

13. Aviation

13.1 Introduction

- 13.1.1 This chapter of the Environmental Impact Assessment Report (EIA Report) considers the potential effects of the Proposed Development on aviation. Specifically, this chapter considers the potential effect of the Proposed Development during the construction, operations and maintenance, and decommissioning phases.
- 13.1.2 This chapter has been written by Osprey Consulting Services Ltd (Osprey), with the assessment undertaken with specific reference to the relevant legislation and guidance and draws upon information contained within **Volume 3 Technical Appendices** of the EIA Report, which contains:
- **Technical Appendix 13.1:** Radar Line of Sight (RLoS) Report (Osprey, 2025), detailing Study Area Primary Surveillance Radar (PSR) theoretical coverage and visibility of the Proposed Development.
 - **Technical Appendix 13.2:** Safeguarding Assessment: Very High Frequency (VHF) Carrier to Interference and Intervisibility (C/I) Assessment (Osprey, 2025) detailing Communication and Navigation systems of GPA.
- 13.1.3 While the positions of T2 and T13 have changed in the layout presented in this Revised EIA Report, all information in this chapter remains valid and the assessment has required no changes. This chapter is included in the Additional Information Revised EIA Report for completeness.

13.2 Legislation, Policy & Guidance

Legislation

- 13.2.1 The Civil Aviation Authority (CAA) Civil Aviation Publication (CAP) 393: The Air Navigation Order (ANO) (CAA, 2022) sets out the provisions of the ANO as amended together with the legislation 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 and is edited by the legal advisers' department of the CAA. CAP 393 also includes application of aviation obstruction lighting to turbines onshore in the United Kingdom (UK).

Planning Policy

- 13.2.2 The Planning Statement associated with this Section 36 application sets out the planning policy framework that is relevant to the EIA. This section considers the relevant aspects of National Planning Framework 4 (NPF4), Planning Advice Notes, the East Ayrshire Local Development Plan (LDP2) and Scottish Onshore Wind Policy Statement (2022), Chapter 6. Of relevance to the assessment presented within this chapter, regard has been had to the following policy:
- Planning Circular 2/03



Guidance

13.2.3 Recognisance has been taken of the following CAA guidance:

- International Civil Aviation Authority (ICAO), Document 8168 Ops/611 *Procedures for Air Navigation Services Aircraft Operations* (ICAO, 2018) describes operational procedures recommended for the guidance of flight operations personnel. It illustrates the need for operational personnel including flight crew to adhere strictly to published procedures to achieve and maintain an acceptable level of safety in operations
- ICAO Annex 14 *Aerodromes Design and Operations* contains Standards and Recommended Procedures (SARPs) (ICAO, 2022)
- CAA CAP 032 *UK Aeronautical Information Publication* (CAA, 2024): Main resource for information and flight procedures at all licensed UK airports as well as airspace, en-route procedures, charts and other air navigation information
- CAA CAP 168 *Licensing of Aerodromes* (CAA, 2022): Sets out the standards required at UK national licensed aerodromes relating to management systems, operational procedures, physical characteristics, assessment and treatment of obstacles and visual aids
- CAA CAP 670 *Air Traffic Services Safety Requirements* (CAA, 2019): Provides an overview of the regulatory framework as well as requirements and guidance for Air Traffic Services, Communication, Navigation, Surveillance, Meteorological and Information and Alerting Systems, as well ATC unit staffing and duty hours
- CAA CAP 738: *Safeguarding of Aerodromes* (CAA, 2020)
- CAA CAP 764 *Policy and Guidelines on Wind Turbines* (CAA, 2016): 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
- CAA CAP 774: *The UK Flight Information Services* (CAA, 2021)
- CAA CAP 785B: *Implementation and Safeguarding of Instrument Flight Procedures (IFP) in the UK* (CAA, 2022b)
- CAA CAP 999: *Helicopter Search and Rescue (SAR) in the UK National Approval Guidance* (CAA, 2023b)
- The Military *MOD Aeronautical Information Publication (AIP)*, (MOD, 2024): Main resource for information and flight procedures at all military aerodromes as well as airspace, en-route procedures, charts and other air navigation information



13.3 Consultation

13.3.1 **Table 13.1**, below, summarises the consultation that has been undertaken to date with key consultees.

Table 13.1: Scoping Consultation Responses

Consultee	Scoping Opinion Comment	Response to Consultee	Further EIA Consultation
East Ayrshire Council	The Planning Authority would expect a detailed assessment of aviation impacts to accompany the application to ensure any potential impacts are fully assessed and any appropriate mitigation detailed. Early engagement with all relevant aviation bodies is advised. Risks associated with the flight path and turbines potentially causing physical obstructions on the approach to Glasgow Prestwick Airport will need to be fully discussed with the airport to ensure a site layout is designed which will not cause unacceptable impacts on the airport. This is of particular relevance given the adjacent land was subject to an application for a wind farm which has since been withdrawn as a result of aviation issues. It is noted there remains a live consent for a wind farm on that land for shorter turbines.	Aviation constraints were a major factor that was taken into consideration during the design of the Proposed Development. Consultation with aviation consultees, including Glasgow Prestwick Airport, are ongoing. Potential impacts of the Proposed Development on aviation and radar are discussed and assessed in this chapter. The consented wind farm (subsequently withdrawn) on land adjacent to the Proposed Development was acquired by the Applicant in order to enable the addition of the 4 additional turbines as discussed in Chapter 3 (Layout C). The Applicant confirms that while the mentioned consent for the adjacent wind farm may still be live, the Applicant will not construct that consented scheme.	N/A
Glasgow Airport	The site is outwith the obstacle limitation surfaces and radar safeguarding area for Glasgow Airport.	Noted.	Glasgow International Airport was consulted again once the final coordinates of the turbines were available. A response was still pending at the time of writing. Additional meeting requested on 18 Feb and 12 Mar 2025 – awaiting response.
	It is within the instrument flight procedures safeguarding areas and may impact. Detailed assessments will be required. Our position with regard to this proposal will only be confirmed once the turbine details are finalized and we have been consulted on a full planning application. At that time we will carry out a full safeguarding impact assessment and will	Noted.	



Consultee	Scoping Opinion Comment	Response to Consultee	Further EIA Consultation
	consider our position in light of, inter alia, operational impact and cumulative effects.		
Glasgow Prestwick Airport	<p>The Initial Safeguarding Assessment confirms that the proposed development lies within the lateral and vertical limits of Glasgow Prestwick Airport's Controlled Airspace (CAS), and is in an area where the Airport's ATC regularly provide an air traffic control service.</p> <p>Other issues identified in the assessment include: Direct radar line of sight between the Primary Surveillance Radar(s) at GPA and the turbines. Potential disruption to multiple Instrument Flight Procedures and minimum safe altitudes due to the site's location and proximity to GPAs controlled airspace, in particular the Instrument Flight Procedures for Runway 30. Potential disruption to the Airport's Instrument Landing System (ILS) for Runway 30. Potential loss of VHF Ground to Air communications in the vicinity of the windfarm as a consequence of the large turbines and proximity to other developments in the area. Increasing cumulative impact due to the proliferation of turbines in the area to the South East of the Airport.</p>	Noted.	<p>Further consultation of Glasgow Prestwick Airport was undertaken. The following will be required by GPA:</p> <ul style="list-style-type: none"> CAA VHF C/I Assessment Technical Appendix 13.2 Meeting 27 Feb 2025 - No expectation of a requirement for visual aviation obstacle lighting
MOD	In this case the development falls within Low Flying Area 16 (LFA 16), an area within which fixed wing aircraft may operate as low as 250 feet or 76.2 metres above ground level to conduct low level flight training. The addition of turbines in this location has the potential to introduce a physical obstruction to low flying aircraft operating in	The Proposed Development falls within the Glasgow Prestwick Airport Control Zone and is therefore outside of the MOD low level flight training area. This will be discussed in Chapter 13 of the EIA Report.	<ul style="list-style-type: none"> The MOD was consulted again once the final coordinates of the turbines were available. A response was still pending at



