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Figure 14.1: Aviation Study Area

Introduction

- 14.1 This Chapter assesses the potential for the Proposed Development to affect aviation Communications, Navigational and Surveillance (CNS) infrastructure. The study has included a review of the location, technical characteristics and operational activities and aviation facilities in the area and an examination of the potential effects of the Proposed Development.
- 14.2 The potential effects of wind turbines on aviation operations and infrastructure have been widely publicised. There are two main likely scenarios that may lead to an objection from aviation stakeholders:
- wind turbines can present as a physical obstruction at, or close, to an aerodrome and other aviation activities such as civil and military low flying operations; and
 - impacts on aviation CNS systems and the provision of a radar-based Air Traffic Service (ATS). Un-demanded returns from wind turbines presenting as radar clutter on radar displays can affect the Air Traffic Control Officer's (ATCO) ability to differentiate between real aircraft and those false returns resulting from the detection of wind turbines. Furthermore, the presence of multiple false targets in close proximity can lead to the generation of false radar tracks creating further difficulty in identifying the true aircraft position.
- The main concern is one of any potential effect on aviation safety and, if left unmitigated, those effects will persist for the lifetime of the Proposed Development.
- 14.3 This assessment considers whether the Proposed 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 (NATS) 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 (ADR), Danger Areas and Ranges and low flying operations.

Legislation, Guidance and Policy

- 14.4 All national and development plan policies and other considerations of relevance to the Proposed Development are outlined in **Chapter 4: Renewable Energy and Planning Policy**.
- 14.5 Of specific relevance to the technical assessments provided in this chapter, the Scottish National Planning Framework (NPF4, 2023) notes that considerations in the determination of applications for energy infrastructure developments are likely to include "*impacts on aviation and defence interests....*" (Policy 11, paragraph e.(iv)).
- 14.6 The Scottish Government's advice regarding onshore wind turbines includes guidance regarding potential impacts on aviation safeguarding and the need for civil and military aviation stakeholders to be consulted regarding proposed wind energy developments.
- 14.7 This assessment also takes into account the additional aviation consultation, regulatory, safeguarding and operational requirements as laid down in a number of publications and regulations.

Scope and Consultation

- 14.8 Taken collectively, the guidance sources establish the distances from various types of airfields where consultation should take place. These distances include;
- airfield with a surveillance radar – 30km;
 - non radar licensed aerodrome with a runway of more than 1,100m – 17km;
 - non radar licensed aerodrome with a runway of less than 1,100m – 5km;
 - 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 – 4km;
 - unlicensed aerodromes with runways of less than 800 metres – 3km;
 - gliding sites – 10km; and
 - other aviation activity such as parachute sites and microlight sites within 3km – in such instances developers are referred to appropriate organisations.
- 14.9 Civil Aviation Publication (CAP) 764 (Policy and Guidelines on Wind Turbines) 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.
- 14.10 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 Proposed 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.
- 14.11 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. The maximum study area has, therefore, been informed by the operational ranges of all of the NATS radars that have the capability of surveilling the airspace at the wind farm location. Taken collectively with civil airport radars and military ATC and ADR radars, the radar types and ranges have determined the maximum study area.

Table 14-1: Scoping Responses

Consultee and Date	Issue Raised	Response / Action Taken
Defence Infrastructure Organisation 06 June 2025	Low Flying within Tactical Training Area 20T DIO considered that the addition of turbines in this location had the potential to introduce a physical obstruction to low flying aircraft operating in the area.	Aviation Lighting Scheme submitted. The lighting assessment was approved by the Civil Aviation Authority (CAA), 16 February 2026, and, subsequently, accepted by the MoD as addressing their low flying concerns (DIO email 19 February 2026).
NATS 25 April 2025	No Objection	N/A
Glasgow Airport (undated email)	No comment to make and no further consultation needed.	N/A
Glasgow Prestwick Airport (undated email)	No Objection	N/A
Edinburgh Airport 12 May 2025	No Objection	N/A

Effects Assessed in Full

- 14.12 The complete spectrum of aviation operations facilities, and any potential for effects are assessed in full, including radar line of sight.

