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16. Aviation

16.1. Introduction

16.1.1. This chapter assesses the potential for the Proposed Development to affect aviation communications, navigation and surveillance infrastructure in the vicinity of the site. The following are considered:

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

16.1.2. This chapter is structured as follows:

- Legislation, policy and guidance;
- Assessment methodology;
- Baseline conditions;
- Assessment of potential effects;
- Mitigation;
- Residual Effects; and
- Summary.

16.2. Legislation, Policy and Guidance

16.2.1. The assessment has been informed by a specialist aviation consultant, Wind Power Aviation Consultants Ltd (WPAC), who were instructed by SETT Wind Development Ltd. It takes into account consultation, regulatory, safeguarding and operational requirements as laid down in a number of publications and regulations including:

- Civil Aviation Publication (CAP) 764 Civil Aviation Authority (CAA) Policy and Guidance on Wind Turbines Version 6, Feb 2016;
- CAP 168 Licensing of Aerodromes, Version 10 March 2014;
- CAP 670 ATS Safety Requirements Version 3 May 2014;
- CAP 774 UK Flight Information Services, Ed 2.3 Feb 2015;
- CAP 738 Safeguarding of Aerodromes Version 2 Dec 2006;
- CAP 793 Safe Operating Practices at Unlicensed Aerodromes Ed 1 July 2010;
- CAP 493 Manual of Air Traffic Services Part 1 Ed 6.1 April 2015;
- CAP 660 Parachuting Ed 4 July 2008;
- 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 Aviation Charts.

16.3. Assessment Methodology

Consultation Criteria

Civil Aerodromes

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

- Airfield with a surveillance radar – 30 km;
- Non radar licensed aerodrome with a runway of more than 1,100 m – 17 km;
- Non radar licensed aerodrome with a runway of less than 1,100 m – 5 km;
- Licensed aerodromes where the turbines would lie within airspace coincidental with any published Instrument Flight Procedure (IFP);
- Unlicensed aerodromes with runways of more than 800 metres – 4 km ;
- Unlicensed aerodromes with runways of less than 800 metres – 3 km;
- Gliding sites – 10 km; and
- Other aviation activity such as parachute sites and microlight sites within 3 km – in such instances developers are referred to appropriate organisations.

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

Ministry of Defence

16.3.3. It is necessary to take into account the aviation and air defence activities of the MOD. The types of issues that will be addressed include:

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

National Air Traffic Services (NERL) Facilities

16.3.4. 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.

Radar Projection Information

16.3.5. Radar modelling has been undertaken using WPAC's '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 4 metres. The results are verified using the Shuttle Radar Topography Mission (SRTM) dataset, a separate smoothed digital terrain model with data spacing of 3 arc seconds. By using two separate and independently generated digital terrain models, anomalies are identified and consistent results assured. Rview models the refractive effects of the atmosphere on radio waves and the First Fresnel Zone. If needed, Rview is also capable of modelling a range of atmospheric refractive conditions. RView models the trajectory of radar signals at different elevations enabling modelling of both volume surveillance and pencil beam radars as well as the effects of angular sterilisation as applied, for example, in Met Office radars.

Consultation Methodology

- 16.3.6. Consultation has been undertaken in accordance with the guidance as described in 16.3.1 above. This has included the Ministry of Defence (Defence Infrastructure Organisation (DIO)), Glasgow Prestwick Airport, Edinburgh International Airport and NERL.

Table 16.1: Summary of consultation responses

Consultee	Response
MOD DIO 27/03/2018	Ref DIO 18347 – The MOD has no objection
Glasgow Prestwick Airport 26/03/2018	"As per our previous e-mail on a scoping opinion for Shepherd's Rig dated 25th April 2013, the development is located roughly 40km to the south east of Glasgow Prestwick Airport. Using estimated co-ordinates from the maps provided the site appears to be terrain shielded from our Primary Surveillance Radar however as the ground undulates a great deal in this area, without exact co-ordinates of the planned positions of each of the 30 turbines, we cannot conduct a full assessment for each and give a more definitive response as to whether we would have a safeguarding objection."
Edinburgh International Airport 03/04/2018	"This development is outside of Edinburgh Airport's safeguarding zone, therefore we have no objections to this proposal."
NERL	No response

Table 16.2: Summary of Additional Consultation and Responses

Consultee Communication	Response
Glasgow Prestwick Airport – further detailed information was provided to GPA by email on 22/06/18 showing the locations of the turbines and the radar projections.	"Glasgow Prestwick Airport have been consulted and are content that the design freeze coordinates and levels associated with the proposal are satisfactory and we would not have any objection to those turbines from a radar or safeguarding perspective providing there were no changes to positions or heights in which case we reserve the right to be consulted again to satisfy ourselves that any changes were appropriately assessed."

<p>NERL were instructed to undertake a Technical and Operational Assessment (TOPA) on 22/06/18 and responded in July under Reference TOPA SG26361</p>	<p>The NERL TOPA stated that "for turbine 13 the terrain screening available will not adequately attenuate the signal, and therefore this turbine 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." The En Route operational assessment for the Prestwick Centre ATC is 'Unacceptable'.</p>
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16.4. Baseline Conditions

16.4.1. The Proposed Development is located 63 km to the north-east of the dormant MOD airfield at West Freugh and 42 km to the south-east of Glasgow Prestwick Airport. The RAF Spadeadam range is over 100 km to the south-east. The site is under an area with a complex controlled airspace structure as it is within the Scottish Terminal Area (TMA), designed to protect aircraft arriving and departing from Prestwick, Edinburgh and Glasgow airports. The TMA has a base of 5500ft in this location. There is a Non Directional Beacon (NDB) designated NGY (New Galloway), a radio navigation aid, just to the south of the site. The area is also used extensively by the MOD for low flying. A CAA 1:250,000 chart extract is provided in **Figure 16.1** illustrating the location of the site in an aviation context.