Consultee	Scoping Opinion Comment	Response to Consultee	Further EIA Consultation
	the area. To address the impact upon low flying given the location and scale of the development, the MOD would require that conditions are added to any consent issued requiring that the development is fitted with aviation safety lighting and that sufficient data is submitted to ensure that structures can be accurately charted to allow deconfliction. The MOD will require the submission, approval, and implementation of an aviation safety lighting specification that details the installation of MOD accredited aviation safety lighting, as a minimum MOD would require that the cardinal turbines are fitted with both 25cd visible and infra-red (IR) COMBI lighting.	As the turbines will be less than 149.9 m and will not be located within the MOD low level flight training area, they will be unlikely to be required to be lit for MOD. However, this will be clarified through further consultation with the MOD.	the time of writing. <ul style="list-style-type: none"> Meeting 13 Mar 2025 – Confirming that IR lighting on the cardinal turbines for aviation safety would be sufficient.
NATS Safeguarding	Proposed development DOES conflict with our safeguarding criteria - Predicted Impact on Lowther RADAR: terrain screening available will not adequately attenuate the signal, and therefore this development is likely to cause false primary plots to be generated. A reduction in the RADAR's probability of detection, for real aircraft, is also anticipated. Prestwick Centre ATC - unacceptable to operations. NATS (En Route) plc objects to the proposal.	Noted. The potential to impact on radar is assessed in this chapter.	<ul style="list-style-type: none"> NATS was consulted again once the final coordinates of the turbines were available. A response was still pending at the time of writing. Meeting 3 Apr 2025 – NATS Customer/Client Operations Confirming the requirement for aa agreed Mitigation Scheme Contract (MSC).

13.3.2 In response to the Scottish Ministers' consultation regarding the May 2025 Application, Glasgow Prestwick Airport (19th June 2025) issued a letter placing a holding objection until such time as all aviation issues are resolved to the satisfaction of the Airport and Developer. However, it noted that the Applicant was already fully engaged with the Airport regarding the aviation safety issues discussed



and good progress was being made. The Applicant and the Airport were still in discussions at the time of submission of the Additional Information.

13.4 Assessment Methods & Significance Criteria

Study Area

13.4.1 The assessment aims to exhaustively identify all potential issues and the associated stakeholders affected by the Proposed Development. This involves considering all military and civil aerodromes in the wider area out to 60 km, all radar installations out to the limit of their range, all navigational aids and air-ground-air communications stations to the limit of their safeguarding and low flying activities in the airspace above and around the site (**Figure 13.1**). The Study Area has been defined on the basis of established guidance; the CAA CAP 764 *Policy and Guidelines on Wind Turbines* (CAA, 2016), consultation zones and criteria. Whilst not definitive, CAP 764 provides criteria for assessing whether any turbine development might have an effect on aviation related operations. Consideration of the potential for the Proposed Development turbines to impact on aviation receptors has been undertaken in accordance with the standard consultation distances stated in CAP 764 including the following:

- Airspace coincident with published IFPs to take into account an aerodrome's requirement to protect its IFPs is also considered.

13.4.2 The cumulative aviation Study Area is the same.

Desk Study

13.4.3 Information on aviation and radar within the aviation and radar study area was collected through a detailed desktop review of existing studies and datasets. The following additional data sources were used in the desk study:

- CAA Visual Flight Rules (VFR) Charts (CAA / NATS, 2024);
- **Technical Appendix 13.1:** RLoS Report (Osprey, 2025), detailing Study Area PSR theoretical coverage and visibility of the Proposed Development; and
- **Technical Appendix 13.2:** Very High Frequency (VHF) Carrier to Interference and Intervisibility (C/I) Assessment (Osprey, 2025) detailing Communication and Navigation systems of GPA

Radar LoS

13.4.4 Radar detectable turbines can be a significant cause of radar false plots, or unwanted returns (clutter), as the rotating blades can trigger the Doppler threshold (e.g. minimum shift in signal frequency) of the Radar Data Processor (RDP) and therefore might be interpreted as aircraft targets. Additionally, the rotation of the turbine blades provides an indication to the radar system that the target acquired is moving and thus defeating Doppler processing techniques. This issue can be further compounded by a large number of turbines located together (such as a wind



farm) which leads to a cumulative effect over a greater volume of airspace with higher densities of radar clutter produced.

13.4.5 Generally, the larger the turbine rotor diameter, the larger its Radar Cross Section (RCS) will be to the radar, thus resulting in more energy being reflected and an increased chance of it creating clutter. This clutter will be processed by the radar and presented to an air traffic controller on the Radar Data Display Screens (RDDS). False plots, clutter and reduced radar sensitivity may reduce the effectiveness of radar to an unacceptable level and compromise the provision of a safe radar service to participating aircraft and detection of aircraft targets. In general, this may lead to:

- Twinkling appearance/blade flash effect can distract the air traffic controller from their primary task;
- Masking of real aircraft targets caused by increased clutter being displayed on the RDDS;
- Increase in unwanted targets or false aircraft tracks;
- Receiver saturation;
- Target desensitisation causing loss of valid aircraft targets that are of a small RCS;
- Shadowing behind the turbine caused by physical obstruction (blocking of radar transmitted signal);
- Degradation of target processing capability and processing overload; and
- Degradation of tracking capabilities including track seduction (real aircraft returns are relocated from their true return location as the radar attempts to update an aircraft track using the false return).

13.4.6 Without specific turbine mitigation processing capabilities, radar cannot distinguish between returns from wind turbines (false returns, or clutter) and those from aircraft. Air traffic controllers are required to assume that actual aircraft targets could be lost over the location of a wind farm; furthermore, identification of aircraft under control could be lost or interrupted. It is mainly for the above reasons that aviation radar system operators object to wind farm developments that are within radar LoS to radar systems.

13.4.7 Osprey utilised the Advanced Topographic Development and Imaging (ATDI) ICS LT (Version 23.8.8 x64) tool to model the terrain elevation profile between the identified PSR systems and the Proposed Development. Otherwise known as a point-to-point radar LoS analysis, the result is a graphical representation of the intervening terrain and the direct signal LoS (taking into account earth curvature and radar signal properties). This is a limited and theoretical desk-based radar modelling study which is frequently used in order to establish the potential for individual wind farm developments to create an effect to aviation radar. However, there are unpredictable levels of atmospheric signal diffraction and attenuation within a given radar environment that can influence the probability of a turbine being detected. The analysis is designed to give an indication of the theoretical likelihood



of a turbine being detected by the assessed radar system. The qualitative definitions utilised in the radar LoS assessment are defined in Table 13.2.

13.4.8 Potential radar detectability is described in **Technical Appendix 13.1**.

Table 13.2: Qualitative Definition of Radar LoS Assessment

Consultee	Consultation Response
Yes	The turbine is highly likely to be detected by the radar: direct LoS exists between the radar and the wind 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.

13.4.9 Radar detectability of turbines does not automatically provide justification for an objection from radar stakeholders. Other factors will determine the nature and severity of the operational impact on the receptor, including:

- The consideration of airspace structure and classification in the wind turbine vicinity;
- The operational significance of the airspace to the operator;
- The range of the development from the radar source;
- Aircraft traffic patterns and procedures; and
- The type of radar service provided to air traffic using the airspace.

Instrument Flight Procedures (IFP)

13.4.10 An Instrument Flight Procedure is a published procedure used by aircraft flying in accordance with the instrument flight rules which is designed to achieve and maintain an acceptable level of safety in operations and includes an instrument approach procedure, a standard instrument departure, a planned departure route and a standard instrument arrival.

13.4.11 The CAA states within CAP 764 that *“the CAA is responsible for being satisfied that a certificated or licensed aerodrome complies with the relevant requirements and is safe for use by civil aircraft, having regard in particular to the physical characteristics of the aerodrome and its surroundings. Aerodrome operators are required to have procedures for safeguarding, to monitor the changes in the obstacle environment, marking and lighting, and in human activities or land use on the aerodrome and in the areas around the aerodrome. In addition, a requirement is placed on the*



licensee to take all reasonable steps to ensure that the aerodrome and its surrounding airspace are safe at all times for use by aircraft”.

- 13.4.12 Large turbine developments, dependent on location and proximity to published airport IFP safeguarded areas might impact the safe operation of these published procedures.