Effects Scoped Out

- 14.13 The MoD did not object on any potential radar line of sight to any military ATC radars in the area and these facilities were scoped out from further consideration.
- 14.14 Radar modelling showed that there were no MoD ADRs that would be affected by the Proposed Development and these were scoped out from further consideration.
- 14.15 Radar modelling demonstrated that neither of the main NATS radars covering the area would be affected by the Proposed Development. NATS responded at Scoping that the Proposed Development did not conflict with any of their safeguarded and these radars have been scoped out from further consideration.
- 14.16 The closest Met Office radar is at Holehead, north of Glasgow and well beyond the Met Office's 20km safeguarding distance. Met Office radars were scoped out from further consideration.
- 14.17 As assessment of the documentation showed that there are no radar licensed airports within the specified consultation distance, as detailed in 14.8 above, and these were scoped out from further consideration.
- 14.18 As assessment of the documentation showed that there are no non-radar licensed airfields within the specified consultation distance, as detailed in 14.8 above, and these were scoped out from further consideration.
- 14.19 As assessment of the documentation showed that there are no unlicensed airfields, hang-gliding sites or glider sites within the specified consultation distance, as detailed in 14.8 above, and these were scoped out from further consideration (although it should be noted

that not all private airstrips are listed in documents, or on charts, and that these can be established at very short notice).

Approach and Methods

- 14.20 The line of sight (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 wind turbines, relative to nearby aviation stakeholders, can be assessed.
- 14.21 The receptors selected as relevant to the assessment of effects, including radar, were based upon an initial desktop screening exercise and reflect the relevant guidance and regulation. Each receptor has been considered and scoped in or out on the basis of effect–receptor pathway, professional knowledge, data confidence and the temporal and spatial scales involved. There are no limitations in the completion of the assessment, however line of sight conclusions are based on theoretical modelling results.
- 14.22 Radar modelling has been undertaken using the “RView” system 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 four metres. The results are verified using the Shuttle Radar Topography Mission (SRTM) dataset, a separate smoothed digital terrain model with data spacing of three arc seconds. By using two separate and independently generated digital terrain models, anomalies are identified and consistent results assured.

Study Area

- 14.23 In addition to the requirements of the extant legislation detailed at paragraph 14.8, the study area was determined by the maximum range of any radar that had the subsequent capability of surveilling the airspace above the Proposed Development.

Desk Based Research and Data Sources

- 14.24 In addition to our extensive data base the following aviation documents were used during the assessment;
- CAP 670 Air Traffic Services Safety Requirements;
 - CAP 764 Policy and Guidelines on Wind Turbines;
 - 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;
 - 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.

Assessment Methods

- 14.25 This section provides an outline description of the methodology and significance criteria used to assess any effects that the Proposed Development would have on aviation operations in the area.
- 14.26 In assessing the significance of the effects from the Proposed Development on aviation operations an analysis was completed which involved a systematic review of the radar modelling results, aviation charts, an extensive aviation infrastructure database and regulatory and guidance available. The assessment identified all potential aviation stakeholders, the location of their operations and procedures relative to the Proposed Development. It then considered the possible options that could mitigate the effect on the operations of the identified aviation stakeholders, if required.
- 14.27 The effects of the Proposed Development on air traffic control radars were evaluated by determining whether the wind turbines would be within line of sight of any such radar facilities and whether the Site is in an area of operational importance to those radar operators. Potential effects on other aviation interests were evaluated by considering the consultation responses from the CAA and MoD in the context of the likelihood of identified aviation operators using the airspace in the vicinity of the Proposed Development and the requirements for obstacle clearance.
- 14.28 The general approach to wind farm development is to avoid effects on infrastructure where possible, and to find appropriate technical mitigation solutions where this cannot be achieved. These solutions should be agreed between the developer and the infrastructure owner/operator, and discussions will often continue through the planning process. On implementation of an appropriate technical solution, wind farm developments will have a negligible effect or no effect on existing infrastructure. Following this approach, it is inappropriate to apply significance criteria to these effects, as the mitigated effect will be either no effect, or a negligible effect, which should be deemed to be acceptable to the relevant infrastructure operator.

