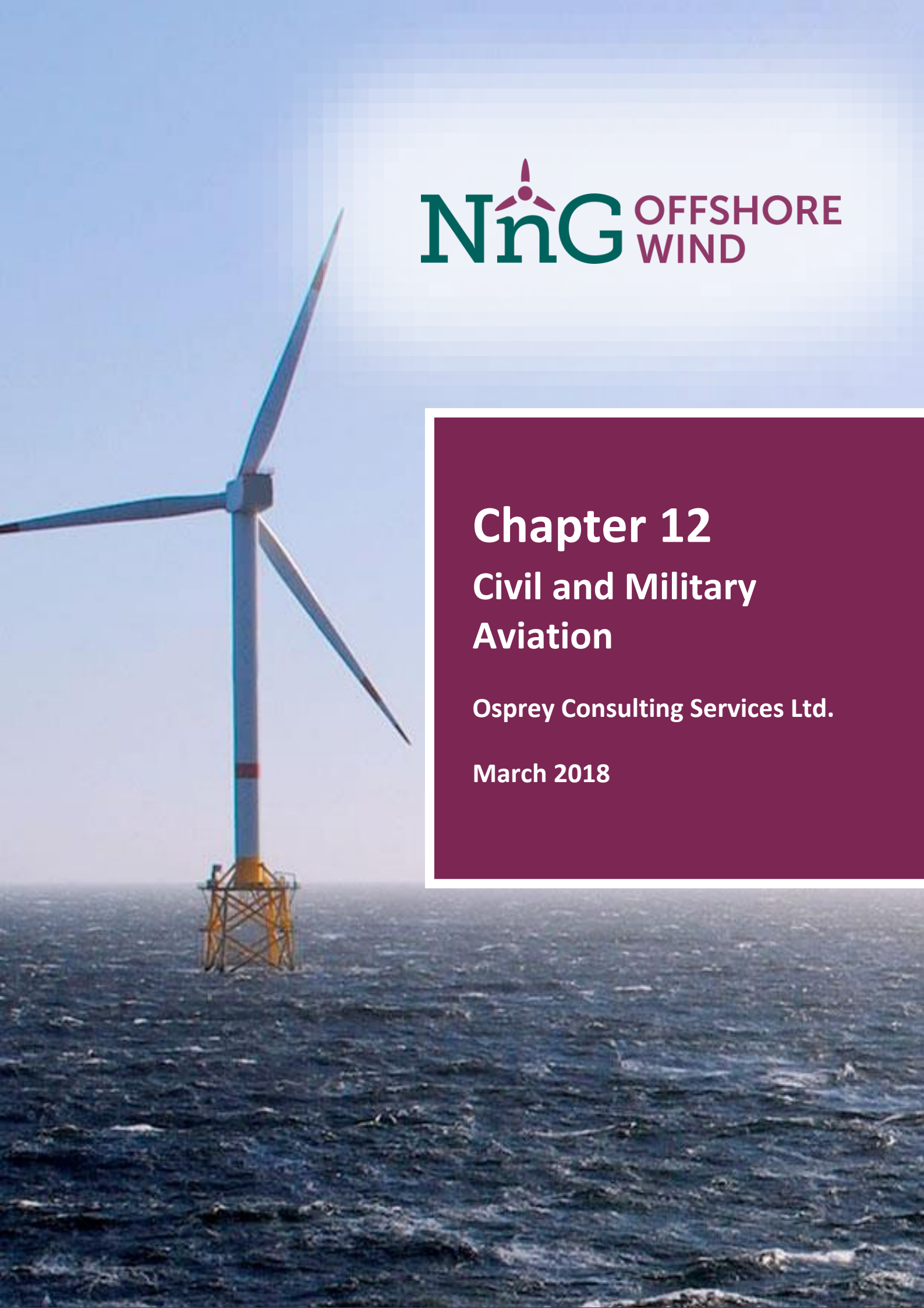

NnG OFFSHORE WIND

# Chapter 12

## Civil and Military Aviation

Osprey Consulting Services Ltd.

March 2018

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# 12 Civil and Military Aviation

## 12.1 Introduction

1. This chapter of the EIA Report presents an assessment of the potential impacts upon aviation arising from the construction, operation and decommissioning of the Project, as detailed in Chapter 4: Project Description.
2. The assessment is based upon a combination of the understanding of the Project in terms of the potential for impact and the resultant effects on receptors through the evaluation of existing data sources, desk studies and consultation with key stakeholders.
3. This chapter is comprised of the following elements:

- A summary of relevant legislation, policy and guidance;
- Details of the data sources used to characterise the study area;
- A summary of the relevant consultations with stakeholders;
- A description of the methodology for assessing the impacts of the Project, including details of the study area and approach to the assessment of potential effects;
- A review of the baseline conditions;
- A description of the worst-case design scenario relevant to aviation;
- An assessment of the likely effects for the construction, operation and decommissioning phases of the Project, including cumulative and in-combination effects;
- Identification of any further mitigation measures or monitoring requirements in respect of any significant effects; and
- A summary of the residual impact assessment determinations taking account of any additional mitigation measures identified.

This chapter is supported by one appendix which is contained within Volume 4 of this EIA Report:

- Appendix 12.1: Radar Line of Sight Analysis.

## 12.2 Relevant Legislation, Policy and Guidance

4. The assessment of potential impacts on aviation has been undertaken with specific reference to The Scottish Planning Policy (SPP). Paragraph 169 of SPP notes that considerations in the determination of applications for energy infrastructure developments are likely to include impacts on aviation and defence interests.
5. A variety of aviation publications contain guidance and information relating to the potential effects of wind energy development on aviation stakeholders. The Civil Aviation Authority (CAA) publishes a number of guidance documents in the form of Civil Aviation Publications (CAP). Those relevant, and which contain information and guidance relating to the potential effects of wind energy development on aviation stakeholders are outlined in Table 12.1 below.

Table 12.1: Guidance and Policy Context - Aviation.

| Relevant guidance | Purpose | Relevance to the Project |
|---|---|---|
| **CAP 393: The Air Navigation Order 2016 and Regulations (CAA, 2017)** | The document sets out the provisions of the Air Navigation Order as amended together with regulations made under the Order. It is prepared for those concerned with day to day matters relating to air navigation that require an up to date version of the air navigation regulations. CAP 393 also includes application of aviation obstruction lighting to wind turbines in UK territorial waters. | The Project will be fitted with aviation lighting, which will be incorporated into the design of the Project as embedded mitigation and will be submitted to Marine Scotland for approval post-consent in the Lighting and Marking Plan. Section 12.7.1 provides further information on the guidance provided by the CAA. |
| **CAP 437: Standards for Offshore Helicopter Landing Areas (CAA, 2016a)** | The criteria applied by the CAA in assessing helicopter landing areas for worldwide use by helicopters registered in the UK. It includes design of winching area arrangements located on turbine platforms to represent current best practice. | There will be no helicopter landing areas provided within the Development Area. However, the wind turbines will be fitted with helihoist platforms on the roof of the nacelle. The Offshore Substation Platforms (OSPs) will also include helihoist platforms.<br>Section 12.7.1 provides further information on the guidance provided by the CAA. |
| **CAP 670: Air Traffic Services Safety Requirements (CAA, 2014a)** | Sets out the safety regulatory framework and requirements associated with the provision of an ATS. | Consideration of impacts is contained within section 12.8; mitigation is contained in section 12.9. |
| **CAP 764: Policy and Guidance on Wind Turbines (CAA, 2016b)** | Provides assistance to aviation stakeholders to help understand and address wind energy related issues, thereby ensuring greater consistency in the consideration of the potential impact of proposed wind farm developments. | The assessment and consideration of potential impacts are contained in section 12.8 of this report. |
| **Military Aviation Authority (MAA): Manual of Aerodrome Design and Safeguarding (MADS) (MAA, 2014)** | MADS provides details of safeguarding of military aerodromes and the management of obstacles on or near to military aerodromes. | Consideration of the safeguarding of military aerodromes has been completed through a desktop assessment included in this EIA Report. Leuchars Station is the only military aerodrome impacted and consideration of impact is provided in Sections 12.6.1.3.3 and 12.6.1.3.4. |

6. A variety of aviation publications contain information and guidance relating to the potential effects of an offshore wind development on aviation stakeholders.

7. Whilst not definitive, CAP 764 (CAA, 2016b) provides criteria for assessing whether a wind turbine development might have an impact on civil aerodrome related operations.

8. CAP 764 (CAA, 2016b) and the Manual of Aerodrome Design and Safeguarding (MADS) (MAA, 2014) also provide criteria for assessing whether wind turbine developments might have an impact on military aerodrome related operations.

9. Consideration of the Project's potential to impact on aviation stakeholders and receptors has been undertaken in accordance with the standard consultation distances stated in CAP 764 however, the impact to a radar system is dependent on a radar's technical and operational range and effect created by the detectability of operational wind turbines within radar Line of Sight (LoS).

10. Helicopters which may operate in the operation and maintenance role are likely to route direct to the development area under the provision of an ATS from Leuchars Station and will be operating under the specific rules of that Air Traffic Service (ATS) and within the bounds of CAP 393 Air Navigation Order and Regulations 2016 (CAA, 2017).

11. Impact to Practice and Exercise Areas (PEXA) would be due to the potential for interference to radar systems which are utilised in providing a radar service to aircraft operating in the PEXA. Therefore policy, legislation and guidance relevant to radar systems would also be relevant to PEXA in this case.

## 12.3 Data Sources

12. The assessment considers the potential interaction between the Project, as described in Chapter 4: Project Description, and aviation receptors within the study area. Table 12.2 details the data sources used to inform the baseline characterisation within the study area.

13. The study area will depend on the maximum operating ranges of each of the radar systems scoped in, relative position of military PEXAs and use of Operation and Maintenance (O&M) helicopters; this will vary from system to system, even between different installations of the same system. The operational range of a radar system is dependent on the type of radar used, its function and its operational requirement; consequently the study area can vary significantly.

14. The study area has been defined by applying the criteria set out within CAP 764 (CAA, 2016b), as follows:

    - Within 30 km of an aerodrome with a surveillance radar (although it is acknowledged that the distance quoted in CAP 764 can be greater than 30 km dependent on a number of factors at individual aerodromes, including type and coverage of radar utilised);
    - Airspace coincidental with published Instrument Flight Procedures (IFP) to take into account the requirement for an aerodrome to protect its IFPs; there is no such airspace within the Project vicinity; and
    - Within 17 km of a non-radar equipped licensed aerodrome with a runway of 1,100 m or more; there are no such aerodromes within 17 km of the Project.

15. Where relevant, the maximum operating range of the radar system identified is used within the baseline study and is as follows:

    - The Leuchars Primary Surveillance Radar (PSR) is located on the airfield at Leuchars Station and has a standard operating range of 40 nautical miles (NM) (74.1 km) radius.
    - The Leuchars Precision Approach Radar (PAR) operates a narrow radar beam which has a standard operating range of 20 NM (37 km) and has a safeguarded area of 20° either side of the runway centreline to which it operates.
    - The Brizlee Wood and Buchan Air Defence Radar (ADR) are long range radar systems which have an estimated operational range of 200 NM (370 km), however due to their individual strategic value to national security their exact operating parameters are not known.