Carrier to Interference (C/I)

- 13.4.13 The Carrier to Interference (C/I) ratio quantifies how much stronger the carrier, main system equipment signal is compared to the interference signal. A high C/I ratio indicates a clearer, more reliable communication channel, while a low ratio can signify potential issues with signal quality, leading to reduced performance in data transmission. The C/I ratio directly affects the quality and reliability of aeronautical communication and navigation systems. A higher C/I ratio indicates that the carrier signal is less affected by interference, leading to clearer and more reliable transmissions. This is especially important in environments with high levels of background noise.

- 13.4.14 The CAA states within CAP 670 that *“turbine interference prediction is a complex process which requires a detailed technical knowledge of radio propagation theory and the application of a defined prediction methodology. Prediction of turbine interference impacts above a threshold value will not automatically result in the rejection of a given development proposal. Technical impact (interference levels) and operational impacts are assessed separately. The type of operational usage and the geographic location and volume of affected airspace (Volume of Interest) will affect the level of operational impact and hence sensitivity to a particular development proposal.*

- 13.4.15 *The level of technical impact in any given scenario will vary considerably dependent upon a number of variables including but not limited to the following:*

- Size of turbine
- Rotation rate
- Number of turbines
- Development layout
- Adjacent developments (accumulated impact)
- Physical separation from the radio station
- Terrain profile
- Signal levels
- Transmitted frequency”

- 13.4.16 Large turbine developments, dependent on location and proximity to Communication, Navigation and Surveillance (CNS) systems safeguarded areas



may impact the safe operation of these systems. Potential impact on CNS is described in **Technical Appendices 13.2**.

Site Survey

- 13.4.17 No site-specific surveys have been undertaken to inform the EIA for aviation as sufficient aeronautical data exists in the public domain.

Assessment of Significance

- 13.4.18 The criteria for determining the significance of effects is a two-stage process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in **Chapter 4**.

- 13.4.19 The criteria for defining magnitude in this chapter are outlined in **Table 13.3**.

Table 13.3: Definition of Terms relating to the Magnitude of an Impact

Magnitude of Impact	Justification
High	Total loss of ability to carry on activities and/or impact is of extended spatial extent and/or long-term duration (i.e. total life of project) and/or frequency of repetition is continuous and/or effect is not reversible for project phase.
Medium	Loss or alteration to significant portions of key components of current activity and/or spatial extent of impact is moderate and/or medium-term duration (i.e. operational period) and/or frequency of repetition is medium to continuous and/or effect is not reversible for project phase.
Low	Minor shift away from baseline, leading to a reduction in level of activity that may be undertaken and/or spatial extent of impact is low and/or short to medium term duration (i.e. construction period) and/or frequency of repetition is low to continuous and/or effect is not reversible for project phase.
Negligible	Very slight change from baseline condition and/or spatial extent of impact is negligible and/or short-term duration (i.e. less than two years) and/or frequency of repetition is negligible to continuous and/or effect is reversible.

- 13.4.20 The criteria for defining sensitivity in this chapter are outlined in **Table 13.4**.

Table 13.4: Definition of Terms relating to the Sensitivity of the Receptor

Sensitivity	Justification
Very High	Receptor or the activities of the receptor, is of critical importance to the local, regional or national economy and/or the receptor or the activities of the receptor, is highly vulnerable to impacts that may arise from the project and/or recoverability is long term or not possible.
High	Receptor or the activities of the receptor, is of high value to the local, regional or national economy and/or the receptor or the activities of the receptor, is generally vulnerable to impacts that may arise from the project and/or recoverability is slow and/or costly.
Medium	Receptor or the activities of the receptor, is of moderate value to the local, regional or national economy and/or the receptor or the activities of the



Sensitivity	Justification
	receptor, is somewhat vulnerable to impacts that may arise from the project and/or has moderate to high levels of recoverability.
Low	Receptor or the activities of the receptor, is of low value to the local, regional or national economy and/or the receptor or the activities of the receptor, is not generally vulnerable to impacts that may arise from the 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.

13.4.21 The significance of the effect upon aviation and radar is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in **Table 13.5**. Where a range of significance of effect is presented in **Table 13.5**, the final assessment for each effect is based upon expert judgement.

13.4.22 For the purposes of this aviation assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of the EIA.

Table 13.5: Matrix used for the Assessment of the Significance of the Effect

Sensitivity of Receptor	Magnitude of Impact			
	High	Medium	Low	Negligible
Very High	Major	Major	Major or Moderate	Minor
High	Major	Major or Moderate	Moderate or Minor	Minor
Medium	Moderate or Major	Moderate	Minor	Minor or Negligible
Low	Moderate or Minor	Minor	Minor or Negligible	Negligible
Negligible	Minor	Minor or Negligible	Negligible	Negligible

Limitations, Difficulties and Uncertainties

13.4.23 The data used in this chapter is the most up to date publicly available information which can be obtained from the data sources as cited. Data has also been provided through consultation.

13.4.24 The results of the LoS and C/I analysis are considered to be conservative in the establishment of results and are provided in order to establish the worst-case possibility of impact to aviation stakeholders. Radar LoS results are theoretical in nature however, analysis is based on an industry standard for establishing the potential impact to aviation PSR systems from operational turbines and it is considered this will not have an implication for the conclusions of the assessment.

13.5 Baseline

Airspace and Air Traffic Services (ATS)

13.5.1 In aviation and airspace terms, the world is divided into Flight Information Regions (FIR) for the allocation of responsibility for the provision of Air Traffic Service (ATS)



to aircraft. The Proposed Development is located within the UK FIR. The UK CAA is the airspace regulator for the UK FIR.

Current Baseline

13.5.2 Airspace is classified as A to G in accordance with International Civil Aviation Organisation (ICAO) standards¹. Airspace Classes A to E are variants of CAS in which aircraft require an ATC clearance. Class G Airspace is designated as uncontrolled airspace in which aircraft can operate autonomously without any clearance required. Above and surrounding the Proposed Development, airspace is used by both military and civil registered aircraft. The Proposed Development sits within Class D (within the GPA CTR Avoidance Area where military tactical low flying training will not take place) and underneath Class C CAS (**Figure 13.2**).

- Class D CAS established from the surface up to 5,500ft above mean sea level (amsl) as part of the GPA CTR immediately surrounding the Proposed Development. Aircraft operating within this airspace must be in receipt of an ATS from GPA.
- Class D CAS established from 5,500 ft amsl up to Flight Level (FL) 195 forming the Scottish Terminal Control Area (TMA). Aircraft operating within this airspace must be in receipt of an ATS from NATS Prestwick Area Control Centre (ACC) or delegated to GPA or Glasgow Airport.
- Class C CAS established from FL 195 up to FL 245. All aircraft operating in this airspace must be in receipt of an ATS from NATS or Military controllers located at a NATS ACC, or Military Air Defence Controllers.
- Class C CAS established above FL 245. Again, all aircraft operating in this airspace must be in receipt of an ATS from NATS or Military controllers located at a NATS ACC, or Military Air Defence Controllers.

13.5.3 There are no Secondary Surveillance Radar (SSR) systems located within the CAA suggested radius where impact is expected (10 km). GPA ATC provide radar services in and around its CTR; additionally, NATS has a licence obligation to provide radar data to other remote aviation stakeholders (such as the Ministry of Defence (MOD)) to a high quality and performance standard for the benefit of UK aviation as a whole. Any potential impact that the Proposed Development might have on NERL radar systems must be considered both in terms of effect on the civilian en-route services and in the context of its remote users such as the MOD and airports.

Future Baseline

13.5.4 The likely evolution without implementation of the Proposed Development as far as airspace changes, including traffic density, can be qualitatively assessed. In the event that the Proposed Development does not come forward, no significant change to the present airspace construct, particularly the GPA CTR, or usage, in terms of

¹ There is no airspace designated as Class B or Class F in UK airspace.



aircraft movement density, above and around the Proposed Development area is expected.