Assumptions, Limitations and Confidence

- 14.29 There are no limitations in the completion of the assessment, however line of sight conclusions are based on theoretical modelling results.

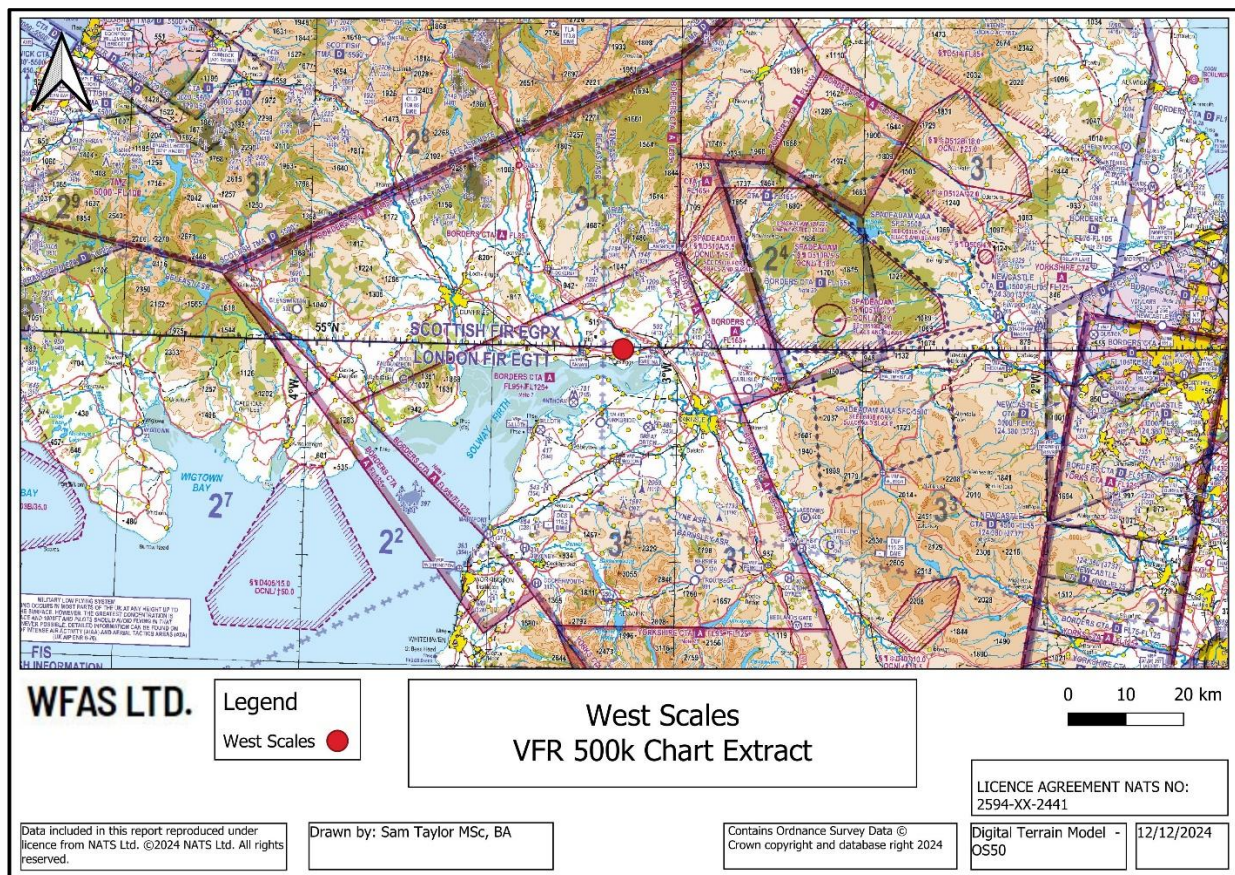
Baseline Conditions

- 14.30 Identification of baseline aviation facilities was conducted using our extensive database of aviation infrastructure in the UK and the following information sources and responses from consultees;
- the UK Aeronautical Information Publication;
 - the Ministry of Defence list of safeguarded sites;

- National Air Traffic Services safeguarding maps.

- 14.31 In aviation considerations, airspace over the UK is classified in accordance with International Civil Aviation Organisation (ICAO) standards from A to G (there is no airspace designated as Class B or Class F in UK airspace). Airspace Classes A, C, D and E are variants of Controlled Airspace (CAS) in which generically aircraft require an ATC clearance to operate within. Class G Airspace is airspace in which aircraft can operate without any clearance required or being in contact with ATC.
- 14.32 **Figure 14.1** illustrates the aviation and airspace infrastructure in the vicinity of the Site. The Proposed Development is located in Class G airspace, in an area that is utilised by both military and civil aviation activity but is also within the coverage range of the both civil and military radars. In this Class G unregulated airspace, whilst it is advisable for aircraft to be in receipt of an ATC service, it is not a regulatory requirement and aircraft can operate in this area autonomously under the visual flight rules (VFR).

Figure 14.1: West Scales Airspace Environment (CAA 1:500,000 chart extract)



Cumulative Situation

- 14.33 The only aviation effect will be the requirement for aviation lighting which will conform with both civil and military regulations. When implemented there should be no operational impact from the proposed development and, therefore, no aviation effects.

Assessment of Effects

- 14.34 In order to assess the effect that wind turbines 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. The fact that wind turbines might affect the performance of a radar system for example, does not always lead to the conclusion that there will be a significant effect. 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.