16. For military operations to, from and within PEXAs, Offshore Wind Farm maintenance helicopter operations, the orientation of approach and departure flight paths, physical safeguarding of flight, airspace characteristics and flight procedures (as published in the UK Integrated Aeronautical Information Package (IAIP) and Military AIP) are all considered.

17. Baseline characterisation data has been collated combining a thorough desk-based study of extant data supplemented with a detailed literature review and a radar LoS analysis to establish theoretical radar detectability of turbines operating in the Offshore Wind Farm.

Table 12.2 Data sources used to inform the baseline description – Aviation.

| Data Source | Study / Data Name | Overview |
|---|---|---|
| **CAA** | Visual Flight Rules Charts (CAA, 2016c) | Aeronautical range of charts, which provide information of airspace boundaries and areas of aviation activity and obstructions above a specified datum. |
| **Ministry of Defence (MOD) No1 Aeronautical Information Distribution Unit** | Military Aeronautical Information Publication (Mil AIP) (MOD, 2017) | Provides details of military aerodromes in the UK and abroad together with Air Traffic Control (ATC) procedures, infrastructure and facilities. |
| **CAA CAP 032** | UK Integrated Aeronautical Information Package (UKIAIP) (NATS, 2017) | The UKIAIP is updated every 28 days, and contains information for the safe conduct of flight and is essential to air navigation. |
| **NnGOWL** | Radar LoS Analysis (Osprey CSL, 2017) | Provides results of the radar LoS assessment – Appendix 12.1. |

## 12.4 Relevant Consultations

18. As part of the EIA process, NnGOWL has consulted with various statutory and non-statutory stakeholders / receptors of relevance to aviation. In response to NnGOWL's request, Marine Scotland Licensing and Operations Team (MS-LOT) issued a Scoping Opinion identifying a number of impacts that could not be scoped out of the aviation assessment at this stage following review of the Scoping Report together with confirming the scope of the assessment to be presented in this EIA Report, as summarised in Table 12.4 below.

Table 12.3 Summary of Consultation – Aviation.

| Date and consultation phase / type | Response | Section where comment addressed |
|---|---|---|
| **08/09/17 MS-LOT Scoping Opinion** | The Scottish Ministers note that there will be a requirement to carry out further desk based studies in relation to increase in turbine blade tip height and radar detectability.<br>The Scottish Ministers agree that the potential increase in turbine height could affect Brizlee Wood, Buchan, Allanshill and Perwinnes radar systems and notes that Leuchars Station would also be affected.<br>The Scottish Ministers recommend that NnGOWL liaise with the MOD regarding its objections to the Project and provide precise turbine location, hub height and rotor | The Scoping Opinion was based on a maximum turbine blade tip height of 230 m above Lowest Astronomical Tide (LAT). A radar LoS assessment was completed at heights of 230, 220, 210, 205 and 200 m above Mean Sea Level (MSL) in order to establish any additional aviation receptors that may be |

| Date and consultation phase / type | Response | Section where comment addressed |
|---|---|---|
| | diameter so a more detailed assessment can be completed and the impacts on the MOD radar defined. The Scottish Ministers recommend that NnGOWL and the MOD Defence Infrastructure Organisation (DIO) have discussions, prior to submission of any application, to resolve any issues.<br><br>The Scottish Ministers note that NnGOWL propose to scope out radar systems that have previously been mitigated in the cumulative impact assessment. The Scottish Ministers note the comments from the DIO with regard to temporary mitigation measures and not assuming that mitigation and consent conditions previously agreed will be applicable to the Project. NnGOWL should take this into account when identifying cumulative effects to scope into the Project EIA.<br><br>The Scottish Ministers have provided a list of projects that should be included in the Project cumulative assessment and advise that NnGOWL confirm with MOD (DIO) that this is appropriate. | relevant. The maximum blade tip height is now 208 m LAT (equivalent to 205 above mean sea level (AMSL). Appendix 12.1 provides the results of the radar LoS assessment; the height of 205 m AMSL has been used within this impact assessment as this is the closest measurement to the maximum height of the wind turbines. Section 12.8 provides the results of the impact assessment.<br>Wind turbine coordinates for an indicative layout within the Wind Farm Area, at a maximum blade tip height of 208 m LAT, have been provided to the DIO for further assessment. Consultation with MOD (DIO) continues with regard to potential impact to RRH Brizlee Wood and Buchan ADRs and impact to Leuchars Station infrastructure; results of the MOD (DIO) assessment are awaited.<br>Impacts on these aviation receptors are assessed under Section 12.8, with cumulative impacts assessed under Section 12.8.2. |
| **08/09/17 DIO Response to Scoping (note that the Scoping Opinion lists four responses received from the MOD DIO which are listed here as presented in the Scoping Opinion .** | 22/06/17: Increase in turbine height and blade length may cause issues not previously identified within the existing consented wind farm.<br>27/06/17: MOD (DIO) objects to the proposal. MOD assessment of the Project conducted based on 56 turbines at 215[1] m LAT blade tip located in the provided boundary positions.<br>MOD objected to the Project based on impact to the Leuchars Station PSR and RRH Brizlee Wood ADR (based on several of the turbines being in LoS of the radar and the number of turbines visible to the radar at Brizlee Wood exceeding the 'cumulative threshold'). | The MOD (DIO) response to scoping pointed to the proposed increase in turbine rotor diameter when compared to the Originally Consented Project and that a number of turbine locations encroach on the PAR 'Protection Zone'<br>A telephone conference with the MOD (DIO) was held on the 28/09/17 in which a |

[1] MOD (DIO) provided a footnote in their response to scoping which stated that "The Scoping Report states the maximum rotor tip height above LAT (m) will be approximately 230 m.

| Date and consultation phase / type | Response | Section where comment addressed |
|---|---|---|
| | The MOD (DIO) also requested the fitting of aviation lighting in accordance with Article 219[2] of the Air Navigation Order.<br>In its first response received on 29/06/17, the MOD (DIO) maintains its objection (set out in its response dated 27/6/17) based on assessment of 56 turbines at 230 m LAT blade tip (although the MOD (DIO) response states 230m in height from ground level) located in the provided boundary positions. An additional objection is noted based on impact to the Leuchars Station PAR resulting from a number of turbine locations.<br>The MOD's (DIO) second response received on 29/06/17 provided additional comments specifically on the Scoping Report and in addition to the objections set out in its responses dated 27/6/17 and earlier on 29/6/17.<br>MOD (DIO) stated that as the turbine rotor diameter has increased, a number of turbines would encroach on the Leuchars Station PAR 'Protection Zone'.<br>Furthermore, the MOD (DIO) stated that the regulator-approved airspace change of the Transponder Mandatory Zone (TMZ), which was established to mitigate the Leuchars Station PSR was agreed by the MOD as an interim solution pending delivery of an enduring technical solution and the assumption should not be made *"that any mitigation, temporary or enduring, agreed for the Original Consented Project is applicable to the new proposed project"*.<br>The MOD (DIO) requested precise turbine location, hub height and rotor diameter information so *"a more detailed assessment can be completed and the impacts on MOD radar defined".* The MOD (DIO) also required confirmation that during the construction phase of the Project, turbines would not be rotational.<br>The MOD (DIO) objection and comments are based on turbine and wind farm parameters supplied to them. | discussion on the MOD response to scoping was held.<br>In order for the MOD (DIO) to complete its assessment (as indicated in the scoping response), details of wind turbine coordinates and reduced turbine blade tip height of 208 m above LAT were provided to the MOD (DIO) by email on the 6/10/17, results of the MOD (DIO) analysis are awaited.<br>During the gradual construction of above LAT infrastructure in the Wind Farm Area, the effect on radar, and on ATS, would be incrementally increased as the turbines are commissioned and the blades start turning. However, since it is not known at this stage in what turbine order this will occur, for the purposes of this aviation assessment, the operational phase is taken to be from the point when the first turbines start turning, until the last turbine ceases to turn, during that time any agreed mitigation will need to be in place and maintained.<br>Impacts on these aviation receptors are assessed under Section 12.8. |
| **08/09/17 NATS response to scoping** | NATS stated that the Project has been examined from a technical safeguarding aspect and does not conflict with NATS safeguarding criteria and therefore NATS has no safeguarding objection to the proposal. | Results of the radar LoS analysis contained in Appendix 12.1 has confirmed that the Perwinnes and Allanshill PSRs will not theoretically detect the turbines and that NATS infrastructure will not be impacted by the Project.<br>Section 12.6.1.1 considers potential impact to NATS infrastructure. |

[2] CAP 393: The Air Navigation Order 2016 and Regulations was amended in June 2017 and Article 219, providing guidance relating to the lighting of wind turbine generators in UK territorial waters became Article 223.

| Date and consultation phase / type | Response | Section where comment addressed |
|---|---|---|
| **06/10/17 MOD (DIO) EIA Consultation. An indicative layout with turbines at 208 m maximum tip height was provided for detailed assessment of radar impacts.** | No response has been received to date. | Since no response has been received, this assessment has been carried out on the basis of the results of the radar LoS analysis (Appendix 12.1) however as the exact operating parameters of ADR are not known, the Buchan ADR has also been taken forward to the assessment phase of the EIA. |
| **29/10/17 Aberdeen Airport EIA consultation. Contacted by email to clarify whether on basis that NATS raised no objection, Aberdeen Airport would also be in the same position.** | No response has been received to date. | Aberdeen Airport's safeguarding and ATC utilises data from NATS Allanshill and Perwinnes PSRs.<br>It is Osprey's professional judgement that, given the fact that the Project lies outside of Aberdeen Airport's safeguarded Obstacle Limitation Surfaces and published IFPs and that no radar objection was raised by NATS, there would be no impact on Aberdeen Airport.<br>Section 12.6.1.1 considers potential impact to NATS infrastructure. |

19. In summary, the Scoping Opinion provided by the Scottish Ministers confirmed that (based on the scheme design as set out in the Scoping Report and on the assumption that the embedded mitigation will be applied) that only the following matters should be scoped into the EIA.

- Operational impacts[3]:
  - Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines – Leuchars Station PSR.
  - Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines – Leuchars Station PAR.
  - Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines – Royal Air Force (RAF) Remote Radar Head (RRH) Brizlee Wood and RRH Buchan ADR systems.
  - Effects on activities carried out in military PEXA.

[3] NB. As noted above in Table 12.4 during the gradual construction of above LAT infrastructure in the Wind Farm Area, the effect on radar, and on ATS, would be incrementally increased as the turbines are commissioned and the blades start turning. However, since it is not known at this stage in what turbine order this will occur, for the purposes of this aviation assessment, the operational phase is taken to be from the point when the first turbines start turning, until the last turbine ceases to turn, during that time any agreed mitigation will need to be in place and maintained.

- Use of helicopters for O&M of the Project.