13.6 Scope of the Assessment

Spatial Scope

13.6.1 The aviation scope exhaustively identifies all potential issues and the associated stakeholders affected by the Proposed Development. This involves considering all military and civil aerodromes in the wider area out to 60 km, all radar installations out to the limit of their range, all navigational aids and air-ground-air communications stations to the limit of their safeguarding and low flying activities in the airspace above and around the Proposed Development, including:

- Airspace coincident with published IFPs to take into account an aerodrome's requirement to protect its IFPs;
- Aerodrome radar to 75 km; and
- NATS en-route radar to 200 km.

13.6.2 There are three PSR sites (NATS Lowther Hill, NATS Great Dun Fell and GPA) located, and considered, within the Proposed Development aviation study area (and radar installations out to the limit of their range) following Scoping response. MOD Air Defence Radar (ADR) Remote Radar Heads (RRH) Buchan and Brizlee Wood, Aberdeen International Airport, Highlands and Islands Ltd, Glasgow International Airport and Edinburg Airport PSRs have been scoped out following Scoping response. There are no SSR systems located within 10 km of the Proposed Development (the CAA suggested radius here impact is expected); therefore, SSR is scoped out from further analysis.

Temporal Scope

13.6.3 This chapter considers the construction (in line with the Construction Programme in **Chapter 2**), operation and maintenance, and decommissioning phases. Impacted receptors would adjust / recover to the Proposed Development in the period from Application through to end of construction phase.

Receptors Requiring Assessment

13.6.4 In account of the scoping and consultation process, **Table 13.6** summarises the Receptors Scoped into this chapter and the potential effects considered.

Table 13.6: Receptors Scoped Into this Assessment

Receptor	Justification
GPA	<p>Scoping Response (30 May 2024) and EIA Scoping Opinion (refer to Technical Appendix 4.1).</p> <p>The Initial Safeguarding Assessment confirms that the proposed development lies within the lateral and vertical limits of GPA CAS, and in an area where the Airport's Air Traffic Control (ATC) provides an Air Traffic Service (ATS):</p> <ol style="list-style-type: none"> i. Direct radar line of sight between the Primary Surveillance Radar(s) at GPA and the turbines.



Receptor	Justification
	<p>ii. Potential disruption to multiple Instrument Flight Procedures and minimum safe altitudes due to the site's location and proximity to GPAs controlled airspace, in particular the Instrument Flight Procedures for Runway 30.</p> <p>iii. Potential disruption to the Airport's Instrument Landing System (ILS) for Runway 30.</p> <p>iv. Potential loss of VHF Ground to Air communications in the vicinity of the windfarm as a consequence of the large turbines and proximity to other developments in the area.</p> <p>v. Increasing cumulative impact due to the proliferation of turbines in the area to the south-east of the Airport.</p>
NATS	<p>Scoping Response (24 May 2024) and EIA Scoping Opinion (refer to Technical Appendix 4.1).</p> <p>Accordingly, NATS (En Route) plc objects to the proposal. The reasons for NATS's objection are a predicted impact on Lowther Hill PSR, the Proposed Development is likely to cause false primary plots to be generated and a reduction in the PSR's probability of detection; outlined in the TOPA SG37400 report.</p>
MOD	<p>Scoping Response (21 May 2024) and EIA Scoping Opinion (refer to Technical Appendix 4.1).</p> <p>The MOD has concerns with the proposal due to the potential impact to low flying aircraft operating in the development area.</p>
Glasgow International Airport	<p>Scoping Response (5 June 2024) and EIA Scoping Opinion (refer to Technical Appendix 4.1).</p> <p>It is within the IFP safeguarding areas and may impact. Detailed assessments will be required. "Our position with regard to this proposal will only be confirmed once the turbine details are finalized and we have been consulted on a full planning application".</p>

Environmental Measures Embedded into the Development Proposals

13.6.5 For the purposes of the EIA process, discussed in overarching general terms for the Proposed Development in **Chapter 4**, the term 'measures adopted as part of the project' is used to include the following measures (adapted from IEMA, 2016):

- Measures included as part of the project design. These include modifications to the location or design of the Proposed Development which are integrated into the application for consent. These measures are secured through the consent itself through the description of the development and the parameters secured in the Consent (referred to as primary mitigation in IEMA, 2016); and
- Measures required to meet legislative requirements, or actions that are generally standard practice used to manage commonly occurring environmental effects and are secured through consents (referred to as tertiary mitigation in IEMA, 2016).

13.6.6 A number of measures (primary and tertiary) have been adopted as part of the Proposed Development to reduce the potential for impacts on aviation and radar. These are outlined in **Table 13.7** below. As there is a commitment to implementing these measures, they are considered inherently part of the design of the Proposed Development and have therefore been considered in the assessment presented



below (i.e. the determination of magnitude and therefore significance assumes implementation of these measures).

Table 13.7: Measures Adopted as part of the Proposed Development

Measures Adopted as part of the Proposed Development	Justification	How the Measures will be Secured
Primary Measures: Measures included as part of the Proposed Development Design		
Development of, and adherence to, a Construction Environmental Management Plan (CEMP) which will be prepared in accordance with the layout principles.	The CEMP, including a final plan of the Proposed Development will be prepared to inform all receptors, as appropriate, but before construction commences.	Through the Scottish Government Energy Consents Unit (ECU).
Tertiary Measures: Measures Required to meet Legislative requirements, or Adopted Standard Industry Practice		
Lighting as required and/or determined necessary for aviation safety as agreed with GPA unless otherwise agreed with the Ministry of Defence (MOD) Defence Infrastructure Organisation (DIO) Safeguarding for the operational life of the Proposed Development.	In line with standard industry practice and in compliance with Article 222 of the ANO (CAP 393). Appropriate marking, lighting and aids to navigation will be employed during the construction, operational and decommissioning phases as appropriate to ensure the safety of all aviation stakeholders. Appropriate lighting will ensure the onshore structures are visible for aeronautical Search And Rescue (SAR) and emergency response procedures.	Aviation safety is secured through a requirement of the ECU.
Defence Geographic Centre (DGC) Notification - information regarding construction should be passed to the DGC at least 10 weeks in advance of the obstacle type(s) erection detailing position, height (tip of arc) and type of aviation lighting. Once reported, all will be included in the DGC Obstruction database and all that meet aviation chart inclusion criteria will be published for broader awareness.	In line with RenewableUK guidance.	In line with standard industry practice.
Defence Infrastructure Organisation Safeguarding (DIOS) Notification - notify DIOS of the following at least 14 days prior to the commencement of construction: <ul style="list-style-type: none">The date of the commencement of construction.The date any turbines are brought into use.	In line with standard industry practice.	Aviation safety is secured through a requirement of the ECU.



Measures Adopted as part of the Proposed Development	Justification	How the Measures will be Secured
<ul style="list-style-type: none"> The maximum height of any construction equipment to be used. The maximum heights of any turbine and meteorological mast to be constructed. The latitude and longitude of each turbine and meteorological mast to be constructed. The DIOS must be notified of any changes to the information supplied and of the completion of construction. 		
NATS Aeronautical Information Service (AIS) Notification - Appropriate information about the site construction and any associated lighting (where applicable), for example the height and temporary location of construction cranes, should be provided to the NATS AIS (for promulgation in applicable aviation publications including the UK Integrated Aeronautical Information Package (IAIP)).	In line with standard industry practice and in compliance with Article 222 of the ANO (CAP 393).	In line with standard industry practice.

- 13.6.7 Where significant effects have been identified, further mitigation measures (referred to as secondary mitigation in IEMA, 2016) have been identified to reduce the significance of effect to acceptable levels following the initial assessment. These are measures that could further prevent, reduce and, where possible, offset any adverse effects on the environment. These measures are set out, where relevant, below.

13.7 Assessment of Potential Effects

- 13.7.1 The impacts of the construction, operational, and decommissioning phases of the Proposed Development on aviation have been assessed and recorded in this Section.
- 13.7.2 A description of the potential effect on aviation receptors caused by each identified impact is given below.

Turbine Creation of Physical Obstacle to Aircraft Operations

- 13.7.3 The construction, operation and decommissioning of the Proposed Development turbines may lead to the creation of a physical obstacle to aircraft operations due to



turbine size, 149.9 metres (m) above ground level (agl) and number, represented by 20 turbines.

