Clash Gour Wind Farm

Airspace Change Proposal Submission
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Harston Mill, Royston Road Harston, Cambridge CB22 7GG
01172 422533 / enquiries@ospreycsl.co.uk
Registered in England and Wales under No: 06034579

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Issue 1.0	04/2024	30th April 2024
Issue 1.1	07/2024	Amendment to Point A and Point D of the lateral limits of the TMZ boundary to include 50 metre micrositing allowance (Appendix A2 paragraph's 2.1 and 2.2).

Table of Contents

Table of Figures

Table of Tables

1 Introduction

1.1 Introduction

Clash Gour Holdings Limited intend to develop an onshore wind farm in the Moray Council area which will be capable of providing electricity to approximately 200,000 houses. The principle of the development has been established through an application to Scottish Ministers under the Electricity Act 1989 and that application was consented by Scottish Ministers on 21st October 2022.

Two conditions are attached to the grant of consent relating to aviation matters. Each condition requires the development and agreement of an Air Traffic Control Radar Mitigation Scheme (ATCRMS) each in respect of both RAF Lossiemouth and Inverness Airport. The conditions require to be discharged before turbines can be operated on site. This Airspace Change Proposal (ACP) does not discuss or consult upon the principle of the development itself and deals solely with proposed airspace solutions as mitigation to any effect the windfarm may have on the Air Traffic Control (ATC) capability of the two units. The Airspace Change Proposal forms a part of the strategy for fulfilling the ATCRMS.

1.2 Background

Force9 Energy (Force9), jointly with EDF Energy Renewables Limited (EDFER) is developing the Clash Gour Wind Farm (Clash Gour) in the name of its wholly owned subsidiary Clash Gour Holdings Limited (CGH).

Clash Gour will be a substantial onshore windfarm which will be located in the Moray Council Area, approximately 14 Nautical Miles (NM) southwest of Elgin and 13 NM southeast of Nairn. Clash Gour will consist of 48 wind turbines with a maximum blade tip height of 180 metres (m) above ground level (agl). Figure 1 below provides the location of the site (outlined in red) of the Clash Gour development.

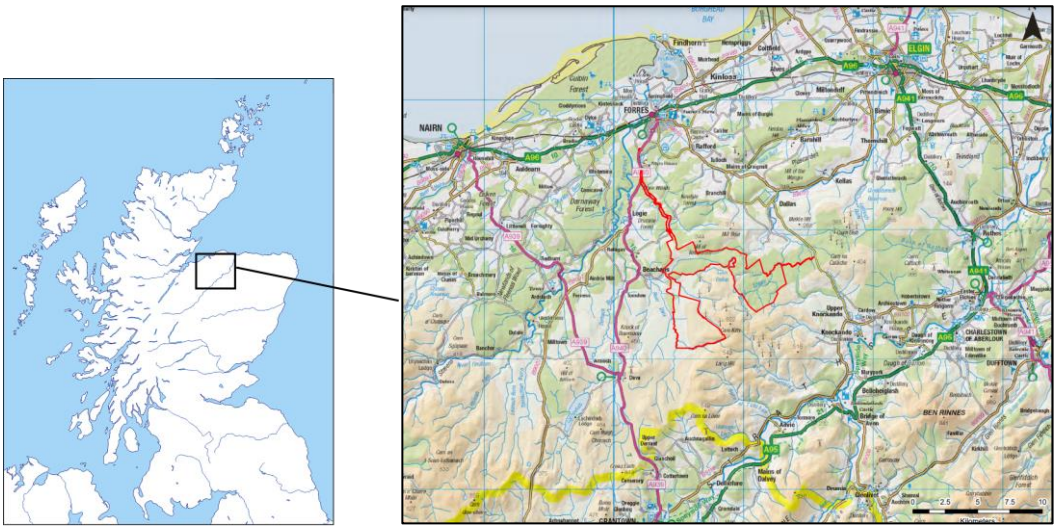


Figure 1 – Clash Gour Wind Farm Location

Clash Gour is brought forward at a point in time when both the UK and Scottish Governments have declared a Climate Emergency and evolved policy to tackle the issue. The Scottish Government declared a climate emergency on 14 May 2019. The declaration of an 'emergency' is a reflection of both the seriousness of climate change and its potential effects and the need for urgent action to cut carbon dioxide emissions.