20. During the construction phase, stationary elements, such as the tower of the wind turbine will not be processed and presented onto a Radar Data Display Screen (RDDS) by the associated aviation radar. Therefore, for the purpose of this aviation assessment, the operational phase is taken to be from the point at which wind turbine blades are capable of turning to the point at which the last turbine ceases to turn. Any required mitigation will be in place prior to this point. On this basis, contrary to the approach proposed in the Scoping Report, a separate assessment of the construction and decommissioning phase has not been presented.

21. Following consideration of the Scoping Report, MS-LOT confirmed in their Scoping Opinion, that the following impacts can be scoped out of the EIA, and are therefore not assessed in Section 12.8:

- Construction and decommissioning impacts:
  - Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines – NATS Allanshill and Perwinnes PSR systems including utilisation of data from these systems by Aberdeen International Airport.
  - Increased meteorological radar clutter resulting in impacts on quality of meteorological data.
  - Construction activities and structures impacting accuracy of Civil and Military Secondary Surveillance Radar (SSR) systems.
  - Physical obstruction and increased risk of collision around airfields.
  - Effects on Military Low Flying Aircraft resulting from increased collision risk.
  - Search and Rescue (SAR) Flight Operations.
  - Effects on quality/interference of VHF communications.
  - Effects on RACONs due to reflection from turbines.
  - Reduction or loss of Automatic Information Services (AIS).
  - Reduction in positional accuracy of Loran.
  - Interference resulting in reduction in positional accuracy of GPS.
  - Interference increasing difficulty in locating distress beacons/SARTs.
  - Reduction in bearing estimation accuracy.
  - Reduction/loss in coverage of mobile phone signals.
  - Reduction/loss in coverage of satellite phone signals.
  - Reduction/loss in picture of TV signals.
  - Reduction/loss in signal of public radio.
  - Intermittent or incomplete loss of data associated with Line-of-Sight links.
- Operational impacts:
  - Increase in risk due to clutter resulting from reflected turbine signals and reduced detectability of aircraft resulting from shadowing behind turbines – NATS Allanshill and Perwinnes PSR systems including utilisation of data from these systems by Aberdeen International Airport.
  - Increased meteorological radar clutter resulting in impacts on quality of meteorological data.
  - Operational activities and structures impacting accuracy of Civil and Military Secondary Surveillance Radar (SSR) systems.
  - Physical obstruction and increased risk of collision around airfields.
  - Effects on Military Low Flying Aircraft resulting from increased collision risk.
  - SAR Flight Operations.
  - Effects on quality/interference of VHF communications.
  - Effects on RACONs due to reflection from turbines.
  - Reduction or loss of AIS.
  - Reduction in positional accuracy of Loran.

- Interference resulting in reduction in positional accuracy of GPS.
- Interference increasing difficulty in locating distress beacons/SARTs.
- Reduction in bearing estimation accuracy.
- Reduction/loss in coverage of mobile phone signals.
- Reduction/loss in coverage of satellite phone signals.
- Reduction/loss in picture of TV signals.
- Reduction/loss in signal of public radio.
- Intermittent or incomplete loss of data associated with Line-of-Sight links.

22. Consultation with the MOD (DIO) is ongoing with the aim of discussing the potential impacts of the Project with regard to the RRH Brizlee Wood and Buchan ADRs and Leuchars Station PSR and PAR and its assessment of whether any operational impact would be apparent (and in light of the technical assessments set out in this EIA Report). The discussions are expected to include (if required), the applicability of a technical mitigation solution for relevant radar receptors and the viability of any other identified mitigation strategy.

23. As the entire Offshore Export Cable is below sea level, it will not have an impact on aviation interests and therefore is not assessed in this chapter.

24. Further details on the technical assessment and the need for, and options related to, radar mitigation are set out in Section 12.9.

## 12.5 Impact Assessment Methodology

25. This assessment considers the potential impacts associated with the construction, operation and decommissioning of the Project and the effects on aviation. The impact assessment process and methodology follows the principles and general approach outlined in Chapter 6: EIA Methodology. The methodology and parameters assessed have also taken into account issues identified through consultation with stakeholders as detailed in Section 12.4 and the understanding of baseline conditions informed by the data sources referenced in Section 12.3.

26. The Project Description (Chapter 4) and the Project activities for all stages of the Project life cycle (construction, operation and decommissioning) have been assessed against the baseline to identify the potential interactions between the Project and the relevant aviation receptors defined in Section 12.4. These are known as the potential impacts and are then assessed to determine a level of significance of effect upon the receptors.

### 12.5.1 Assessment and Assignment of Significance

27. The sensitivity of aviation receptors are defined by both their potential vulnerability to an impact from the Project, their recoverability and value or importance of the receptor. The definitions of terms relating to the sensitivity of aviation receptors are detailed in Table 12.4.

Table 12.4: Sensitivity / importance of the receptor – Aviation.

| Receptor sensitivity / importance | Description / justification |
|---|---|
| **High** | Receptor provides a service, which is of major importance to the local, regional or national economy, and / or the receptor is generally vulnerable to impacts that may arise from the Project, and / or recoverability is slow and / or costly. |
| **Medium** | Receptor provides a service, which is of moderate value to the local, regional or national economy, and / or the receptor is somewhat vulnerable to impacts that may arise from the Project, and / or has moderate to high levels of recoverability. |
| **Low** | Receptor provides a service, which is of minor value to the local, regional or national economy, and / or the receptor is not generally vulnerable to impacts that may arise from the Project, and / or has high recoverability. |
| **Negligible** | Receptor provides a service, which is of negligible value to the local, regional or national economy, and / or the receptor is not vulnerable to impacts that may arise from the Project, and / or has high recoverability. |

28. The magnitude of impact is defined by a series of factors including the spatial extent of any interaction, the likelihood, duration, frequency and reversibility of a potential impact.

29. The definitions of the levels of magnitude used in this assessment in respect of aviation are described in Table 12.5.

Table 12.5: Magnitude of the impact – Aviation.

| Magnitude of impact | Description (adverse effects) |
|---|---|
| **High** | Loss of resource and / or quality and integrity of resource; severe damage to key characteristics, features or elements. |
| **Medium** | Loss of resource, but not adversely affecting integrity of resource; partial loss of / damage to key characteristics, features or elements. |
| **Low** | Some measurable change in attributes, quality or vulnerability, minor loss of, or alteration to, one (maybe more) key characteristics, features or elements. |
| **Negligible** | Very minor loss or detrimental alteration to one or more characteristics, features or elements. |
| **No change** | No loss or alteration or characteristics, features or elements; no observable impact in either direction. |
| **High** | Receptor provides a service, which is of major importance to the local, regional or national economy, and / or the receptor is generally vulnerable to impacts that may arise from the Project, and / or recoverability is slow and / or costly. |

30. The magnitude of the impact is correlated against the sensitivity of the receptor to provide a level of significance. It is noted that significance criteria for aviation impacts are typically difficult to establish; they are not strictly based on the sensitivity of the receptor or magnitude of change but on whether the industry regulations for safe obstacle avoidance or radar separation (from radar clutter) can be maintained in the presence of wind turbines. Any anticipated impact upon aviation receptors, which results in restricted operations is considered to be of significance.

31. For the purposes of this assessment any effect that is considered major or moderate, and shaded in red or orange in Table 12.6, is considered significant in EIA terms. Any effect that is minor or below is not considered to be significant.

Table 12.6: Significance of potential effects – Aviation.

| | | Magnitude of Impact | | | |
|---|---|---|---|---|---|
| | | **High** | **Medium** | **Low** | **Negligible** |
| **Sensitivity** | **High** | Major | Major | Moderate | Minor |
| | **Medium** | Major | Moderate | Minor | Negligible |
| | **Low** | Moderate | Minor | Negligible | Negligible |
| | **Negligible** | Minor | Negligible | Negligible | Negligible |

32. During the gradual decommissioning of above LAT infrastructure in the Wind Farm Area, the effect on radar, and on ATS, would be incrementally reduced as the turbines are decommissioned and the blades cease turning. However, since it is not known at this stage in what turbine order this will occur, for the purposes of this aviation assessment, the operational phase is taken to be the point until which all turbines have ceased turning. Until that time, any agreed mitigation will need to be maintained.

### 12.5.2 Uncertainty and Technical Difficulties Encountered

33. The LoS analysis is a limited and theoretical desk based study; in reality there are variable levels of signal diffraction and attenuation within a given radar environment that can influence the probability of a wind turbine being detected by a particular radar. The analysis is designed to give an indication of the likelihood of the wind turbine being detected such that the operational significance of the Project relative to nearby aviation radar stakeholders can be assessed.

## 12.6 Baseline Description

### 12.6.1 Wind Farm Area

#### 12.6.1.1 Existing Airspace Environment

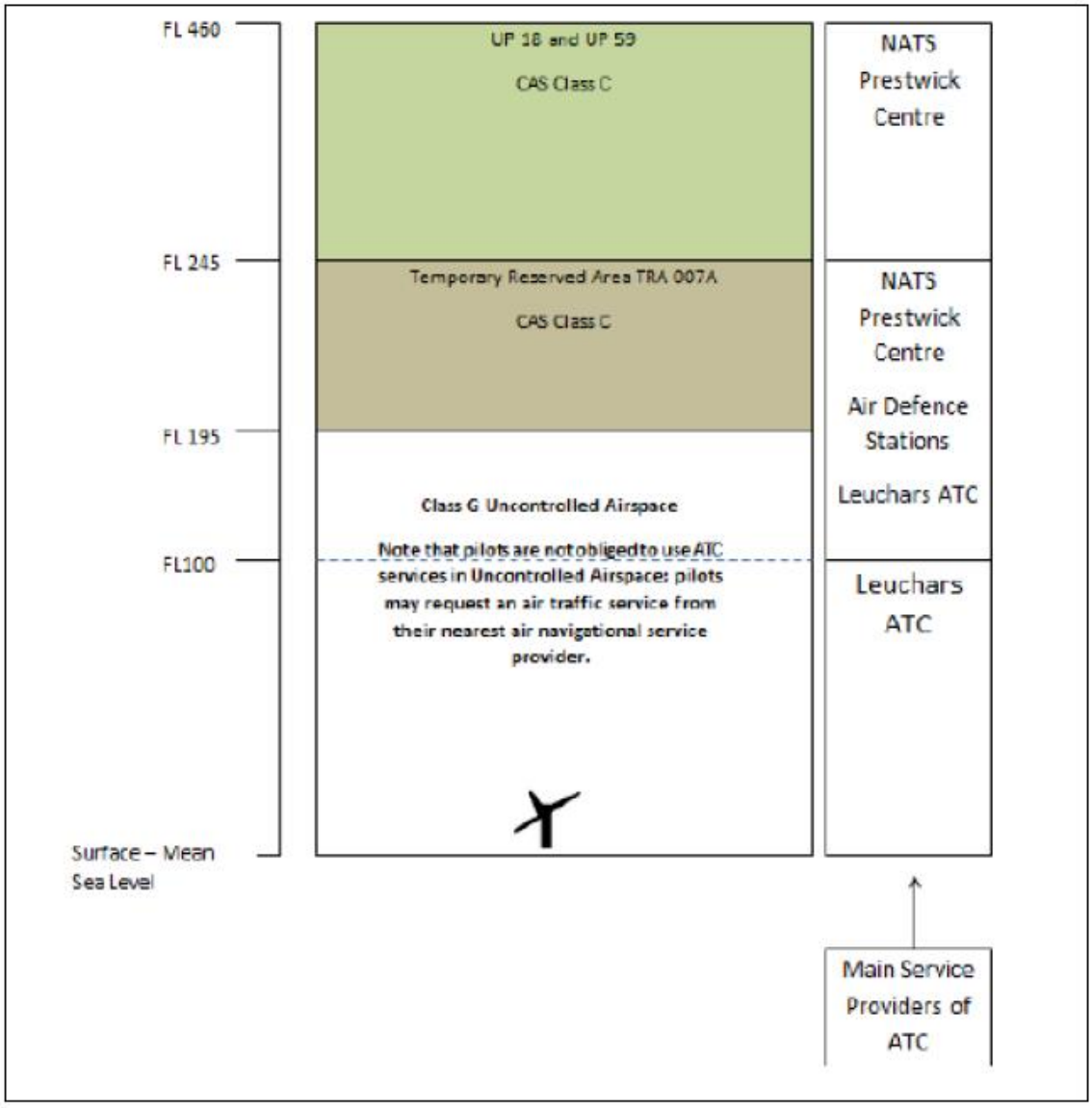
34. The airspace above the Wind Farm Area (see Illustration 12.1 below) is predominately Class G uncontrolled airspace, which is established from the surface up to Flight Level (FL) 195 (approximately 19,500 feet (ft)). There are also discrete areas of Class C controlled airspace (CAS) above FL 195. Under these classifications of airspace, the following applies:

