Environmental Impact Assessment Report

Teindland Wind Farm

Volume 1

Chapter 13: Aviation

Document prepared by Envams Ltd for: Teindland Wind Farm Ltd

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Contents

13 AVIATION

13.1 INTRODUCTION

This chapter assesses the potential for the proposed Teindland Wind Farm (the Development) on land owned by Forestry and Land Scotland approximately 3 km north of Rothes, Moray, (the Site) to affect aviation communications, navigation and surveillance (CNS) infrastructure. The assessment takes into account the guidance laid down in Civil Aviation Publication (CAP) 764[1] and other aviation regulations. The assessment considers whether the Development is likely to have any effect on the following:

- Civil aviation interests, including "En Route" facilities managed and operated by National Air Traffic Services (En Route) Ltd (NERL), airports, licensed and unlicensed aerodromes, light aircraft landing strips, microlight sites, parachute and gliding sites; and
- Military facilities including Ministry of Defence (MOD) Airfields and military Air Traffic Control (ATC) facilities, Air Defence Radars, Danger Areas and Ranges and low flying operations.

This chapter is supported by the following Technical Appendices (TAs) in Volume 3 of this EIA Report:

- TA A13.1: The Initial Aviation Assessment (WFAS) and Addendum;
- TA A13.2: The Cyrrus IFP Assessment; and
- TA A13.3: The Aviation Lighting Assessment (as assessed in Section 5.7.6 of Chapter 5: Landscape and Visual).

The assessment has been undertaken by aviation specialists Wind Farm Aviation Safeguarding Ltd (WFAS).

13.2 CONSULTATION

Aviation consultation has been undertaken through the EIA Scoping process and in accordance with the guidance described in Section 13.2.

Table 13.1 – Aviation Consultation

Consultee	Response	Comment
MOD	In response to the Scoping Opinion Defence Infrastructure Organisation (DIO) highlighted a concern of possible interference on the Primary Surveillance Radar at RAF Lossiemouth.	Following on from detailed radar modelling which indicated that there would be line of sight to the radar (in TA A13.1), DIO have responded to consultation (WFAS letter 19 June 2024) that the MOD would be able to assess any proposed mitigation the project may provide and then advise accordingly (20240624_MOD_Rsponse _Teindland Wind Farm (sic)). It will be necessary to agree a Planning Condition to reflect this.
	In response to the Scoping Opinion DIO highlighted a concern of possible interference on the Air Defence Radar at Buchan.	Following on from detailed radar modelling which indicated that there would be no line of sight to the radar, DIO have responded to consultation (WFAS letter 19 June 2024) that they would have no objection to the layout proposed (20240624_MOD_Rsponse_Teindland Wind Farm (sic)). Radar modelling included in TA A13.1 has indicated that within the submitted layout the turbines all remain below line of sight to the radar.
	In the interests of air safety, DIO have stated that the MOD will request that all turbines be fitted with aviation safety lighting in accordance with the Civil Aviation Authority, Air Navigation Order.	CAA aviation lighting requirements in accordance with Article 219 of the Air Navigation Order come into effect at a height of 150 m. A lighting assessment was submitted to the CAA for approval, and a response was received on 28 February 2025 indicating CAA's approval.

[1] UK Govt Civil Aviation Publication (CAP) 764 Civil Aviation Authority (CAA) Policy and Guidance on Wind Turbines

Consultee	Response	Comment
NATS	In their response to Scoping NATS Safeguarding indicated that they had no safeguarding objection to the proposal.	Detailed radar modelling has confirmed that there should be no line of sight to the NATS radars from the proposed layout (see TA A13.1).
Highlands and Islands Limited (HIAL)	In their response to Scoping HIAL Safeguarding indicated concerns that the proposed wind farm may infringe the safeguarding criteria and operation of Inverness Airport and requested that an Aviation Impact Feasibility Study (AIFS) of the proposed wind farm be undertaken to understand any impact on the infrastructure and operation of Inverness Airport.	In agreement with HIAL, an impact assessment was conducted by Cyrrus which indicated that there would be no effects on the airport operation (6 November 2024, CL-6131-RPT-002 V1.0). The Cyrrus assessment is included as TA A13.2.