Construction Effects

Low flying operations

- 13.7.4 Turbine construction infrastructure agl could pose a physical obstruction to flight operations in the vicinity, and specifically to low flying operations. Construction infrastructure and erected turbines can be difficult to see from the air, particularly in poor meteorological conditions, leading to potential increased obstacle collision risk. Furthermore, during the construction phase, the presence and movement of associated infrastructure may present a potential obstacle collision risk to aircraft flight operations. The Proposed Development is entirely within CAS, the GPA CTR, a military low flying avoidance area, where aircraft require a GPA ATC clearance to operate.
- 13.7.5 A range of adopted measures, in the form of appropriate notification to aviation stakeholders, development of, and adherence to the CEMP, and lighting and marking to minimise effects to aviation flight operations would apply to the Proposed Development. These will comply with current guidelines where appropriate and be agreed with GPA and are outlined in **Table 13.7**.
- 13.7.6 The impact is predicted to be of regional spatial extent, short-term duration, intermittent, with low reversibility for the construction phase. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be **Low**.
- 13.7.7 Pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter; however, during flight, weather conditions or operational requirements may necessitate route adjustments. In Visual Meteorological Conditions (VMC), pilots are ultimately responsible for seeing and avoiding obstructions such as turbines and will be aware through notification procedures (**Table 13.7**) of the Proposed Development. Furthermore, when flying under Instrument Flight Rules (IFR) pilots will be under the control of ATC with an appropriate level of radar service and flying at an altitude which provides the required separation from obstacles below them.
- 13.7.8 The MOD DIO (EIA Scoping Opinion (**Technical Appendix 4.1**)) raised concerns on this issue; however, the Proposed Development is within an area (the GPA CTR) where military aircraft would require an approval to enter.
- 13.7.9 The stakeholders' ability to continue to conduct military and other low flying operations in the airspace is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be **Low**.

Instrument Flight Procedures (IFP)

- 13.7.10 Turbine construction infrastructure agl could likely pose a physical obstruction to flight operations in the vicinity, specifically to flight procedures. GPA states in its



Scoping response (30 May 2024) that there is “*Potential disruption to multiple Instrument Flight Procedures and Minimum Safe Altitudes (MSA....*”. Glasgow International Airport’s flight operations in the vicinity could also be affected.

- 13.7.11 The impact is predicted to be of regional spatial extent, short-term duration, intermittent and low reversibility for the construction phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **Medium**.
- 13.7.12 GPA has been consulted throughout the pre-application phase, as presented in **Table 13.1**. The Applicant is continuing to engage with GPA to provide an agreed route to mitigation and the Applicant has commissioned an IFP Mitigation Report to be provided to GPA.
- 13.7.13 The receptor is deemed to be of high vulnerability, low recoverability and high value. The sensitivity of the receptor is therefore, considered to be **High**.

Significance of the effects

- 13.7.14 Low Flying. Overall, the magnitude of the impact is deemed to be **Low**, and the sensitivity of the receptor is considered to be **Low**. The effect will, therefore, be of **Minor** adverse significance, which is *Not Significant* in EIA terms.
- 13.7.15 IFP. Overall, the magnitude of the impact is deemed to be **Medium**, and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be of **Major** adverse significance, which is *Significant* in EIA terms.

Operational Effects

Low flying operations

- 13.7.16 Turbines agl could pose a physical obstruction to flight operations in the vicinity, and specifically to low flying operations. Erected turbines can be difficult to see from the air, particularly in poor meteorological conditions, leading to potential increased obstacle collision risk. The Proposed Development is entirely within CAS, the GPA CTR, a military low flying avoidance area, where aircraft require a GPA ATC clearance to operate.
- 13.7.17 A range of adopted measures, in the form of appropriate notification to aviation stakeholders, development of, and adherence to the CEMP, and lighting and marking to minimise effects to aviation flight operations would apply to the Proposed Development. These will comply with current guidelines where appropriate and be agreed with GPA and are outlined in **Table 13.7**.
- 13.7.18 The impact is predicted to be of regional spatial extent, continuous, with low reversibility (but previously notified and chartered) for the operational phase. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be **Low**.
- 13.7.19 Pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter; however, during flight, weather conditions



or operational requirements may necessitate route adjustments. In Visual Meteorological Conditions (VMC), pilots are ultimately responsible for seeing and avoiding obstructions such as turbines and will be aware through notification procedures (Table 13.7) of the Proposed Development. Furthermore, when flying under Instrument Flight Rules (IFR) pilots will be under the control of ATC with an appropriate level of radar service and flying at an altitude which provides the required separation from obstacles below them.

13.7.20 The MOD DIO (EIA Scoping Opinion (**Technical Appendix 4.1**)) raised concerns on this issue; however, the Proposed Development is within an area (the GPA CTR) where military aircraft would require an approval to enter.

13.7.21 The stakeholders' ability to continue to conduct military and other low flying operations in the airspace is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be **Low**.

Instrument Flight Procedures (IFP)

13.7.22 Turbine infrastructure agl could likely pose a physical obstruction to flight operations in the vicinity, specifically to flight procedures. GPA states in its Scoping response (30 May 2024) that there is "Potential disruption to multiple Instrument Flight Procedures and Minimum Safe Altitudes (MSA....". Glasgow International Airport's flight operations in the vicinity could also affected.

13.7.23 The impact is predicted to be of regional spatial extent, continuous and low reversibility for the operational phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **Medium**.

13.7.24 GPA has been consulted throughout the pre-application phase, as presented in **Table 13.1**. The Applicant is continuing to engage with GPA to provide an agreed



route to mitigation and the Applicant has commissioned an IFP Mitigation Report to be provided to GPA.

- 13.7.25 The receptor is deemed to be of high vulnerability, low recoverability and high value. The sensitivity of the receptor is therefore, considered to be **High**.

Significance of the effects

- 13.7.26 Low Flying. Overall, the magnitude of the impact is deemed to be **Low**, and the sensitivity of the receptor is considered to be **Low**. The effect will, therefore, be of **Negligible** adverse significance, which is *Not Significant* in EIA terms.
- 13.7.27 IFP. Overall, the magnitude of the impact is deemed to be **Medium**, and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be of **Major** adverse significance, which is *Significant* in EIA terms.

Decommissioning Effects

Low flying operations

- 13.7.28 Deconstruction infrastructure and remaining turbines agl could pose a physical obstruction to flight operations in the vicinity, and specifically to low flying operations. Erected turbines can be difficult to see from the air, particularly in poor meteorological conditions, leading to potential increased obstacle collision risk. The Proposed Development is entirely within CAS, the GPA CTR, a military low flying avoidance area, where aircraft require a GPA ATC clearance to operate.
- 13.7.29 A range of adopted measures, in the form of appropriate notification to aviation stakeholders, development of, and adherence to the CEMP, and lighting and marking to minimise effects to aviation flight operations would have applied to the Proposed Development. These would have complied with current guidelines where appropriate and been agreed with GPA and are outlined in **Table 13.7**.
- 13.7.30 The impact is predicted to be of regional spatial extent, short-term, with high reversibility (and previously notified and chartered) for the decommissioning phase. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be **Negligible**.
- 13.7.31 Pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter; however, during flight, weather conditions or operational requirements may necessitate route adjustments. In Visual Meteorological Conditions (VMC), pilots are ultimately responsible for seeing and avoiding obstructions such as turbines and will be aware through notification procedures (Table 13.7) of the Proposed Development. Furthermore, when flying under Instrument Flight Rules (IFR) pilots will be under the control of ATC with an



appropriate level of radar service and flying at an altitude which provides the required separation from obstacles below them.

- 13.7.32 The MOD DIO (EIA Scoping Opinion (**Technical Appendix 4.1**)) raised concerns on this issue; however, the Proposed Development is within an area (the GPA CTR) where military aircraft would require an approval to enter.
- 13.7.33 The stakeholders' ability to continue to conduct military and other low flying operations in the airspace is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be **Low**.