- **Class G uncontrolled airspace:** any aircraft can operate in this area of uncontrolled airspace without any mandatory requirement to be in communication with, or receive a radar service from, any ATC establishment. Pilots of aircraft operating in Class G airspace are ultimately responsible for seeing and avoiding other aircraft and obstructions; and
- **Class C controlled airspace:** only aircraft that have filed a flight plan can operate within controlled airspace. Controllers apply the required levels of separation to aircraft operating in controlled airspace and generally, instructions issued to the pilot flying in controlled airspace are mandatory. Aircraft operating in controlled airspace must be in receipt of an ATS from NATS or a separate authorised military service provider.

35. The Class C controlled airspace above FL 195 contains a number of airways designated P18[4], UP18 and UP59; UP18 and UP59 are located above FL 245 and are designated upper airways. Airways are predominantly used by en-route civil aircraft and an ATS to pilots operating on the airways above the Project is routinely provided by NATS controllers operating from the Prestwick Area Control Centre (ACC) utilising remote long-range radar. It is noted that NATS has responded to Scoping confirming that they have no safeguarding objection to the Project.

36. Military air defence controllers utilising radar data from ADRs provide an airways crossing service to aircraft under air defence control, utilising ADR systems, and are likely to operate in the airspace above the Project.

Illustration 12.1: Airspace classifications above the Wind Farm Area




### 12.6.1.2 Military Practice and Exercise Areas

37. The only aeronautical Military PEXA within the study area is Temporary Reserved Area (TRA) 007A which is used by military aircraft for activities including air combat training, training exercises and supersonic flight. It is established above the Wind Farm Area from FL 195 (19,500 ft) to FL 245 (24,500 ft) and is activated Monday to Friday 0830 to 1700 (0730 to 1700 during the months of summer). TRA

[4] NB. P18 is not included in Illustration 12.1 as P18 is not located directly above the Wind Farm Area.

007A does not include controlled airspace within Airway P18 during the published hours of the airway. TRAs allow military aircraft to work autonomously or to be in receipt of an ATS service from approved ATS units, to avoid operational restrictions. Air defence controllers using radar data from ADR systems and airborne radar assets are responsible for navigation services and support to aircraft activity within TRA 007A.

### 12.6.1.3 Radar Coverage within the Study Area

#### 12.6.1.3.1 NATS PSRs

38. NATS operates a number of long-range PSR systems positioned to provide maximum coverage of UK airspace. Wind farm developments have the potential to impact NATS radar and operations and by association other users of radar data supplied by NATS.

39. The NATS Perwinnes PSR is located to the north of Bridge of Don; approximately 97.6 km from the northern edge of the Project and together with the Allanshill PSR, which is located to the south west of Fraserburgh; approximately 146 km from the northern edge of the Project (see Figure 12.2 (Volume 2)), are the only NATS long range PSR that could potentially detect the operational turbine blade tips of the Wind Farm Area.

40. Results of the radar LoS analysis contained within Appendix 12.1 indicate that the wind turbines within the Wind Farm Area will not be detected by assessed NATS PSRs.

#### 12.6.1.3.2 Aberdeen International Airport

41. Aberdeen International Airport utilises the two NATS radars at Perwinnes and Allanshill for the provision of ATC services. These services are provided to aircraft inbound and outbound to the airport and in the northern North Sea airspace, including the Atlantic rim airspace and the East Shetland Basin.

42. Aberdeen Airport also provides ATC services for Helicopter Main Routes (HMRs) which are utilised on a frequent basis by helicopters in support of the oil and gas industries. HMRs between Aberdeen and the offshore platforms are situated approximately 50 NM north of the Wind Farm Area and outside any CAA recommended consultation range. This is discussed further in section 12.6.1.3.6. Furthermore, all Aberdeen International Airport flight procedures are located within 30 NM of the airport and therefore aircraft would not be routed in close proximity to the Wind Farm Area whilst established on these procedures.

43. A number of defined airfield Obstacle Limitation Surfaces (OLS) are established at the airport particular to the runway and its intended use. The OLS for the airport will extend to approximately 15 km from the airfield and will not be impacted by the Project.

44. NATS provides under contract ATC services to aircraft operating to and from the airport utilising the NATS Perwinnes and Allanshill PSRs, results of the radar LoS analysis contained within Appendix 12.1 indicate that the wind turbines within the Wind farm Area will not be detected by the PSRs.

#### 12.6.1.3.3 Leuchars Station PSR

45. Leuchars Station operates a standard Watchman PSR, which is located on the airfield at the Station; the radar has an operating range of 40 NM (74.1 km) radius. The PSR is located approximately 18 NM (34 km) from the western edge of the Wind Farm Area (see Figure 12.2 (Volume 2)) and is utilised by Leuchars Station ATC in the provision of air traffic services to aircraft operating in and out of the airfield and the provision of a Lower Airspace Radar Service (LARS) below FL 100 to transitory civil and military aircraft within a radius of 40 NM (74.1 km) of the airfield every day of the year, 24 hours per day.

46. Leuchars Station used to be known as RAF Leuchars however, on the 31 March 2015 the Station was handed over to the British Army. Based Typhoon aircraft were relocated to RAF Lossiemouth, Morayshire and continued their Quick Reaction Alert in defence of the UK from their new base. The airfield at Leuchars Station remains open and is administered by RAF personnel who also provide ATC

with a number of skilled personnel in specific roles. The proximity of the airfield to the military practice Danger Areas to the east and southeast makes Leuchars Station an attractive, and possibly the only military aerodrome option, for aircraft diverting in following an emergency or due to inclement weather conditions at their home base.

#### 12.6.1.3.4 Leuchars Station PAR

47. Leuchars Station also has a PAR in addition to the PSR described above in Section 12.6.1.3.3. The Exelis (formerly ITT Gilfillan) PAR system employed by the MOD, at Leuchars Station and other locations, is a radar guidance system designed to provide lateral and vertical guidance to an aircraft pilot for landing, or until the landing threshold is reached. In general terms, the radar's 'Protection Zone' (Safeguarded Area) extends out to 20 NM (37 km) from the runway touchdown point and 20° either side of the extended runway centreline. The Leuchars Station PAR is located approximately 18 NM (34 km) from the western edge of the Wind Farm Area (see Figure 12.2 (Volume 2)). Further information on the PAR system can be found in Appendix 12.1.

#### 12.6.1.3.5 RRH Brizlee Wood and RRH Buchan ADRs

48. The MOD operates a series of fixed ADR that feed into the Control and Reporting Centres (CRC) at RAF Boulmer and RAF Scampton, where the UK Recognised Air Picture (RAP) is produced. The nearest ADR to the Wind Farm Area is the Lockheed Martin TPS-77 equipped RRH Brizlee Wood located at Alnwick Moor Northumberland, 91.7 km from the southern boundary of the Wind Farm Area (see Figure 12.2 (Volume 2)). The Wind Farm Area is within the estimated operational range of 200 NM (370 km), however due to their individual strategic value to national security their exact operating parameters are not known

49. The RRH Buchan ADR houses a Lockheed Martin Type 92(B3), which has been upgraded to TPS-77 standard, and is located just south of Peterhead on the Aberdeenshire coast, 127.7 km from the northern boundary of the Wind Farm Area (see Figure 12.2 (Volume 2)). As above, the Wind Farm Area is within the estimated operational range of the radar.

#### 12.6.1.3.6 Offshore Helicopter Operations in Support of Oil and Gas Operations

50. Offshore oil and gas platforms in the North Sea are supported by a number of helicopter operators who ferry crews and supplies to and from the mainland. Helicopters operate offshore in support of the oil and gas industry and normally route along HMRs, which are non-mandatory routes, where helicopters may operate on a frequent basis. HMRs, which are concentrated in the northern North Sea, east and northeast of Aberdeen International Airport and route to the offshore oil and gas platforms, are all situated outside of CAA recommended consultation distances which states that there should be no obstacles within 2 NM either side of the HMR.

#### 12.6.1.3.7 Helicopters Operating in Support of O&M

51. As there are no HMRs between the coast and the Wind Farm Area, helicopters operating in an O&M role to the Project are likely to route direct to the Wind Farm Area under a LARS provided by Leuchars Station ATC dependent on suitable radar and radio frequency coverage.

### 12.6.2 Development of Baseline Conditions without the Project

52. In the future, it is anticipated that the airspace would continue to be used by military and civil aviation stakeholders and the baseline would remain as detailed.

## 12.7 Design Envelope – Worst Case Design Scenario

53. The Application is for the construction, operation and decommissioning of an offshore wind farm with a maximum output of 450 Megawatts (MW), comprising a maximum of 54 turbines. The assessment scenarios identified in respect of aviation have been selected as those having potential to represent

the greatest effect on an identified receptor based on the design envelope described in Chapter 4: Project Description.

54. The worst-case design scenarios are set out in Table 12.7.

55. The worst-case scenario for impacts on aviation and radar assumes that the entirety of the Wind Farm Area will be populated with wind turbines. This is because the largest area of turbines will create the largest impact from an obstruction perspective, leading to a greater effect on radar and aviation services. Any aspects of the infrastructure that are lower in height than the wind turbines and within the Wind Farm Area will not create an incremental effect on aviation interests.