- 14.35 To determine the potential effects of the Proposed Development on aviation operations, the sensitivity of a receptor was considered in relation to the magnitude of effect. Significance criteria for aviation impacts are typically difficult to establish; there is no standard definition, and they are not strictly based on the sensitivity of the receptor or magnitude of change but on whether the industry regulations for technical safeguarding, safe obstacle avoidance or radar separation (from radar clutter) can be maintained in the presence of wind turbines. 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.
- 14.36 In this sense aviation does not conform to normal EIA significance assessment techniques or criterion.

Potential Construction Effects

- 14.37 The fact that any tall object can represent a vertical obstacle to flight and, potentially, pose a flight safety risk is self-evident. Throughout the construction phase, and up to including any testing and subsequent commissioning of the Proposed Development, there will be additional vertical obstacles in the form of cranes and static turbines as they are added.
- 14.38 During construction, and prior to testing/commissioning, the wind turbine blades will not be rotating; there will be no prospect of any wind turbines, either assembled or being assembled, being detected by any radar and presented on to controllers' radar display screens on any radar. On this basis, there will be no likely significant effects on radar operations during the construction phase.
- 14.39 There is one potentially significant effect on aviation during the construction phase of the Proposed Development: visual flight operations, including military low flying.
- 14.40 Each vertical object can represent an obstacle to flight depending on location, such as close to airports and airfields or as a potential obstruction to en-route flying across country. During construction of a wind farm, the operation of cranes and the actual turbines, as they are added, could be considered as a hazard to navigation. These effects become heightened when considered against military low flying, day and night. Depending on their position in relation to airports/airfields the magnitude of the effect of turbines as a vertical obstruction to aircraft can be significant when assessed against the flight profiles of civil and military aircraft in the area.
- 14.41 To facilitate safe flight, day or night, there are regulations governing the procedures that must be followed to ensure the timely dissemination of information regarding the construction of anemometer masts and wind turbines. Information regarding any such construction must be passed to the Defence Geographical Centre (DGC) and the General Aviation Awareness Council (GAAC) in advance of the commencement of turbine construction and then be updated regarding location, height and lighting type. Information