Instrument Flight Procedures (IFP)

- 13.7.34 Shrinking turbine infrastructure agl could likely pose a physical obstruction to flight operations in the vicinity, specifically to flight procedures. GPA states in its Scoping response (30 May 2024) that there is "Potential disruption to multiple Instrument Flight Procedures and Minimum Safe Altitudes (MSA....". Glasgow International Airport's flight operations in the vicinity could also be affected.
- 13.7.35 The impact is predicted to be of regional spatial extent, short-term and high reversibility for the decommissioning phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **Low**.
- 13.7.36 GPA has been consulted throughout the pre-application phase, as presented in **Table 13.1**. The Applicant is continuing to engage with GPA to provide an agreed route to mitigation and the Applicant has commissioned an IFP Mitigation Report to be provided to GPA.
- 13.7.37 The receptor is deemed to be of high vulnerability, low recoverability and high value. The sensitivity of the receptor is therefore, considered to be **High**.

Significance of the effects

- 13.7.38 Low Flying. Overall, the magnitude of the impact is deemed to be **Negligible**, and the sensitivity of the receptor is considered to be **Low**. The effect will, therefore, be of **Negligible** adverse significance, which is *Not Significant* in EIA terms.
- 13.7.39 IFP. Overall, the magnitude of the impact is deemed to be **Low**, and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be of **Minor** adverse significance, which is *Not Significant* in EIA terms.

Turbines causing Interference on Aviation Communication, Navigation and Surveillance (CNS) Systems

- 13.7.40 The construction, operation and decommissioning of the Proposed Development turbines may lead to the interference to aviation Communication, Navigation and



Surveillance (CNS) Systems operations due to the presence of 20 x turbines, at 149.9 m agl.

Construction Effects

Turbines causing Interference on Very High Frequency (VHF) Communication and Navigation Systems (Carrier to Interference (C/I) Ratio)

- 13.7.41 A (C/I) analysis across the Proposed Development has been completed to establish theoretical interference of the turbines, placed within, to selected GPA Very High Frequency (VHF) aeronautical communication and navigation systems. The full details are presented in **Technical Appendix 13.2**.
- 13.7.42 C/I mathematical modelling results indicate that turbine construction might theoretically degrade VHF signals in the area of the Proposed Development. Prediction of turbine interference impacts above a threshold value will not automatically result in an overall loss of service. Technical impact (interference levels) and operational impacts are assessed separately. The type of operational usage by GPA and the geographic location and volume of affected airspace (Volume of Interest) will affect the level of operational impact and hence sensitivity to a particular development proposal.
- 13.7.43 The technical impact is predicted to be of local spatial extent, short-term duration, continuous and low reversibility for the construction phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **Low**.
- 13.7.44 GPA has been consulted throughout the pre-application phase, as presented in **Table 13.1**. The Applicant is continuing to engage with GPA to provide an agreed route to mitigation.
- 13.7.45 The receptor is deemed to be of high vulnerability, low recoverability and high value. The sensitivity of the receptor is therefore, considered to be **Medium**.

Significance of the effects

- 13.7.46 C/I. Overall, the magnitude of the impact is deemed to be **Low**, and the sensitivity of the receptor is considered to be **Medium**. The effect will, therefore, be of **Minor** adverse significance, which is *Not Significant* in EIA terms.

Operational Effects

Turbines causing Interference on Very High Frequency (VHF) Communication and Navigation Systems (Carrier to Interference (C/I) Ratio)

- 13.7.47 A (C/I) analysis across the Proposed Development has been completed to establish theoretical interference of the turbines, placed within, to selected GPA Very High Frequency (VHF) aeronautical communication and navigation systems. The full details are presented in **Technical Appendix 13.2**.
- 13.7.48 C/I mathematical modelling results indicate that turbine operation might theoretically degrade VHF signals in the area of the Proposed Development. Prediction of



turbine interference impacts above a threshold value will not automatically result in an overall loss of service. Technical impact (interference levels) and operational impacts are assessed separately. The type of operational usage by GPA and the geographic location and volume of affected airspace (Volume of Interest) will affect the level of operational impact and hence sensitivity to a particular development proposal.

- 13.7.49 The technical impact is predicted to be of local spatial extent, long-term duration, continuous and low reversibility for the operational phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **Medium**.
- 13.7.50 GPA has been consulted throughout the pre-application phase, as presented in **Table 13.1**. The Applicant is continuing to engage with GPA to provide an agreed route to mitigation.
- 13.7.51 The receptor is deemed to be of high vulnerability, low recoverability and high value. The sensitivity of the receptor is therefore, considered to be **Medium**.

Turbines causing Interference on Aviation Primary Surveillance Radar (PSR) Systems

- 13.7.52 A radar Line of Sight (LoS) analysis across the Proposed Development has been completed to establish theoretical radar detectability of the turbines, placed within the Proposed Development Array Area, to selected PSR systems located in the UK based on a maximum upper blade tip height of 149.9 m agl. The full details are presented in **Technical Appendix 13.1**, of the EIA: RLoS Report (Osprey, 2025).
- 13.7.53 Radar LoS modelling results indicate that operational wind turbines in the Proposed Development would be theoretically detectable by the following PSR systems:
- NATS Lowther Hill (due to the vertical extent of the turbines, all of the Proposed Development is theoretically highly likely to be in radar LoS to this NATS PSR).
 - GPA Terma Radar (due to the vertical extent of the turbines, all of the Proposed Development is theoretically highly likely to be in radar LoS to this GPA radar).
- 13.7.54 Turbines detectable by a PSR system may degrade the system by creating false targets, reduce system sensitivity, create radar shadowing behind the wind turbines and saturate the radar receiver leading to clutter potentially concealing real aircraft targets. Without mitigation, the technical impact created by the detection of operational turbines is predicted to be of regional spatial extent, long-term duration, continuous and low reversibility for the operational phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **Medium**.
- 13.7.55 The ability of operators of aviation PSR systems to accurately operationally use their respective PSR systems for the provision of an ATS could be impacted by the presence of turbine interference and the production of radar clutter onto displays.



Consultation with NATS and GPA will be undertaken by the Applicant to provide an agreed route to mitigation of effect.

- 13.7.56 All PSR receptors require assurance that impact created by the detection of operational turbines does not have a detrimental impact on the ATS they provide so that they may continue to deliver a safe and effective ATS and to monitor the airspace of operational importance to them. The radar stakeholders are considered to be of high vulnerability, low recoverability and high value. The sensitivity of these receptors is therefore, considered to be **High**.

Significance of the effects

- 13.7.57 C/I. Overall, the magnitude of the impact is deemed to be **Medium**, and the sensitivity of the receptor is considered to be **Medium**. The effect will, therefore, be of **Moderate** adverse significance, which is *Not Significant* in EIA terms.
- 13.7.58 Radar LoS. Overall, the magnitude of the impact is deemed to be **Medium**, and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be of **Moderate** adverse significance, which is *Not Significant* in EIA terms.

Decommissioning Effects

Turbines causing Interference on Very High Frequency (VHF) Communication and Navigation Systems (Carrier to Interference (C/I) Ratio)

- 13.7.59 A (C/I) analysis across the Proposed Development has been completed to establish theoretical interference of the turbines, placed within, to selected GPA Very High Frequency (VHF) aeronautical communication and navigation systems. The full details are presented in **Technical Appendix 13.2**.
- 13.7.60 C/I mathematical modelling results indicate that turbine decommissioning might theoretically degrade VHF signals in the area of the Proposed Development. Prediction of turbine interference impacts above a threshold value will not automatically result in an overall loss of service. Technical impact (interference levels) and operational impacts are assessed separately. The type of operational usage by GPA and the geographic location and volume of affected airspace (Volume of Interest) will affect the level of operational impact and hence sensitivity to a particular development proposal.
- 13.7.61 The technical impact is predicted to be of local spatial extent, short-term duration, intermittent and high reversibility for the decommissioning phase. It is predicted that



the impact will affect the receptor directly. The magnitude is therefore, considered to be **Low**.

13.7.62 GPA has been consulted throughout the pre-application phase, as presented in **Table 13.1**. The Applicant is continuing to engage with GPA to provide an agreed route to mitigation.