56. As discussed in Section 12.4, during the gradual construction of above LAT infrastructure in the Wind Farm Area, the effect on radar, and on ATS, would be incrementally increased as the turbines are commissioned and the blades start turning. However, since it is not known at this stage in what turbine order this will occur, for the purposes of this aviation assessment, the operational phase is taken to be from the point when the first turbines start turning, until the last turbine ceases to turn, during that time any agreed mitigation will need to be in place and maintained. On this basis, construction and decommissioning effects were scoped out of this assessment and therefore no worst-case design scenario is identified for these phases.

Table 12.7: Design envelope scenario assessed – Aviation.

| Potential Impact | Worst Case Design Scenario | Justification |
|---|---|---|
| **Operation** | | |
| **Turbines causing persistent interference on Leuchars Station PSR system from reflected turbine signals.** | Wind turbines with maximum blade tip height of 208 m above LAT across the full extent of the Wind Farm Area. | Maximum number of the tallest turbines in the Wind Farm Area. Modelling assumes that the entirety of the Wind Farm Area will be populated with turbines. This is because the largest area of turbines will create the largest impact from an obstruction perspective, leading to a greater effect on radar and aviation services. Any aspects of the infrastructure that are lower in height than the wind turbines and within the Wind Farm Area will not create an incremental effect on aviation interests. |
| **Turbines causing persistent interference on Leuchars Station PAR system from reflected turbine signals.** | Wind turbines with maximum blade tip height of 208 m above LAT across the full extent of the Wind Farm Area. | Maximum number of the tallest turbines in the Wind Farm Area. Modelling assumes that the entirety of the Wind Farm Area will be populated with turbines. This is because the largest area of turbines will create the largest impact from an obstruction perspective, leading to a greater effect on radar and aviation services. Any aspects of the infrastructure that are lower in height than the wind turbines and within the Wind Farm Area will not create an incremental effect on aviation interests. |
| **Turbines causing persistent interference on RRH Brizlee Wood and RRH Buchan ADRs from reflected turbine signals** | Wind turbines with maximum blade tip height of 208 m above LAT across the full extent of the Wind Farm Area. | Maximum number of the tallest turbines in the Wind Farm Area. Modelling assumes that the entirety of the Wind Farm Area will be populated with turbines. This is because the largest area of turbines will create the largest impact from an obstruction perspective, leading to a greater effect on radar and aviation services. Any aspects of the infrastructure that are lower in height than the wind turbines and within the Wind Farm Area will not create an incremental effect on aviation interests. |

| Potential Impact | Worst Case Design Scenario | Justification |
|---|---|---|
| **Effects on activities carried out in military PEXA.** | Wind turbines with maximum blade tip height of 208 m above LAT across the full extent of the Wind Farm Area. | The impact to the military PEXA is a consequence of radar interference created by the detectability of the Wind Farm Area and is based on the maximum number of the tallest turbines in the Wind Farm Area. Modelling assumes that the entirety of the Wind Farm Area will be populated with wind turbines. This is because the largest area of turbines will create the largest impact from an obstruction perspective, leading to a greater effect on radar and aviation services in and around the PEXA. Any aspects of the infrastructure that are lower in height than the wind turbines and within the Wind Farm Area will not create an incremental effect on aviation interests. |
| **Use of helicopters for O&M of the Wind Farm Area.** | Wind turbines with maximum blade tip height of 208 m above LAT across the full extent of the Wind Farm Area. | Maximum number of the tallest wind turbines in the Wind Farm Area. Modelling assumes that the entirety of the Wind Farm Area will be populated with wind turbines. This is because the largest area of turbines will create a reduced area for manoeuvre of the helicopter, leading to an increased risk of collision. |

### 12.7.1Embedded Mitigation

57. A number of mitigation options, both embedded and for implementation, were identified within the design envelope for the Originally Consented Project, during the consultation phase of the Original Application and during the on-going liaison with aviation stakeholders, their representatives and with MS-LOT.

58. As set out in the Scoping Report (and as summarised in Chapter 5: Scoping and Consultation) these have been adopted into the Project design as the design envelope has evolved as embedded mitigation. Those embedded mitigation measures that are relevant to the potential impacts on aviation are set out below.

- During construction
  - Information Circulation: Appropriate liaison to ensure information on the construction of the wind farm is circulated in Notice to Airman (NOTAM) and other appropriate media;
  - Hydrographic Office (UKHO) will be provided with the positions and maximum heights of the wind turbines and construction equipment above 150 m LAT. Coordinates and maximum heights of the wind turbines will be provided to the UKHO for aviation charting purposes within one month of the final commissioning of the Project. The UK IAIP is updated on a monthly basis under the Aeronautical Information Regulation and Control (AIRAC) system. Information provided under the AIRAC system shall be distributed by AIS at least 42 days in advance of the effective date with the objective of reaching recipients at least 28 days in advance of the effective date;
  - Lighting and Marking Plan: The Project construction works will be marked in line with CAP 393 (CAA, 2017) and CAP 437 (CAA, 2016a) and as agreed with the CAA. A Lighting and Marking Plan will be submitted for approval, to MS-LOT outlining the Projects lighting and marking strategy to mitigate the risk to aviation safety during construction of the Project;
  - The Project will be designed as per MGN 543, including Annex 5 which details 'Standards and procedures for generator shutdown and other operational requirements in the event of a SAR, counter pollution or salvage incident in or around an Offshore Renewable Energy Installation (OREI)'; and

- Creation of an Emergency Response Co-operation Plan (ERCoP) based on the Maritime and Coastguard Agency (MCA) template and site Safety Management Systems (SMS), in consultation with the MCA. Procedures will be the followed in the event of an emergency during the construction phase.

- During Operation
  - Information Circulation: Appropriate liaison to ensure information on the operation and maintenance of the wind farm is circulated in Notice to Airman (NOTAM) and other appropriate media;
  - Aviation Chart Marking: Prior to operation, information in line with that previously provided to the UKHO will be promulgated to NATS AIS for inclusion in the UK IAIP (NATS, 2017)and to the Defence Geographic Centre (DGC) for marking on related aeronautical charts and documentation;
  - During the operational phase, the Project will be lit in line with CAP 393 (CAA, 2017) and CAP 437 (CAA, 2016a), and as agreed with the CAA. A Lighting and Marking Plan will be submitted for approval, to MS-LOT outlining the Projects lighting, and marking strategy to mitigate the risk to aviation safety during operation of the Project;
  - The Project will be operated as per MGN 543, including Annex 5 which specifies 'Standards and procedures for generator shutdown and other operational requirements in the event of a SAR, counter pollution or salvage incident in or around an OREI'; and
  - Maintenance of the previously established ERCoP based on the MCA template and site SMS, in consultation with the MCA. Procedures will be followed in the event of an emergency during the operational phase.
- During Decommissioning
  - Aviation Chart Marking: Prior to decommissioning, in line with information previously provided to the UKHO, information on decommissioning equipment above 150 m LAT and dates of commencement and final decommissioning of the Wind Farm Area will be promulgated to NATS AIS for inclusion in the UK IAIP (NATS, 2017)and to the Defence Geographic Centre (DGC) for marking on related aeronautical charts and documentation under the AIRAC system;
  - Information Circulation: Appropriate liaison to ensure information on the decommissioning of the wind farm is circulated by NOTAM and other appropriate media;
  - Lighting and Marking Plan: During the decommissioning phase, the Project will be lit in line with CAP 393 and CAP 437, and as agreed with the CAA. The operational Lighting and Marking Plan will have been previously approved. Should any structures be left in situ, appropriate prior modification to lighting and marking will be discussed and agreed with the CAA;
  - The Project will be decommissioned as per MGN 543, including Annex 5 which specifies 'Standards and procedures for generator shutdown and other operational requirements in the event of a SAR, counter pollution or salvage incident in or around an OREI'; and
  - Maintenance of the previously established ERCoP based on the MCA template and site SMS, in consultation with the MCA. Procedures will be followed in the event of an emergency during the decommissioning phase.

59. The embedded mitigation, where relevant, will comply with current guidelines and be agreed with the appropriate stakeholders, as follows:

- CAP 393 Article 223 (CAA, 2017) sets out the mandatory requirements for lighting of offshore wind turbines.

- Legislation requires the fitting of obstacle lighting on offshore wind turbines with a height of 60 m or more above the level of the sea at Highest Astronomical Tide (HAT);
- Where four or more turbines are located together in the same group, with the permission of the CAA, only those on the periphery of the group need to be fitted with at least one medium intensity steady red light positioned as close as reasonably practicable to the top of the fixed structure; and
- The obstruction light or lights must be fitted to show when displayed in all directions without interruption. The requirements of the angle of the plane of the beam and peak intensity levels are defined within CAP 393 (CAA, 2017).

- CAP 437 (CAA, 2016a) sets out a procedure to indicate to a helicopter operator that a wind turbine blades and nacelle are safely secured in position prior to helicopter hoist operations commencing.
  - CAP 437 states that this is best achieved through the provision of a helihoist status light located on the nacelle of the turbine within the pilot's field of view, which is capable of being operated remotely and from the platform itself or from within the nacelle;
  - A steady green light is displayed to indicate to the pilot that the turbine blades and nacelle are secure and it is safe to operate. A flashing green light is displayed to indicate that the turbine is in a state of preparation to accept hoist operations or, when displayed during hoist operations, that parameters are moving out of limits. When the light is extinguished this indicates to the operator that it is not safe to conduct helicopter hoist operations; and
  - Obstruction lighting in the vicinity of the winching area that has a potential to cause glare or dazzle to the pilot or to a helicopter hoist operations crew member should be switched off prior to, and during, helicopter hoist operations.
- Information will be circulated to relevant military and aviation stakeholders including NATS and MOD. Information on potential aviation obstructions will be promulgated within the UK IAIP and notified to the Defence Geographic Centre (DGC) for marking on aeronautical related charts and documentation.
- An ERCoP will be in place for the construction, operation and decommissioning phases of the Project. The content and structure of the ERCoP will be agreed post-consent.

### 12.7.2 Anticipated Consent Conditions

60. A number of consent conditions were attached to the Original Consents to manage the environmental risk associated with the Originally Consented Project. Those consent condition commitments that are relevant to the potential impacts on Aviation are set out in Table 12.8. If further mitigation is required following the impact assessment process, then this will be included as additional mitigation and is set out in Section12.9.

Table 12.8: Consent conditions for the Originally Consented Project relevant to aviation

| Original Consent Requirement | Relevance to Military and Civil Aviation |
|---|---|
| **Lighting and Marking Plan** | Setting out for approval, the final lighting and marking of structures to ensure aviation safety at the Offshore Wind Farm. |
| **Air Traffic Control Mitigation Scheme (ATC Scheme)** | Setting out, for approval, an ATC scheme to mitigate the adverse impacts of the Project on the air traffic control radar at Leuchars Station and the operations of the MOD. |

| Original Consent Requirement | Relevance to Military and Civil Aviation |
|---|---|
| **Provision of Turbines and Construction Equipment above 150 m LAT** | Provide the positions and maximum heights of the turbines and construction equipment above 150 m LAT and any offshore substation platform to the United Kingdom Hydrographic Office (UKHO) for aviation and nautical charting purposes to ensure aviation and navigational safety. |

## 12.8 Impact Assessment

61. The impacts resulting from the operation of the Project have been assessed on aviation receptors identified within the study area and as defined under Section 12.4 and described under Section 12.6. A discussion of the likely significance of each effect resulting from each impact is presented below.