will then be promulgated within the civil UK Integrated Aeronautical Information Package (UK IAIP), the main resource for information for all of the UK airspace, as well as the Military Aeronautical Information Publications. Furthermore, the guidance on the use of cranes is contained within CAP 1096. Essentially, cranes are considered as another tall object but are subject to separate requirements due to the fact that they can move. Notification of the erection and operation of any crane is to be made to the CAA, in advance of the commencement of any construction and before any crane erection begins, detailing position, height, and required lighting etc. With this mitigation applied, the potential effects of construction activities on aviation receptors would be appropriately managed, and no likely significant effects are predicted during the construction phase. Potential Operational Effects

- 14.42 The Proposed Development is located within an MoD low flying Tactical Training Area and, therefore, was subject to an expression of 'concern' by the MoD (see **Table 14-1: Scoping Responses**), in order to ensure that Infra-Red lighting is applied. An Aviation Lighting Impact Assessment has been undertaken and has been approved by the CAA and the MoD as addressing their concern on Low Flying; it accompanies this Chapter as **Technical Appendix 14.1**.
- 14.43 The mitigation of the approved aviation lighting scheme outlined in **Technical Appendix 14.1: Aviation Lighting Impact Assessment**, would result in the Proposed Development having **Negligible and not significant** operational effects, and therefore be acceptable (as they have already confirmed and with the approval included within Technical Appendix 14.1) to the CAA and MoD.

Potential Cumulative Effects

- 14.44 Cumulative aviation effects can occur where a number of wind farm developments all show on a specific radar and where the overall ability of the air traffic control service provider, or MoD Air Defence System, to maintain a surveillance and control service is likely to suffer additional operational and technical effects.
- 14.45 There are no such notified radar effects resulting from the Proposed Development, and the Proposed Development will not contribute to any cumulative effects. On this basis, no likely significant cumulative effects are predicted. Further Survey Requirements and Monitoring
- 14.46 There is no further surveying or monitoring required for aviation.
- 14.47 As a consequence of the implementation of an agreed lighting scheme, and which has been approved by both the CAA and MoD, no aviation effects are anticipated as a result of the Proposed Development. On this basis, **no likely significant effects are predicted** as a result of the Proposed Development.

References

- A. CAP 670 Air Traffic Services Safety Requirements, Issue 3, dated 07 June 2019;
- B. CAP 764 Policy and Guidelines on Wind Turbines, Version 7, dated 17 Dec 2025;
- C. CAP 393 The Air Navigation Order 2016 and Regulation, Version 6, dated 12 Feb 2021;
- D. CAP 168 Licensing of Aerodromes, Version 12, (corr) Jan 2022;

- E. CAP 774 UK Flight Information Services, Version 4, Dec 2021;
- F. CAP 738 Safeguarding of Aerodromes, Version 3, Oct 2020;
- G. CAP 793 Safe Operating Practices at Unlicensed Aerodromes, Ed 1, Jul 2010;
- H. CAP 493 Manual of Air Traffic Services Part 1, Version 12, Sep 2025;
- I. CAP 1096 Guidance to Crane Users on aviation lighting and notification, Ed 2.2, Apr 2021;
- J. Military Aviation Authority Traffic Management (3000 series) Regulatory Articles;
- K. Military Aviation Authority Regulatory Article 2330 (Low Flying);
- L. UK Military Aeronautical Information Publication (MIL AIP);
- M. UK Aeronautical Information Publications (AIP); and
- N. CAA 1:250,000 and 1:500,000 VFR Charts