13.7.63 The receptor is deemed to be of high vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **Low**.

Significance of the effects

13.7.64 C/I. Overall, the magnitude of the impact is deemed to be **Low**, and the sensitivity of the receptor is considered to be **Low**. The effect will, therefore, be of **Negligible** adverse significance, which is *Not Significant* in EIA terms.

13.8 Further Mitigation

IFP

13.8.1 Consultation with regard to the potential breach of the IFPs with GPA is continuing with a view to reaching agreement on mitigation to maintain safe separation for aircraft flying IFR procedures in the sectors of the IFPs impacted by the Proposed Development..

13.8.2 The aerodrome licence holder or representative acting on the licence holder's behalf is responsible for the initial design, routine maintenance and periodic review of their aerodrome's IFPs. Agreement will be sought should the minimum of 300 m separation between the highest obstacle (turbine) and the IFP minima be breached.

13.8.3 The aerodrome licence holder shall, if appropriate, independently re-issue the procedures related to an aerodrome as soon as possible if the changing obstacle environment or aerodrome operational requirement dictates an amendment to procedures, either laterally or vertically. During annual maintenance review an appointed and CAA Approved Procedure Designer will review the IFPs published for the given aerodrome and assess their compliancy to International Civil Aviation Organisation (ICAO) criteria – as well as ensuring that the applicable obstacle clearance is achieved for all procedures considering the latest aerodrome and obstacle survey data available at the given date. As an output from the review, the Procedure Designer will provide a list of recommended changes to the Proposed Development, to be actioned on the IFPs to ensure they remain compliant to criteria as well as provide the required clearance margin over terrain and obstacles surrounding the airport.

13.8.4 If a change to the procedures is required, consideration will be given to any new dominant vertical obstacle(s) that require a change to the level previously provided



in a particular segment/area of the IFP charts related to the aerodrome. This new level will provide a minimum of 300 m obstacle clearance for IFR flights.

Radar LoS

- 13.8.5 An ATS provider such as NATS and GPA might accept that although a technical impact may be present, it can be managed and accepted by implementing operational mitigation in airspace that is not regularly used for the separation of aircraft. However, in the airspace in which the Proposed Development is located, operational acceptance of the effect created is unlikely to be acceptable to all ATS providers without mitigation, portions of airspace may be more important to some ATC establishments than others, due to the role and responsibility of ATC provision allocated to them. Further engagement and agreement is required with the respective radar receptor on the mitigation solution to be utilised.
- 13.8.6 In the case of NATS radar systems impacted (Lowther Hill PSR) previous acceptable mitigation of wind turbine impact to these systems has been achieved through agreement by NATS of radar optimisation and in some cases, infill. The Lowther Hill Indra PSR incorporates the latest technologies for en-route air route surveillance which might provide an enhanced capability to mitigate wind turbine effect. However, optimisation of the radar system to mitigate the potential impact of the Proposed Development will be required and be agreed by NATS.
- 13.8.7 NATS has defined mitigation solutions which will be subject to commercial agreement between the Applicant and NATS and will be implemented by radar optimisation of the affected Proposed Development Area of the Lowther Hill PSR which will remove all wind turbine radar returns.
- 13.8.8 In the case of GPA Terma PSR previous acceptable mitigation of wind turbine impact to these systems has been achieved through agreement by GPA of updates to processor, data access / storage. The GPA Terma PSR incorporates the latest technologies for terminal surveillance which provides an enhanced capability to mitigate wind turbine effect. However, optimisation of the radar system to mitigate the potential impact of the Proposed Development will be required and be agreed by GPA.
- 13.8.9 GPA has a defined mitigation solution which will be subject to commercial agreement between the Applicant and GPA and will be implemented by radar and processor optimisation for the affected Proposed Development Area of the GPA PSR.
- 13.8.10 The Proposed Development is within the GPA CTR and underneath the GPA CTA and the Scottish Terminal Manoeuvring Area (TMA) where aircraft are obliged to transpond (carriage and operation of a pressure-altitude transponder is mandatory



within an aircraft), unless otherwise authorised, allowing SSR tracking by NATS and GPA.

VHF C/I

- 13.8.11 An insignificant theoretical, mathematical effect to VHF communications in the near volume of the Proposed Development. This is a technical item and at this point therefore theoretical in nature. If any operational total loss of VHF communication outside the volume of the Proposed Development was ascribed to the presence of the turbines, operational mitigation would be in the form of a notice of potential 'poor' communications in the area (or on specific radial and altitude). Aerodromes have volumes of airspace at low levels in their vicinity that suffer degraded communication due to various reasons including the surrounding topography, built environment and atmospheric conditions. Hypothetical, unproven and unmodelled technical mitigation could take the form of a combination of the following: increased transmitter power at the aerodrome, taller transmitter towers or repeater transmitters within the Proposed Development Area.
- 13.8.12 CAA guidance on this subject is contained within CAP 670: *Air Traffic Services Safety Requirements*, which sets out a two-step process:
- The first step is to determine through theoretical mathematical modelling, the conceptual effect of the Proposed Development. The worst-case mathematical modelling assumes that the WTG would be always facing the VHF radio antenna to create a safety-conservative, worst-case scenario (despite this not being physically probable).
 - The second step is for GPA to then assess the potential for operational impact, based on the theoretical results of the first step, mathematical modelling, and hence sensitivity to the Proposed Development.

13.9 Assessment of Residual Effects

Low Flying

- 13.9.1 It is considered that the residual impact to stakeholders would be **Negligible** adverse with mitigation in place, which is *Not Significant* in EIA terms.

Instrument Flight Procedures (IFP)

- 13.9.2 It is considered that the residual impact to the GPA IFPs would be **Minor** adverse with mitigation in place, which is *not Significant* in EIA terms.

Radar LoS

- 13.9.3 It is considered that the residual impact to the NATS, with mitigation implemented and associated operational processes and procedures in place, will be of **Minor** adverse significance, which is *Not Significant* in EIA terms.
- 13.9.4 It is considered that the residual impact to GPA, with mitigation implemented and associated operational processes and procedures in place, will be of **Minor** adverse significance, which is *Not Significant* in EIA terms.



VHF C/I

- 13.9.5 An insignificant theoretical, mathematical effect to VHF communications in the near volume of the Proposed Development. There is little, if no, recorded historical evidence of total loss for VHF aeronautical communication and navigation system signal from any onshore wind farm across the UK. Any theoretical effect is a hypothetical degradation below the theoretical ideal, restricted to the adjacent confines of the volume of the Proposed Development. Traffic in the area of the Proposed Development would, under Visual Flight Rules (VFR), avoid the Proposed Development volume by 500 feet (ft) vertically and horizontally. Instrument Flight Rules (IFR) traffic would avoid the Proposed Development volume by 1,000 ft vertically and one nautical mile horizontally. Both types of obstacle flight avoidance would significantly reduce any hypothetical degradation in GPA VHF communication and navigation to the aircraft. The only inhabited aircraft likely to enter the fully built-out array would be airborne Search And Rescue (SAR) helicopters; the Maritime and Coastguard Agency (MCA). Royal Air Force (RAF) SAR found in the North Hoyle trials (between 20 July and 11 August 2004) no evidence of significant VHF communications degradation between the helicopter within, and beyond, the offshore array and other VHF assets outside the array, including Air Traffic Control (ATC).
- 13.9.6 It is considered that the residual impact to the GPA, with mitigation implemented and associated operational processes and procedures in place, will be of **Minor** adverse significance, which is *not Significant* in EIA terms. Nevertheless, the Applicant recognises that GPA must undertake its own operational assessment as part of the CAP 670 process.

13.10 Assessment of Cumulative Effects

IFP

- 13.10.1 There are a number of existing, consented and proposed wind farms, including the Proposed Development, located in areas that might interfere with GPA IFPs. The Proposed Development might have cumulative effects on the GPA IFPs, in its area and with these other projects. Discussions are ongoing with GPA regarding potential mitigation measures, if required, as described in **Section 13.8**.
- 13.10.2 Following implementation of mitigation, it can be expected that the stand-alone and cumulative effects of the Proposed Development on the GPA IFPs will be reduced to an insignificant level.