### 12.8.1 Operational Phase Impacts

#### 12.8.1.1 Radar Impacts

62. There are unpredictable levels of signal diffraction and attenuation within a given radar environment that can influence the probability of a wind turbine being detected by a radar system. Occasional detectability of a wind turbine may take place when there is intervening terrain blocking the radar signal or due to radar signal properties. Wind turbines detectable by a radar system might degrade the system by creating false targets, reduce system sensitivity, create radar shadowing behind the turbines and saturate the radar receiver leading to clutter potentially concealing real aircraft targets.

#### 12.8.1.2 Line of Sight Assessment

63. Radar performance and propagation modelling has been undertaken to determine the theoretical detection of wind turbines by the region's radar infrastructure (LoS assessment). The assessment has utilised the Advanced Topographic Development and Images (ATDI) ICS LT (Version 4.3.0) tool to model the terrain elevation profile between the identified PSR and ADR systems and the Wind Farm Area. The LoS assessment is presented in detail in Appendix 12.1.

64. The qualitative definitions utilised in the LoS assessment are defined in Table 12.9 below.

Table 12.9: Qualitative definitions of LoS results – Aviation.

| Result | Definition |
|---|---|
| **Yes** | The turbine is highly likely to be detected by radar, as a direct LoS exists between the radar and the turbine. |
| **Likely** | The turbine is likely to be detected by the radar at least intermittently. |
| **Unlikely** | The turbine is unlikely to be detected by the radar but cannot rule out occasional detection. |
| **No** | The turbine is unlikely to be detected by the radar, as significant intervening terrain exists. |

65. For the purpose of the LoS assessment, the final individual wind turbine locations within the Wind Farm Area are not relevant. That is because the maximum extent of the Wind Farm Area will represent the greatest extent of radar clutter that could be expected to occur on radar systems that detect the wind turbines. Therefore, 25 random points[5] were selected across the Wind Farm Area to complete the LoS analysis.

[5] NB. These 25 points are not intended to show actual locations where turbines will be installed, these locations have been chosen to provide an even spread of turbines across the Wind Farm Area to gauge theoretical detection.

#### 12.8.1.2.1 Creation of Wind Turbine Induced Clutter to the Leuchars Station PSR

66. Radar LoS analysis between the Wind Farm Area and the Leuchars Station PSR was carried out for the Original EIA. This previous analysis demonstrated that due to the coastal location of the PSR, the lack of intervening terrain, and the range from the Wind Farm Area, the Leuchars Station PSR system will theoretically detect the operational wind turbines, potentially creating turbine derived clutter to be presented on the Leuchars Station RDDS. As the turbines in the Project design envelope are taller than those in the Original EIA, there was no requirement to repeat the LoS analysis.

67. The direct, persistent effect of clutter as generated by the Offshore Wind Farm may hamper the radar operator's ability to distinguish actual aircraft returns from those created by the wind turbines, and therefore degrade the safety and efficiency of the ATS being provided. MOD (DIO) has confirmed wind turbines within the Wind Farm Area will be detectable by, and will cause unacceptable interference to the ATC PSR at Leuchars Station.

68. In the vicinity of the Wind Farm Area aircraft under the control of Leuchars ATC will be operating in Class G airspace and may request a Deconfliction Service (DS) from the controllers at Leuchars. DS is the highest level of radar service provided to pilots in Class G uncontrolled airspace: essentially the controller must provide instructions to the pilot to ensure the aircraft remains adequately separated from 'unknown traffic' or clutter. For a pilot requesting a DS, on a flight path within 5 NM of the Wind Farm Area, the air traffic controller will be unable to provide the 5 NM separation (between clutter within the Wind Farm Area and an aircraft) required for the safe provision of the ATS.

69. The sensitivity of the receptor is high. The magnitude of impacts is assessed as high; therefore without mitigation, the impacts would be of major significance, which is significant in EIA terms.

#### 12.8.1.2.2 Creation of Wind Turbine Induced Clutter to the Leuchars Station PAR

70. Radar LoS analysis between the Wind Farm Area and the Leuchars Station PAR was carried out for the Original EIA. This previous analysis demonstrated that due to the coastal location of the PAR, the lack of intervening terrain, and the range from the Wind Farm Area, the Leuchars Station PAR system will theoretically detect the operational wind turbines, potentially creating turbine derived clutter to be presented on the Leuchars Station RDDS. As the turbines in the Project design envelope are taller than those in the Original EIA, there was no requirement to repeat the LoS analysis.

71. PAR provides lateral and vertical guidance for aircraft approaching a runway. ATC Leuchars use PAR derived information to determine an aircraft's course and height during approach and provides heading and descent advice to maintain an aircraft's correction to the runway centreline using voice communication. The use of PAR is limited to a narrow sector centred on the extended runway centreline of the runway of approach. MOD (DIO) safeguards the PAR within an arc of radar coverage which extends to 20 NM from the runway touchdown point and 20° either side of the centreline. Part of the Wind Farm Area would overlap a small area of the PAR 'Protection Zone' (Safeguarded Area). Wind turbines when operated within the arc of coverage have the capacity to affect PAR in a variety of ways. In particular, MOD DIO has previously objected to wind farm proposals based on track loss, track seduction, and processor overload.

72. The sensitivity of the receptor is high. The magnitude of impacts is assessed as high; therefore without mitigation, the impacts would be of major significance, which is significant in EIA terms.

#### 12.8.1.2.3 Creation of Wind Turbine Induced Clutter to the RRH Brizlee and RRH Buchan ADR Systems

73. Radar clutter has the potential to obscure genuine targets and could have safety implications for aircraft under control. Furthermore, wind turbine generated clutter could shield the radars from genuine aircraft targets from the air defence controller. These direct and persistent effects would affect the air defence controller's ability detect an airborne threat and to provide a safe service to aircraft in support of air defence activities.

74. The results of the radar LoS assessment to potentially affected radar systems at a blade tip height of 205 m AMSL indicate that theoretically the RRH Buchan ADR will not detect turbines at 208 m above LAT within the Wind Farm Area.

75. There are mixed results from the LoS assessment to the ADR at RRH Brizlee Wood at 205 m AMSL. Of the 25 points assessed 12 are likely to be detected by RRH Brizlee Wood and of the other 13 points assessed analysis cannot rule out occasional detection.

76. Because the exact operating parameters of the RRH Buchan and RRH Brizlee Wood ADRs are not known, the results of assessment by the MOD (DIO) are awaited to establish if an effect to RRH Buchan or RRH Brizlee Wood ADRs is likely.

77. Based on the LoS assessment carried out, the sensitivity of the receptor is high. The magnitude of impacts is assessed as high; therefore without mitigation, the impacts would be of major significance, which is significant in EIA terms.

#### 12.8.1.2.4 Effects on Activities Carried Out in Military PEXA

78. TRA 007A is a military PEXA and is an area of airspace temporarily reserved and allocated for the exclusive use of a specific user during a predetermined period of time. The creation of radar clutter onto RDDS may impact the provision of air traffic/air defence radars services to aircraft. Air defence controllers using radar data from ADRs are responsible for navigation services and support to aircraft activity within and crossing TRA 007A and wind turbine induced clutter created on an RDDS is likely to impact the safe provision of the service. The sensitivity of this receptor is high. The magnitude of impacts is assessed as medium; therefore, the impacts are considered to be of major significance, which is significant in EIA terms.

### 12.8.1.3 Use of Helicopters for O&M of the Offshore Wind Farm

79. Helicopters may be required access to the Wind Farm Area for troubleshooting minor defects and resets to wind turbines or to facilitate access to the Wind Farm Area when sea states do not allow vessel access. Physical obstruction caused by the infrastructure within the Wind Farm Area may present a potential collision risk to helicopter flight operations.

80. A range of embedded mitigation measures relating to lighting, notification, promulgation and the inclusion of the Project on relevant aviation material will reduce impact to helicopter operators providing O&M support to the Wind Farm Area. When operating in the Class G airspace above the Wind Farm Area pilots are ultimately responsible for seeing and avoiding other aircraft and obstructions. Operations will be conducted in Visual Flight Rules (VFR) conditions which dictate a minimum in-flight visibility of 5 km (approximately 3 NM).

81. Helicopters are likely to be under an ATS from Leuchars when operating in or in transit to the Wind Farm Area. Aircraft can be in receipt of an ATS and may be provided with traffic information on other aircraft, but ultimately pilots are responsible for their own separation from other aircraft, obstacles and terrain. Due to the low number of helicopter movements predicted for O&M duties (80 trips per annum) the procedures existing for the avoidance of obstacles, and the availability of existing ATS, the impact to other aircraft operators in the vicinity of the Wind Farm Area is not considered to be an issue.

82. The sensitivity of the receptor is medium. The magnitude of impacts is assessed as low; therefore, the impacts would be of minor significance, which is not significant in EIA terms.

## 12.8.2 Cumulative Impacts

83. Cumulative effects refer to effects upon receptors arising from the Project when considered alongside other proposed developments and activities and any other reasonably foreseeable project(s) proposals. In this context, the term ‘projects’ is considered to refer to any project with comparable effects and is not limited to offshore wind projects.

84. Project and activities considered within the cumulative impact assessment are set out in Table 12.10.

Table 12.10: Projects for cumulative assessment – Aviation.

| Development Type | Project | Status | Data Confidence Assessment / Phase |
|---|---|---|---|
| **Offshore Wind Farm** | Inch Cape Offshore Wind Farm (Scenario 2) | Consented | High - project details available |
| **Offshore Wind Farm** | Inch Cape Offshore Wind Farm (Scenario 1) | Proposed | High - Scoping Report available |
| **Offshore Wind Farm** | Seagreen Alpha and Bravo Offshore Wind Farms (Scenario 2) | Consented | High - project details available |
| **Offshore Wind Farm** | Seagreen Phase 1 Offshore Wind Farm (Scenario 1) | Proposed | High - Scoping Report available. |
| **Offshore Wind Farm** | Hywind Scotland Pilot Park | Operational | High – final design information published by MS-LOT. |
| **Offshore Wind Farm** | Blyth Offshore Demonstrator Wind Farm (Phase 1 to 3) | Under construction | High – consented, Phase 1 under construction final design information available. |
| **Offshore Wind Farm** | Beatrice Offshore Wind Farm | Under construction | High – consented, under construction. Final design information published by MS-LOT. |
| **Offshore Wind Farm** | MORL Eastern Development Area | Consented | High – consented, details published in the public domain but not confirmed as being accurate. |
| **Offshore Wind Farm** | MORL Eastern Development Area (Alternative Design) a.k.a. Moray East Offshore Wind Farm | Scoping | High – Scoping Report available. |
| **Offshore Wind Farm** | Moray West Offshore Wind Farm | Proposed | High – Scoping Report available. |
| **Offshore Wind Farm** | European Offshore Wind Deployment Centre | Consented | High – consented, details published in the public domain but not confirmed as being accurate. |
| **Offshore Wind Farm** | Kincardine Floating Offshore Wind Farm | Consented | High – consented, details published in the public domain but not confirmed as being accurate. |
| **Offshore Wind Farm** | Forthwind Offshore Wind Farm | Consented | High - consented, details published in the public domain but not confirmed as being accurate. |
| **Offshore Wind Farm** | Forthwind Offshore Wind Demonstration Project Phase 2 | Scoping | High – Scoping Report available. |
| **Offshore Wind Farm** | Offshore Renewable Energy Catapult Levenmouth | Operational | High – final design information published by MS-LOT. |

85. It is assumed that those offshore wind farms, that have been consented, or are operational, have (or will have) technical mitigation in place (if required), which will mitigate effects to any relevant radar systems. Currently, for any other radar systems for which impacts are not mitigated it is assumed that

any effects are deemed acceptable; however, the addition of unmitigated clutter created by the Project turbines could create a cumulative effect where existing detectable turbines are currently considered manageable.