13.3 LEGISLATION, POLICY AND GUIDANCE

This assessment takes into account consultation, regulatory, safeguarding and operational requirements as laid down in a number of publications and regulations including, in addition to CAP 764:

- CAP 670 Air Traffic Services Safety Requirements;
- CAP 393 The Air Navigation Order 2016 and Regulation;
- CAP 168 Licensing of Aerodromes;
- CAP 774 UK Flight Information Services;
- CAP 738 Safeguarding of Aerodromes;
- CAP 793 Safe Operating Practices at Unlicensed Aerodromes;
- CAP 493 Manual of Air Traffic Services Part 1;
- UK Govt CAA Policy Statement Lighting of Onshore Wind Turbine Generators;
- CAP 1096 Guidance to Crane Users on aviation lighting and notification:
- Military Aviation Authority Traffic Management (3000 series) Regulatory Articles;
- Military Aviation Authority Regulatory Article 2330 (Low Flying);
- UK Military Aeronautical Information Publication (MIL AIP);
- UK Aeronautical Information Publications (AIP); and
- CAA 1:250,000 and 1:500,000 VFR Charts.

13.4 ASSESSMENT METHODOLOGY

This section provides an outline description of the methodology used to assess any effects that the Development would have on aviation operations in the area.

13.4.1 Civil Aerodromes

CAP 764 states the distances from various types of airfields where consultation should take place. These distances include:

- Airfield with a surveillance radar – 30 km;
- Non radar licensed aerodrome with a runway of more than 1,100 m – 17 km;
- Non radar licensed aerodrome with a runway of less than 1,100 m – 5 km;
- Licensed aerodromes where the turbines would lie within airspace coincidental with any published Instrument Flight Procedure (IFP);
- Unlicensed aerodromes with runways of more than 800 metres – 4 km;
- Unlicensed aerodromes with runways of less than 800 metres – 3 km; and
- Other aviation activity such as parachute sites and microlight sites within 3 km – in such instances developers are referred to appropriate organisations.

CAP 764 goes on to state that these distances are for guidance purposes only and do not represent ranges beyond which all wind turbine developments will be approved or within which they will always be objected to. These ranges are intended as a prompt for further discussion between developers and aviation stakeholders. As well as examining the technical impact of wind turbines on ATC facilities, it is also necessary to consider the physical safeguarding of ATC operations using the criteria laid down in CAP 168 to determine whether a proposed development will breach obstacle clearance criteria.

13.4.2 Ministry of Defence

It is necessary to take into account the aviation and air defence activities of the MOD. The issues that will be assessed include the likely significant effect of the Development on:

- MOD Airfields, both radar and non-radar equipped;
- MOD remote ATC radars
- MOD Air Defence Radars;
- MOD Meteorological Radars;
- Military Aviation Authority Aerodrome Design and Safeguarding; and
- Military Low Flying.

13.4.3 National Air Traffic Services (NERL) Facilities

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

13.4.4 Radar Projection Information

Radar modelling has been undertaken using specialist software (RView) which utilises a comprehensive systems database incorporating the safeguarding criteria for a wide range of radar and radio navigation systems. RView models terrain using the latest Ordnance Survey (OS) Terrain 50 digital terrain model, which has a post spacing of 50 metres and has a root mean square (RMS) error of 4 metres. The results are verified using the Shuttle Radar Topography Mission (SRTM) dataset, a separate smoothed digital terrain model with data spacing of 3 arc seconds. By using two separate and independently generated digital terrain models, anomalies are identified and consistent results assured. Rview models the refractive effects of the atmosphere on radio waves and the First Fresnel Zone. If needed, Rview is also capable of modelling a range of atmospheric refractive conditions. RView models the trajectory of radar signals at different elevations enabling modelling of both volume surveillance and pencil beam radars as well as the effects of angular sterilisation as applied, for example, in Met Office radars.