Civil Aviation - Radar Equipped Licensed Aerodromes

16.4.2. The closest radar equipped licensed aerodrome is Glasgow Prestwick Airport, 42 km to the north-west. The Proposed Development is just beyond the distance within which consultation is recommended; however, an assessment of radar impact has been undertaken. The results show that none of the turbines will be visible to either the existing Primary Surveillance Radar (PSR) at Prestwick or the newly installed Terma Scanter 4000 radar. Radar line of sight is in excess of 500 metres above ground level (AGL). As the wind turbines will all be screened by terrain from the radars, there will be no effect on operations at Prestwick.

16.4.3. Glasgow and Edinburgh Airports are well beyond consultation distance; however, for completeness, radar modelling has been undertaken which confirms that all of the turbines are screened by terrain and neither airport radar will be affected.

Civil Aviation – Non-radar Equipped Licensed Aerodromes

16.4.4. There are no non-radar equipped licensed aerodromes within or near consultation distance of the Proposed Development.

Civil Aviation – Unlicensed Aerodromes, Microlight and Parachute Sites

16.4.5. There are no other known civil aviation facilities that are within consultation distance or likely to be affected by the Proposed Development.

Civil Aviation – NATS En Route Ltd (NERL)

- 16.4.6. NATS En Route Ltd (NERL) operates a network of long range ATC radars throughout the country in addition to other communications, navigation and surveillance systems. Whether or not they would object to any turbine development depends upon whether the turbines show on the radar and what type of airspace is above the site or if the turbines will be likely to infringe upon the technical safeguarded criteria for other systems. In this case, the closest radar is located at Lowther Hill, 31km to the north east. Radar modelling has been undertaken which shows that none of the wind turbines are likely to be visible to the radar due to terrain screening. A second NERL radar is located 130 km to the east at Great Dun Fell. As stated above in Table 16.2, a TOPA assessment was undertaken by NERL in July 2018 which found that for turbine 13 the terrain screening available will not adequately attenuate the signal.

MOD Aviation/Radar/Low Flying

- 16.4.7. Extensive radar modelling has been undertaken which demonstrates that the Proposed Development will not be visible to any of the radars at West Freugh or RAF Spadeadam. This was confirmed by the MOD response at scoping stating that they have no objection to the proposal.
- 16.4.8. The Proposed Development is located within a busy Low Flying Area known as Tactical Training Area 20. A detailed assessment on the possible effect on low flying operations was undertaken by WPAC who concluded that due to the layout of the terrain and other factors, the MOD would be unlikely to object to the proposal. This was confirmed by the MOD response stating they have no objection to the proposal. It will, however, be necessary to provide infra-red lighting to an MOD approved specification which is likely to be a condition of any planning consent.
- 16.4.9. There will be no effect on the network of Met Office radars as the closest one is at Holehead, 88km to the north and well beyond the 20 km safeguarding radius.

16.5. Assessment of Potential Effects

- 16.5.1. With the exception of the NERL Great Dun Fell radar which will be affected by a single turbine, there are no potential effects on either civil airport or military air traffic control communications, navigation and surveillance systems and no technical radar mitigation is required. As the Proposed Development will have no impact on any of these systems, there is no cumulative impact to take into account. The issue of the impact of Turbine 13 on the Great Dun Fell NERL radar will need to be resolved through negotiation with NERL.

16.6. Mitigation

- 16.6.1. Aviation Lighting – as the maximum turbine tip height will be below 150 metres AGL, there is no requirement for En Route Hazard Lighting as defined in CAA DAP01062017 letter on aviation lighting. There is, however, a requirement for the turbines to be illuminated with infra-red lighting which is invisible to the human eye, in order for military aircrew using Night Vision Devices to be able

to see and avoid the wind turbines. The MoD have stated that the turbines will need to be lit in accordance with the Air Navigation Order 219; however, that requirement is unnecessary as the turbines are not taller than 150 m. Visible aviation lighting will not be required.

- 16.6.2. NERL Great Dun Fell radar – it will be necessary to agree a technical mitigation scheme with NERL or it may become necessary to relocate T13 in order for the effect to be removed. It is likely, however, that NERL will be able to introduce a 'single cell blank' to mitigate the effect of the single turbine in radar coverage. This issue will be resolved through negotiation with NERL.

16.7. Residual Effects

- 16.7.1. Provided the effect of Turbine 13 on the Great Dun Fell radar is mitigated there are no residual effects

16.8. Summary

- 16.8.1. The Proposed Development has been assessed from an aviation perspective and the wind turbines will have no residual effect on any military or civil aviation airport, communications, navigation or surveillance systems. A single turbine will be visible to the NERL Great Dun Fell radar, however, a simple single cell blank should enable any objection to be removed. In the unlikely situation that this is not possible, Turbine 13 may need to be relocated or reduced in size to a height that is deemed acceptable by NERL.