to be not significant in EIA terms.

### 17.9 Transboundary effects

152. The potential impacts of WTGs on aviation are localised and the North Falls array areas are completely within UK airspace, with the nearest Dutch operated airspace approximately 9km south-east of the southern array area at its closest point.
153. Due to the localised nature of the potential impacts, significant transboundary impacts on aviation and radar are unlikely to occur and for this reason are not discussed any further.

### 17.10 Interactions

154. Potential interactions exist with this chapter and Chapter 13 Offshore ornithology (Volume I), Chapter 15 Shipping and navigation (Volume I), Chapter 18 Infrastructure and other users (Volume I), and Chapter 29 Seascape, landscape and visual (Volume I), as detailed in Table 17.8.
155. Aviation lighting fitted to offshore WTGs could cause confusion to the maritime community as the specification for the lighting to be displayed below the horizontal plane of the light filament itself could cause mariners some confusion. This confusion could result in WTGs with conflicting warning lighting representing a collision risk to maritime surface vessels.
156. Work has been undertaken to develop an aviation warning lighting standard where, from the nature of the lighting, it will be apparent to mariners that the aviation lighting is clearly distinguishable from maritime lighting. Where it is evident that the default aviation warning lighting standard may generate issues for the maritime community a developer can make a case, that is likely to receive CAA approval, for the use of a flashing red Morse Code Letter ‘W’ instead. See CAP 764 paragraph 3.16.

**Table 17.8 Aviation and Radar interactions**

Topic and description	Related chapter (Volume I)	Where addressed in this chapter	Rationale
<b>Operation</b>			
Aviation lighting fitted to offshore WTGs.	Chapter 13 Offshore ornithology Chapter 15 Shipping and navigation Chapter 29 Seascape, landscape and visual	Section 17.3.3.2	Lighting impact on birds. Potential confusion to the maritime community. Visual effects associated with lighting.

Topic and description	Related chapter (Volume I)	Where addressed in this chapter	Rationale
Creation of an aviation obstacle environment. Increased air traffic in the area related to wind farm activities.	Chapter 15 Shipping and navigation Chapter 18 Infrastructure and other users	Sections 17.6.2.2 and 17.6.2.3.	Impacts on helicopter traffic associated with SAR operations, and impacts on military low flying.

### 17.11 Inter-relationships

157. The impacts identified and assessed in this chapter have the potential to interrelate with each other. For example, the effects of the creation of an obstacle environment and increased air traffic due to wind farm activities interacting on helicopter / SAR traffic or military low flying. The worst-case impacts assessed within the aviation and radar chapter take these potential inter-relationships into account, therefore the assessments are considered conservative and the levels of significance appropriate.

### 17.12 Summary

158. Table 17.9 presents a summary of the preliminary effects assessment undertaken with respect to North Falls in relation to aviation and radar.



**Table 17.9 Summary of potential effects on aviation and radar**

Potential impact	Receptor	Pre-mitigation effect	Mitigation measures proposed	Residual effect
<b>Construction</b>				
Impact 1: Impacts on civil and military radar systems due to high construction vessels / cranes and partially complete structures.	NERL MoD Southend Airport	No Change	N/A	No Change
Impact 2: Creation of an aviation obstacle environment.	Military low flying Helicopters utilising HMRI 20 Other offshore fixed-wing and helicopter operations, including SAR	Not Significant	As outlined in Section 17.3.3 Consultation with relevant helicopter operator regarding HMRI 20	Not Significant
Impact 3: Increased air traffic in the area related to wind farm activities.	Military low flying Other offshore fixed-wing and helicopter operations, including SAR	Not Significant	Managed by existing ATS infrastructure Pilot compliance with regulatory requirements	Not Significant
<b>Operation</b>				
Impact 1: WTGs causing permanent interference on civil and military radars.	NERL MoD Southend Airport	Major Significant	Technical mitigation solution applied to impacted radars to be agreed with operators	Not Significant
Impact 2: Creation of an aviation obstacle environment.	Military low flying Helicopters utilising HMRI 20 Other offshore fixed-wing and helicopter operations, including SAR	Not Significant	As outlined in Section 17.3.3 Any mitigation agreed for HMRI 20 from construction phase	Not Significant
Impact 3: Increased air traffic in the area related to wind farm activities.	Military low flying	Not Significant	Managed by existing ATS infrastructure Pilot compliance with regulatory requirements	Not Significant

Potential impact	Receptor	Pre-mitigation effect	Mitigation measures proposed	Residual effect
	Other offshore fixed-wing and helicopter operations, including SAR			
<b>Decommissioning</b>				
Impact 1: WTGs causing permanent interference on civil and military radars.	NERL MoD Southend Airport	No Change	Mitigations applicable from operation phase to remain in place until all WTG blades are removed	No Change
Impact 2: Removal of aviation obstacle environment.	Military low flying Helicopters utilising HMRI 20 Other offshore fixed-wing and helicopter operations, including SAR	No Change	As outlined in Section 17.3.3 Any mitigation agreed for HMRI 20 from construction phase	No Change
Impact 3: Increased air traffic in the area related to wind farm activities.	Military low flying Other offshore fixed-wing and helicopter operations, including SAR	Not Significant	Managed by existing ATS infrastructure Pilot compliance with regulatory requirements	Not Significant
<b>Cumulative</b>				
Impact 1: WTGs causing permanent interference on civil and military radars.	NERL MoD Southend Airport	Major Significant	Technical mitigation solution applied to impacted radars to be agreed with operators	Not Significant
Impact 2: Creation of an aviation obstacle environment.	Military low flying Helicopters utilising HMRI 20 Other offshore fixed-wing and helicopter operations, including SAR	Not Significant	As outlined in Section 17.3.3 Consultation with relevant helicopter operator regarding HMRI 20, taking account of Five Estuaries Offshore Wind Farm	Not Significant

Potential impact	Receptor	Pre-mitigation effect	Mitigation measures proposed	Residual effect
Impact 3: Increased air traffic in the area related to wind farm activities.	Military low flying Other offshore fixed-wing and helicopter operations, including SAR	Not Significant	Managed by existing ATS infrastructure Pilot compliance with regulatory requirements	Not Significant

## 17.13 References

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