Radar LoS

- 13.10.3 There are a number of existing, consented and proposed wind farms, including the Proposed Development, located in areas understood to be detectable to GPA Terma and NATS PSRs. Without mitigation, the Proposed Development would have cumulative effects on the GPA and NATS PSRs with these other projects, in terms of the area affected by radar clutter and the distances between areas of clutter



on the radars. Discussions are ongoing with NATS and GPA regarding potential mitigation measures as described **Sections 13.7 and 13.8**.

- 13.10.4 Following implementation of mitigation, it can be expected that the stand-alone and cumulative effects of the Proposed Development on the GPA and NATS PSR will be reduced to an insignificant level.

VHF C/I

- 13.10.5 There are a number of existing, consented and proposed wind farms, including the Proposed Development, located in areas that might interfere with GPA VHF aeronautical communication and navigation systems. The Proposed Development might have cumulative effects on the GPA VHF systems, none reported, in its volume and with these other projects, in terms of the volume affected and the distances between areas of interference. Discussions are ongoing with GPA regarding potential mitigation measures, if required, as described in **Section 13.8**.
- 13.10.6 Following implementation of mitigation, if required, it can be expected that the stand-alone and cumulative effects of the Proposed Development on the GPA VHF C/I will be reduced to an insignificant level.

Low flying operations

- 13.10.7 While the proliferation of turbines within Low Flying Area 16 (LFA 16) is a general concern for the MoD regarding military Low Flying operations in this region, the Proposed Development is within the GPA CTR Avoidance Area where military tactical low flying training will not take place. Further, military aircraft, like all other aircraft, will require a GPA ATC approval to enter the CTR. No adverse cumulative effects are therefore predicted as a result of the Proposed Development.

13.11 Summary

Baseline

- 13.11.1 The Proposed Development is located within the UK FIR. The UK CAA is the airspace regulator for the UK FIR. The Proposed Development sits within Class D CAS, the GPA CTR, and underneath Class C CAS (**Figure 13.2**). GPA ATC provide radar services in and around its CTR; additionally, NATS has a licence obligation to provide radar data and services in the surrounding volume of airspace.
- 13.11.2 The likely evolution without implementation of the Proposed Development as far as airspace changes, including traffic density, in the event that the Proposed Development does not come forward, no significant change to the present airspace



construct, particularly the GPA CTR, or usage, in terms of aircraft movement density, above and around the Proposed Development area is expected.

Mitigation

- 13.11.3 Mitigation measures adopted are defined in **Table 13.7**.
- 13.11.4 Consultation with regard to the potential breach of the IFPs with GPA is continuing with a view to reaching agreement on mitigation to maintain safe separation for aircraft flying IFR procedures in the sectors of the IFPs impacted by the Proposed Development. Agreement will be sought should the minimum of 300 m separation between the highest obstacle (turbine) and the IFP minima be breached..
- 13.11.5 NATS has defined mitigation solutions which will be subject to commercial agreement between the Applicant and NATS and will be implemented by radar optimisation of the affected Proposed Development Area of the Lowther Hill PSR which will remove all wind turbine radar returns.
- 13.11.6 GPA has a defined mitigation solution which will be subject to commercial agreement between the Applicant and GPA and will be implemented by radar and processor optimisation for the affected Proposed Development Area of the GPA PSR.

Residual Effects

- 13.11.7 Residual effects, with appropriate mitigations in place, will be **Minor** adverse in the worst case, which is *Not Significant* in EIA terms.
- 13.11.8 A theoretical, mathematical effect to VHF communications in the near volume of the Proposed Development. This is a technical item and at this point therefore theoretical in nature. If any operational total loss of VHF communication outside the volume of the Proposed Development was ascribed to the presence of the turbines, operational mitigation would be in the form of a notice of potential 'poor' communications in the area (or on specific radial and altitude). Aerodromes have volumes of airspace at low levels in their vicinity that suffer degraded communication due to various reasons including the surrounding topography, built environment and atmospheric conditions. Hypothetical, unproven and unmodelled technical mitigation could take the form of a combination of the following; increased transmitter power at the aerodrome, taller transmitter towers or repeater transmitters within the Proposed Development Area.



Table 13.8: Summary

Description of Effect		Significance of Potential Effect		Mitigation Measures	Significance of Residual Effect	
		Significance	Beneficial / Adverse		Significance	Beneficial / Adverse
During Construction & Decommissioning						
Creation of Physical Obstacle to Aircraft Operations	Low Flying	Minor/Negligible	Adverse	Notification (Table 13.7)	Negligible	Adverse
	IFP	Major/Minor	Adverse	Changes to be actioned on the IFPs to ensure they remain compliant to safety criteria	Minor	Adverse
Interference on Aviation CNS Systems	VHF C/I	Minor/Negligible	Adverse	Hypothetical, unproven and unmodelled technical mitigation	Minor	Adverse
	Radar LoS	N/A	N/A	N/A	N/A	N/A
During Operation						
Creation of Physical Obstacle to Aircraft Operations	Low Flying	Negligible	Adverse	Notification (Table 13.7)	Negligible	Adverse
	IFP	Major	Adverse	Changes to be actioned on the IFPs to ensure they remain compliant to safety criteria	Minor	Adverse
Interference on Aviation CNS Systems	VHF C/I	Moderate	Adverse	Hypothetical, unproven and unmodelled technical mitigation	Minor	Adverse
	Radar LoS	Moderate	Adverse	NATS and GPA have individual defined radar system mitigation solutions which will be subject to commercial agreement between the Applicant and NATS and the Applicant and GPA	Minor	Adverse



Description of Effect		Significance of Potential Effect		Mitigation Measures	Significance of Residual Effect	
		Significance	Beneficial / Adverse		Significance	Beneficial / Adverse
Cumulative Effects						
Creation of Physical Obstacle to Aircraft Operations	Low Flying	Negligible	Adverse	Notification (Table 13.7)	Negligible	Adverse
	IFP	Moderate	Adverse	Changes to be actioned on the IFPs to ensure they remain compliant to safety criteria	Minor	Adverse
Interference on Aviation CNS Systems	VHF C/I	Moderate	Adverse	Hypothetical, unproven and unmodelled technical mitigation	Minor	Adverse
	Radar LoS	Moderate	Adverse	NATS and GPA have individual defined radar system mitigation solutions which will be subject to commercial agreement between the Applicant and NATS and the Applicant and GPA	Minor	Adverse



13.12 References

- UK Govt, *National Planning Framework 4 (NPF4)* (UK Govt, 2024)
- Scottish Govt, *Onshore Wind Policy Statement* (Scot Govt, 2022)
- Scottish Govt, *Planning Circular 2/03 Town and Country Planning (Safeguarded Aerodromes, Technical Sites and Military Explosives Storage Areas)* (Scot Govt, 2003)
- East Ayrshire, *Local Development Plan (LDP2)*, and Scottish. Of relevance to the assessment presented within this chapter, regard has been had to the following policy:
- ICAO, Document 8168 Ops/611 *Procedures for Air Navigation Services Aircraft Operations* (ICAO, 2018)
- ICAO Annex 14 *Aerodromes Design and Operations contains Standards and Recommended Procedures (SARPs)* (ICAO, 2022)
- CAA CAP 032, *UK Aeronautical Information Publication* (CAA, 2024)
- CAA CAP 168, *Licensing of Aerodromes* (CAA, 2022)
- CAA CAP 393, *The Air Navigation Order (ANO)* (CAA, 2022)
- CAA CAP 670, *Air Traffic Services Safety Requirements* (CAA, 2019)
- CAA CAP 738, *Safeguarding of Aerodromes* (CAA, 2020)
- CAA CAP 764, *Policy and Guidelines on Wind Turbines* (CAA, 2016)
- CAA CAP 774, *The UK Flight Information Services* (CAA, 2021)
- CAA CAP 785B, *Implementation and Safeguarding of Instrument Flight Procedures (IFP) in the UK* (CAA, 2022b)
- CAA CAP 999, *Helicopter Search and Rescue (SAR) in the UK National Approval Guidance* (CAA, 2023b)
- The Military MOD Aeronautical Information Publication (AIP), (MOD, 2024)