86. In assessing the cumulative impacts for the Project, two scenarios are considered with respect to the Inch Cape and Seagreen offshore wind farm projects. Scenario One incorporates the design envelopes for the proposed Inch Cape and Seagreen projects as detailed in the Scoping Reports submitted to MS-LOT in 2017 (ICOL, 2017; Seagreen, 2017). Scenario Two incorporates the consented design envelopes as detailed in the respective project consents. Scenario 1 (Table 12.10: Projects for cumulative assessment – Aviation.) is likely to be the worst case scenario as any increase in wind turbine blade tip height above LAT, and increase in turbine numbers, is likely to increase detectability to regional radar systems.

87. Table 12.11 sets out the potential cumulative impact and the worst case cumulative design envelope scenario considered within the cumulative impact assessment.

88. Due to the narrow beam of radar coverage provided by PAR and the small 'Protection Zone' (Safeguarded Area) of the system (20 NM from the runway touchdown point, 20° either side of the runway centreline), and that there are no other projects within the PAR 'Protection Zone', the Leuchars Station PAR is not considered for cumulative effect.

89. Since the impact on PEXA is a consequence of the radar detectability of the Wind Farm Area by the radar systems that would be utilised for control of aircraft in TRA 007A, the cumulative effect is to the radar system (RRH Brizlee Wood and RRH Buchan), not the PEXA itself, assuming that any effects, direct or residual, by other offshore wind farms are deemed acceptable.

90. Effects relating to helicopter use during O&M were specific to the Project and therefore do not need to be considered on a cumulative basis.

Table 12.11: Cumulative worst-case design envelope scenarios – Aviation.

| Impact | Project | Worst Case Design Scenario | Justification |
|---|---|---|---|
| **Cumulative impact of wind turbines causing persistent interference on the Leuchars Station PSR system from reflected turbine signals** | Scenario 1 Inch Cape Offshore Wind Farm | Max no. turbines: 72<br>Max. tip height: 291 m | The Leuchars Station PSR has a Declared Operational Range (DOC) of 40 NM. Therefore, the potential for cumulative effect is limited to those developments, within 40 NM of the PSR, which unmitigated could create a cumulative impact.<br>The parameters which make up the worst case scenario are those which would cause the greatest cumulative impact on the Leuchars PSR i.e. largest number of tallest turbines. |
| | Scenario 1 Seagreen Phase 1 Offshore Wind Farm | Max no. turbines: 120<br>Max. tip height: 280 m | |
| | Forthwind Offshore Wind Farm | Max no. turbines: 2<br>Max. tip height: 185 m | |
| | Offshore Renewable Energy Catapult Levenmouth | Max no. turbines: 1<br>Max. tip height: 195.6 m | |
| | Forthwind Offshore Wind Demonstration Project Phase 2 | Max no. turbines: 7<br>Max. tip height: 225 m | |
| **Cumulative impact of wind turbines causing** | Scenario 1 Inch Cape Offshore Wind Farm | Max no. turbines: 72<br>Max. tip height: 291 m | The operational range of RRH Brizlee Wood and RRH Buchan ADR systems is unknown |

| Impact | Project | Worst Case Design Scenario | Justification |
|---|---|---|---|
| **persistent interference on RRH Brizlee Wood and RRH Buchan ADRs from reflected turbine signals** | Scenario 1 Seagreen Phase 1 Offshore Wind Farm | Max no. turbines: 120<br>Max. tip height: 280 m | however; it is expected to be in the region of 200 NM radius from the location of the ADRs. Therefore, the potential for cumulative effect is limited to those developments, within 200 NM of the ADRs, which unmitigated could create a cumulative impact.<br>The parameters which make up the worst case scenario are those which would cause the greatest cumulative impact on the ADRs i.e. largest number of tallest turbines. |
| | Hywind Scotland Pilot Park | Max no. turbines: 5<br>Max. tip height: 178 m | |
| | Blyth Offshore Demonstrator Wind Farm Phase 1 to 3 | Max no. turbines: 5<br>Max. tip height: 191.5 m | |
| | Beatrice Offshore Wind Farm | Max no. turbines: 84<br>Max. tip height: 198.4 m | |
| | MORL Eastern Development Area | Max no. turbines: 186<br>Max. tip height: 204 m | |
| | MORL Eastern Development Area (Alternative Design) a.k.a. Moray East Offshore Wind Farm | Max no. turbines: 100<br>Max. tip height: 280 m | |
| | European Offshore Wind Deployment Centre | Max no. turbines: 8<br>Max. tip height: 191 m | |
| | Forthwind Offshore Wind Farm | Max no. turbines: 2<br>Max. tip height: 185 m | |
| | Offshore Renewable Energy Catapult Levenmouth | Max no. turbines: 1<br>Max. tip height: 195.6 m | |
| | Kincardine Floating Offshore Wind Farm | Max no. turbines: 7<br>Max. tip height: 191 m | |
| | Moray West Offshore Wind Farm | Max no. turbines: 90<br>Max. tip height: 272 m | |
| | Forthwind Offshore Wind Demonstration Project Phase 2 | Max no. turbines: 7<br>Max. tip height: 225 m | |

### 12.8.2.1 Operational Phase Impacts

91. As set out in Table 12.10, there are a number of other operational and proposed wind farms, at various stages in the planning process, within the vicinity of the Wind Farm Area.

#### 12.8.2.1.1 Creation of Wind Turbine Induced Clutter to the Leuchars PSR System

92. It is assumed that those wind farms, both offshore and onshore, that are operational, have technical mitigation in place (if required), which will remove effects to those radar systems that require it, within radar LoS. Currently, for radar systems for which impacts are not mitigated it is assumed that any effects are deemed acceptable; however, the addition of unmitigated clutter created by the Project wind turbines could create a cumulative effect where existing detectable wind turbines are currently considered manageable.

93. The Offshore Renewable Energy Catapult (Levenmouth) turbine and the Forthwind Offshore Wind Farm received no objections from the MOD (DIO) with reference to effect on Leuchars PSR and are therefore no considered further in this assessment. 2B Energy state in their Scoping Report for the Forthwind Offshore Wind Demonstration Project Phase 2 that the MOD (DIO) have confirmed they do not object to the development.

94. As discussed in Section 12.8.1.2.1, radar propagation modelling provided in Appendix 12.1 indicates that the Wind Farm Area is likely to be detectable by the PSR at Leuchars Station. It is expected that due to the distances to the Inch Cape and Seagreen Phase 1 wind farms, and the lack of intervening terrain, it is likely that all three wind farms would be detectable by the Leuchars Station PSR. In addition, the wind farms are located in areas where controllers using the Leuchars Station PSR are required to detect and control aircraft, depending on the service provided. As per the Project alone, this could hamper the controllers' ability to distinguish actual aircraft returns from those created by the wind farms. Radar detectability of the wind farms would create, in effect, a large area within which significant clutter can be expected. It is evident that, as larger areas are covered and the extent of the clutter increases, the availability of uncluttered airspace reduces.

95. The sensitivity of the receptor is high. The magnitude of impact would remain high; therefore, the cumulative impact would be of major significance, which is significant in EIA terms.

#### 12.8.2.1.2 Creation of Wind Turbine Induced Clutter to the RRH Brizlee and RRH Buchan ADR Systems

96. Wind turbines detectable by a radar system might degrade the system by creating 'false' targets, reduce system sensitivity, create radar shadowing behind the turbines and saturate the radar receiver leading to clutter potentially concealing real aircraft targets. It is assumed that those wind farms, both offshore and onshore, that are operational have technical mitigation in place (if required), which will remove effects on any radar systems within radar LoS. Currently, for radar systems for which impacts are not mitigated it is assumed that any effects are deemed acceptable; however, the addition of unmitigated clutter created by the Project wind turbines could create a cumulative effect where existing detectable wind turbines are currently considered manageable

97. 'False' targets might potentially conceal real aircraft targets under control and also those targets that might be conflicting to aircraft under control of air defence controllers, leading to potential reduction of safety margins. Other radar detectable developments within the individual operational range of the two ADR systems may create adverse technical impact; the appearance of multiple 'false' targets created by wind turbines in close proximity can lead to degradation of radar tracking ability leading to a significant cumulative effect.

98. The Beatrice Offshore Wind Farm, MORL Eastern Development Area, MORL Eastern Area (Alternative Design) a.k.a. Moray East Offshore Wind Farm, the Moray West Offshore Wind Farm, the Offshore Renewable Energy Catapult (Levenmouth) turbine and the Forthwind Offshore Wind Farm have no objections from the MOD (DIO) on the basis of ADR. These projects have therefore not been considered further in this cumulative assessment.

99. 2B Energy state in their Scoping Report for the Forthwind Offshore Wind Demonstration Project Phase 2 that the MOD (DIO) have confirmed they do not object to the development.

100. As discussed in Section 12.8.1.2.3, radar propagation modelling provided in Appendix 12.1 indicates that the Wind Farm Area is likely to be detectable by RRH Brizlee Wood, but theoretically not by RRH

Buchan. Until the results of the requested MOD (DIO) assessment of impact to its radar systems are known both RRH Brizlee Wood and RRH Buchan ADR systems are included within the cumulative assessment. There will be potential for cumulative effect, dependent on the radar detectability of the Projects to the two ADR systems which are located in areas where controllers using the ADR systems are required to detect and control aircraft.

101. It is understood that the Hywind Scotland Pilot Park, the European Offshore Wind Deployment Centre and the Kincardine Floating Offshore Wind Farm all either have mitigation in place, or have a consent condition in place, to mitigate their impact on the RRH Buchan ADR.

102. The Blyth Offshore Demonstrator Wind Farm Phase 1 to 3 has a consent condition in place to mitigate its impact on the RRH Brizlee Wood ADR.

103. On the basis of information provided in the scoping report and scoping opinion for the Seagreen Phase 1 Offshore Wind Farm and the Inch Cape Offshore Wind Farm, the developments are understood to be potentially detectable to both the RRH Brizlee Wood and RRH Buchan ADRs.