13.5 BASELINE CONDITIONS AND POTENTIAL EFFECTS

The Development is located in Class G airspace (the least regulated). RAF Lossiemouth, which has a Primary Surveillance Radar (PSR) and Secondary Surveillance Radar (SSR), is located 19 km to the northwest of the Site.

The MOD have an Air Defence radar at Remote Radar Head (RRH) Buchan, 83 km to the east of the Development. There are no other MOD aviation facilities within the accepted consultation distances.

The UK Met Office do not have any radars within consultation distance.

Inverness Airport is approximately 50 km to the west of the Development and has both a PSR and a wind farm mitigation TERMA radar.

NATS En Route Ltd (NERL) have radars at Alanshill and Perwinnes near Aberdeen which provides radar coverage over the area of the Development.

There is a glider site at Easterton, approximately 7 km to the west of the Development.

This section describes the potential effects on aviation which could result from the construction, operation and decommissioning of a wind farm. Inclusion here does not imply that they would occur, or be significant at the Development, only that they have been considered. Mitigation measures to reduce potential effects are described in Section 13.6 (Mitigation) with an assessment of residual effects, i.e. those remaining after the implementation of mitigation, provided in Section 13.7 (Residual Effects).

13.5.1 Study Area

The aviation study area and assessment has been determined by, and is dependent on, the maximum operating ranges of each of the radar systems scoped into the assessment. The operational range of the radar system is dependent on the function of the radar, the operational requirement of the radar and on the type of radar used. The ranges of those

radars and, subsequently, the topic-specific study area will vary depending on the technical specification of each radar system and, possibly, between different installations of the same system. The same factors apply to other aviation infrastructure (radios/beacons).

13.5.2 Significance criteria

The effects of turbines on either civil or military aviation safeguarding fall into two categories:

- Effects on an aerodrome and the associated safeguarded surfaces which surround it, i.e., the presence of structures and obstacles that could potentially cause physical harm through risk of collision or lead to an increase in instrument approach minima; and
- Effects on the CNS systems used enable the provision of air traffic control terminal and “en route” services and air defence.

In order to assess the effect that wind farms have on aviation operations it is necessary to undertake an assessment of the potential technical effects on CNS systems and to then determine if the technical effect would lead to a significant effect on operations or flight safety. There is no standard or agreed method of determining the extent on effect within aviation. The fact that a wind farm might affect the performance of a radar system for example, does not always lead to the conclusion that there will be a significant effect. This is due to the fact that, whilst technical effects on CNS systems are simple to identify and evaluate, operational and flight safety effects can be subjective and are often challenged. Therefore, any anticipated impact upon aviation stakeholders which results in restricted operations will be considered to be of significance but it is down to the affected stakeholder as to whether any effect is significant on their operations or not. The guidance laid down in CAP 764 encourages a dialogue between the developer and aviation stakeholders to agree what effect if any there will be on operations and then to agree mitigation if that is feasible.

13.5.3 Desk Study

An assessment of any potential aviation effects of the Development was undertaken in accordance with the guidance and methodology described in 13.3. The location of the Development in relation to aviation facilities is shown in TA A13.1.

13.5.4 RAF Lossiemouth Primary Surveillance Radar

Radar modelling was undertaken to calculate the radar line of sight (RLOS) of the Lossiemouth radar at each of the turbine locations. The results varied across the site ranging between ground level and 87 metres (285 ft) above ground level (agl). These figures show that the turbines will be visible to the RAF Lossiemouth radar.

13.5.5 RAF Buchan

Radar modelling (TA A13.1) was undertaken to calculate the RLOS of the Buchan air defence radar at each of the turbine locations. The results varied across the site ranging between 274 metres (898 ft) agl and 388 metres (1272 ft) agl. These figures show that the turbines will not be visible to the Buchan radar.