104. It is implicit that the more sites that are proposed or built, the greater the impact on the provision of radar services. In effect, a larger area within which significant clutter can be expected will be created. Without mitigation, the Project would likely create cumulative effects on RRH Brizlee Wood and Buchan ADR systems with these other projects, in terms of the area affected by radar clutter and the distances between areas of clutter on the RDDS.

105. The sensitivity of the receptor is high. The magnitude of impact would remain high; therefore, the cumulative impact would be of major significance, which is significant in EIA terms.

### 12.8.3 Inter-relationships

106. This chapter has an inter-relationship with Chapter 11: Shipping and Navigation. Aviation lighting to offshore wind turbines could cause confusion to maritime activities as the specification for lighting to be displayed below the horizontal plane of the light fitment itself could cause mariners some confusion. Work has been undertaken to develop an aviation warning light standard which is clearly distinguishable from maritime lighting. Within CAP 764 (CAA, 2016b) the CAA state that where it is evident that the default aviation warning lighting standard for offshore obstacles 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. There is however, no intent to change the lighting intensity specifications set out for offshore obstacles; indeed, those specifications remain the default aviation warning lighting requirement. A detailed Lighting and Marking Plan will be submitted which will be discussed and agreed with the CAA and MCA prior to construction.

107. The Project will be designed as per MGN 543. Annex 5 specifies 'Standards and procedures for generator shutdown and other operational requirements in the event of a SAR, counter pollution or salvage incident in or around an Offshore Renewable Energy Installation (OREI)'; and creation of an Emergency Response Co-operation Plan (ERCoP) based on the Maritime and Coastguard Agency (MCA) template and site Safety Management Systems (SMS), in consultation with the MCA. Procedures will be the followed in the event of an emergency during all phases.

## 12.9 Mitigation and Monitoring

108. The assessment of impacts, both in isolation and cumulatively, on aviation receptors as a result of the operation of the Project are predicted to be of minor, moderate and major significance. In addition to the embedded mitigation set out in Section 12.7.1 a number of further mitigation measures have been identified to reduce or manage the residual effects.

### 12.9.1 Leuchars Station PSR

109. Analysis has concluded that the Project would be theoretically detectable by the Leuchars Station PSR system. The effect of the detectability of the Offshore Wind Farm to the Leuchars Station PSR would result in an unacceptable effect on Leuchars Station operations and would therefore require the implementation of an agreed mitigation strategy.

110. The airspace regulator, the CAA, has approved an Airspace Change Proposal for the introduction of a TMZ over the Wind Farm Area. The Airspace Change occurs in two stages; stage one includes radar blanking of the Leuchars Station PSR; stage two is the introduction of the TMZ covering the Wind Farm Area.

111. The carriage and operation of transponder equipment in the aircraft is mandatory whilst flying within a TMZ, this enables a controller to track the aircraft using the data from its SSR transponder and provide a SSR Alone radar service. The TMZ is considered an interim solution, until an enduring technical solution is identified, tested and implemented, that will remove any unwanted effect created by the Project to the Leuchars Station PSR until the enduring solution is found.

112. The MOD has previously accepted the TMZ as an interim solution ahead of any enduring technical solution. With the agreed two stage TMZ mitigation in place, the sensitivity of the receptor is high, and the magnitude of impact is negligible; therefore, the residual impact would be of minor significance, which is not significant in EIA terms.

113. With regard to cumulative effects, it is understood that a TMZ has also been approved for the Inch Cape Offshore Wind Farm. It is assumed that such an arrangement will also be agreed for Seagreen Phase 1 Offshore Wind Farm if required.

114. Cumulatively, and assuming TMZ mitigation is in place for all the wind farms, the sensitivity of the receptor is high, and the magnitude of the impact is negligible; therefore the residual cumulative impact would be of minor significance, which is not significant in EIA terms.

#### 12.9.1.1 Enduring Technical Solution

115. Previous technical mitigation solutions accepted by the MOD (DIO) for radar impacts have included 'in-fill' solutions. A resolution in-fill solution involves the removal of PSR data where radar clutter is anticipated in the vicinity of the wind turbines, and replacing it with an alternate radar source which is not affected by radar clutter. A number of emerging technologies may potentially offer acceptable technical mitigation (no one technology has been proven against an offshore wind farm of this kind) for ATC radar impacts and have been considered by some airports across the UK in wind farm mitigation procurement activities. Consultation with the MOD (DIO) is continuing to establish an enduring technical solution for the Leuchars Station PSR.

116. With respect to cumulative effects, it is understood that the developers of the Inch Cape Offshore Wind Farm are also engaging in discussions regarding an enduring technical solution. Given that the Seagreen Offshore Wind Farm also has an objection on the basis of the Leuchars Station PSR, it is expected that the developer will also engage in discussions with the MOD (DIO) regarding an enduring mitigation solution.

### 12.9.2 Leuchars Station PAR

117. There is no technical mitigation solution for the impact the turbines create to the PAR system at Leuchars Station. NnGOWL has therefore committed to not siting any wind turbines within the PAR 'Protection Zone' (Safeguarded Area), including turbine blades, to remove the potential for radar detectability of any element of a turbine.

118. With the above mitigation in place, the sensitivity of the receptor is high and the magnitude of impact is negligible; therefore, the residual impact would be of minor significance, which is not significant in EIA terms.

### 12.9.3 RRH Brizlee Wood and RRH Buchan ADRs

119. Radar LoS analysis indicates that RRH Brizlee Wood is likely to detect wind turbines of 208 m above LAT within the Wind Farm Area. Ongoing consultation with the MOD (DIO) aims to ascertain its position regarding the potential that the Project may be detectable by RRH Buchan, and its assessment of whether any operational impact would be apparent. It is likely that the MOD (DIO) would need to consider the cumulative effects of multiple wind farms in the region as there might be limitations on the signal processing capability of the ADR TPS-77 radar system to implement a technical solution for other offshore wind farms within the area (consented and in development) which are also detectable by the RRH Brizlee Wood and RRH Buchan ADRs.

120. RRH Brizlee Wood and RRH Buchan (which have been upgraded to TPS-77 radar standard) have an inherent resilience, utilising hardware and software, to wind turbine induced clutter through the use of pulse Doppler processing. However, where the inherent radar performance is not considered satisfactory for ADR purposes, the TPS-77 has an enhanced signal processing capability, which enables the implementation of a Non-Automatic Initiation Zone (NAIZ).

121. A NAIZ prevents the radar from automatically creating tracks from any returns that originate within the lateral confines of the NAIZ. In creating a NAIZ around a wind farm, none of the wind turbine radar returns will be processed, thereby significantly reducing the possibility of unwanted tracks. Mature tracks, which have been formed from returns originating outside the NAIZ (an aircraft transiting through the NAIZ) will still be tracked and updated. If it is concluded that the addition of NAIZ to the TPS-77 at RRH Brizlee Wood and RRH Buchan is not suitable, NnGOWL will consult with MoD regarding other technical mitigation solutions prior to construction.

122. With the above mitigation in place, the sensitivity of the receptor is high and the magnitude of impact is negligible; therefore, the impact would be of minor significance, which is not significant in EIA terms.

123. Should the Seagreen Phase 1 Offshore Wind Farm and Inch Cape Offshore Wind Farm also be visible to RRH Brizlee Wood or RRH Buchan ADR, it is expected that the developers would also engage in discussions with the MOD (DIO) regarding mitigation. Cumulatively, with the above mitigation in place, the sensitivity of the receptor is high, and the magnitude of the impact is negligible; therefore the residual cumulative impact would be of minor significance, which is not significant in EIA terms.

### 12.9.4 Military PEXA

124. Military PEXA activity within TRA 007A may be impacted by the creation of clutter onto an RDDS displaying data from radar systems assessed in this EIA. Mitigation of radar impact as detailed in Section 12.9.2 and 12.9.3 above, will remove impact to military PEXA activity.

125. The sensitivity of the receptor is high. The magnitude of impacts is assessed as negligible; therefore, the impacts would be of minor significance, which is insignificant in EIA terms.

### 12.9.5 Use of Helicopters for O&M of the Offshore Wind Farm

126. The physical presence of the wind turbines within the Wind Farm Area has the potential to represent a collision risk to helicopters operating in the vicinity of the Wind Farm Area in support of O&M. As detailed in Section 12.8.1.3, a range of embedded mitigation measures are already in place to reduce the risk of collision.

127. Since the assessment concluded that the effect was minor and not significant in EIA terms, no further mitigation is proposed.

## 12.10 Summary of Residual Effects

128. This chapter has assessed the potential effects on aviation of operation of the Project, both in isolation and cumulatively. Where significant effects were identified, additional mitigation has been considered

and incorporated into the assessment. Table 12.12 summarises the impact determinations discussed in this chapter and presents the post-mitigation residual significance.

Table 12.12 Summary of predicted impacts of the Project – Aviation.

| Potential Impact | Significance of Effect | Mitigation Measures | Residual Significance of Effect |
|---|---|---|---|
| **Operation** | | | |
| **Wind turbines causing persistent interference to the Leuchars Station PSR from reflected turbine signals** | Major (significant) | Mitigation in the form of the regulator approved TMZ and associated radar blanking will remove the wind turbine radar returns from the Leuchars Station PSR RDDS until an enduring technical solution is established and agreed. | Minor (not significant) |
| **Wind turbines causing persistent interference to the Leuchars Station PAR from reflected turbine signals** | Major (Significant) | The removal of wind turbine infrastructure including overlap from rotation of turbine blades from the Leuchars Station PAR Safeguarded Area will remove any impact to the PAR system. | Minor (not significant) |
| **Wind turbines causing persistent interference to RRH Brizlee Wood and RRH Buchan ADR from reflected turbine signals** | Major (significant) | Subject to stakeholder approval, technical mitigation in the form of a NAIZ will remove impact to the Brizlee Wood and Buchan ADR systems. If this mitigation solution is not applicable a technical mitigation solution will be agreed with the MOD before construction. | Minor (not significant) |
| **Effects on Activities carried out in military PEXA** | Major (significant) | Removal of wind turbine induced clutter through NAIZ mitigation on the ADRs. If this mitigation solution is not applicable a technical mitigation solution will be agreed with the MOD before construction. | Minor (not significant) |
| **Use of helicopters for O&M of the Wind Farm Area** | Minor / Negligible (not significant) | n/a | Minor (not significant) |
| **Cumulative Effects** | | | |
| **Wind turbines causing persistent interference to RAF Leuchars PSR** | Major (significant) | Mitigation in the form of the regulator approved TMZ and associated radar blanking will remove the wind turbine generated radar returns from the Leuchars Station PSR RDDS until an enduring technical solution is established and agreed. | Minor (not significant) |
| **Wind turbines causing persistent interference to RRH Brizlee Wood and RRH Buchan ADRs.** | Major (significant) | Removal of wind turbine induced clutter through NAIZ mitigation on the ADRs. If this mitigation solution is not applicable a technical mitigation solution will be agreed with the MOD before construction. | Minor (not significant) |

## 12.11 References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