13.5.6 NATS Radars

Radar modelling (TA A13.1) was undertaken to calculate the RLOS of the Perwinnes radar at each of the turbine locations. The results varied across the site ranging between 645 metres (2116 ft) agl to 760 metres (2493 ft) agl. These figures show that the turbines will not be visible to the Perwinnes radar.

13.5.7 HIAL – Inverness Airport

Radar modelling (TA A13.1) was undertaken to calculate the RLOS of the Primary Surveillance Radar and TERMA wind turbine mitigation radar at each of the turbine locations. The results varied across the site ranging between 165 metres (541 ft) agl to 271 metres (889 ft) agl for the PSR and between 196 metres (643 ft) agl to 265 metres (945 ft) agl for the TERMA. There will be turbine visibility between the radar and the turbines.

The Development is approximately 50 km to the east of Inverness Airport and will be clear of the new controlled airspace to be implemented surrounding the airport. The Cyrrus assessment has determined that there can be no effects on the IFPs serving the Airport.

13.5.8 Unlicensed Aerodromes in the Area

There is one small unlicensed aerodrome in the area at Easterton, c. 5.5 km west of the Development site, which is well beyond the consultation distance of 3 km for an airfield with a runway length of the published distance.

13.5.9 Air Safety and Aviation Lighting

As noted in Table 13.1, in the interests of air safety, aviation safety lighting is required on structured over 150 m in accordance with Article 219 of the Air Navigation Order.

13.6 REQUIREMENTS FOR MITIGATION

13.6.1 Construction

There is a well-established procedure (in CAP 1096, as listed in section 13.2) for the need for lighting and for dissemination of information relating to construction crane operations and considered essential for the safety of flying operations, both civil and military, to allow such aviation operations to be planned and to continue accordingly.

13.6.2 Operation

13.6.2.1 RAF Lossiemouth Primary Surveillance Radar

Effects on the radar at RAF Lossiemouth will require mitigation and this may be possible within the Wind Farm Filter algorithms within the Thales radar. As noted in Table 13.1, it will be essential to maintain a dialogue with the MOD as this matter is likely to be on-going for some time.

A suitable worded Suspensive Planning Condition will be required on a mitigation scheme to address the effects on the radar at RAF Lossiemouth and the aviation operations which are dependent on that radar. The radar mitigation scheme will only be required during the operational phase of the Development.

13.6.2.2 Air Safety and Aviation Lighting

An aviation light assessment has been submitted to and agreed by the CAA (see TA A13.3).

13.6.3 Decommissioning

There is a well-established procedure (in CAP 1096, as listed in section 13.2) for the need for lighting and for dissemination of information relating to decommissioning and crane operations and considered essential for the safety of flying operations, both civil and military, to allow such aviation operations to be planned and to continue accordingly.

13.7 RESIDUAL EFFECTS

The residual effect of the Development in relation to the RAF Lossiemouth radar is likely to be minimal, if any, once the radar mitigation scheme is installed and set to work.

The proposed aviation lighting scheme has been accepted by the CAA as being effective, as set out in TA A13.3, and hence no residual effects on air safety are anticipated.

13.8 CUMULATIVE ASSESSMENT

It is not possible to assess the cumulative impact of the Development with other wind farms on the operation of a classified system. The MOD will assess any cumulative effect and determine its acceptability after radar mitigation has been applied.

13.9 SUMMARY

The Development has been assessed by taking into account the guidance laid down in CAP 764 and other aviation regulations. Radar modelling has been undertaken which demonstrates that the turbines will be visible to the Inverness radars and that at RAF

Lossiemouth. Given the location 50 km to the east of Inverness there should be no effects on civil aviation operations although the turbines will need to be fitted with aviation lighting. On the military side, the only affected system will be the radar at RAF Lossiemouth, 19 km to the northwest of the Development. It will be necessary to agree a mitigation scheme with the MOD.

13.10 STATEMENT OF SIGNIFICANCE

Subject to a satisfactory mitigation scheme being agreed with the MOD, the Development would have no residual significant effects on aviation interests and radar systems.