The UK and Scottish Governments have both subscribed to legally binding targets through international agreements to tackle climate change and that is the foundation upon which UK and Scottish renewable energy policy is based.

A large increase in the deployment of this renewable energy technology is supported through a number of UK level policy documents including the latest UK Energy White Paper (2020) and Net Zero Strategy (2021). The White Paper in particular emphasised the UK Government's commitment to reduce reliance on fossil fuels in favour of cleaner energy sources. Key commitments in The Net Zero Strategy include:

- Take action so that by 2035, all our electricity will come from low carbon sources, subject to security of supply, bringing forward the government's commitment to a fully decarbonised power system by 15 years.
- Accelerate deployment of low-cost renewable generation, such as wind and solar through the Contracts for Difference scheme by undertaking a review of the frequency of the CfD auctions

Clash Gour wind farm is a beneficiary of the Contracts for Difference system where it won a contract with the Governments Low Carbon Contracts Company under Allocation Round 5 (AR5). Under the contract the project company is required to produce renewable electricity from 2027/2028.

The Scottish Government has similar aspirations. The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019, which amends the Climate Change

(Scotland) Act 2009 sets targets to reduce Scotland's emissions of all greenhouse gases to net-zero by 2045 at the latest.

Scottish Government policy commitments are also clear – most recently expressed in the Onshore Wind Policy Statement (OWPS) and in the adopted National Planning Framework 4 (NPF4). Onshore wind remains vital to Scotland's future energy mix, and current energy policy supports development to meet Scotland's legally binding net zero target. The Scottish Government remain committed to onshore wind as the lowest-cost new-build electricity generation in the UK.

The key points which can be drawn from the OWPS include:

- The central requirement for a rapid transition to net zero and the crucial role of further onshore wind development in achieving legally binding targets, especially through the 2020s.
- Unequivocal Scottish Government policy support for the future role of onshore wind.
- The urgency of the Climate Emergency and the scale of the necessary ambition – there is express recognition in the OWPS of the need for ''decisive and meaningful action'', ''further and faster'' delivery and that continued deployment of onshore wind will be key to ensuring our 2030 targets are met. The OWPS sets out a new ambition for the deployment of onshore wind in Scotland of ''A minimum installed capacity of 20 GW….by 2030.''

It should be noted that current installed and consented capacity in Scotland is at about 9GW, meaning 11GW of new on shore wind capacity is required within 6 years.

Clash Gour will have an installed capacity of up to circa 225 MegaWatt (MW) which will contribute significantly to the aforementioned Scottish Government targets. The wind farm is expected to produce between 570 GigaWatt (GW) hours and 710 GW hours of electricity annually which is sufficient to provide electricity for approximately 200,000 houses.

Clash Gour benefits from a grid connection which is available to the project in 2027. If the grid connection date is missed the project could get delayed beyond 2030. Clash Gour is a therefore a strategically important project in the context of UK and Scottish national targets for renewable energy production before 2030.

1.3 Section 36 Electricity Act Application

As part of the development consent process for Clash Gour, CGH, through Force9, engaged with relevant aviation stakeholders to determine the impact of Clash Gour's proposed wind turbines on aviation radar systems and operations in the area. In particular and relevant to this ACP, both the Ministry of Defence (MOD) and HIAL (in respect of Inverness Airport) confirmed that, without mitigation, the development would have an operational effect due to an adverse impact on their ability to provide a safe Air Traffic Service (ATS). This is because wind turbines have the potential to create interference (radar clutter) on the Primary Surveillance Radar (PSR) systems in operation at RAF Lossiemouth and Inverness Airport at the time of the consultation process.

Clash Gour is located approximately 13 NM southwest of RAF Lossiemouth and 15 NM southeast of Inverness Airport, as shown in Figure 2 below.

Figure 2 – Clash Gour Wind Farm Location

Source: Google Earth

During determination of the Electricity Act application, both the MOD and HIAL confirmed and agreed that it would be technically possible to mitigate the effects of Clash Gour wind farm on their radar and air traffic control operations. An agreement was reached between CGH and both HIAL and the MOD on the wording of conditions which are attached to the grant of consent which would secure the steps to mitigation for the wind farm. The conditions will require CGH to agree aviation mitigation plans with those parties, as set out below:

Condition Number	Condition	Reason
5	**Lossiemouth Radar Mitigation (Section 36 Condition)** (1) No wind turbine shall be erected unless and until an *Air Traffic Control Radar Mitigation Scheme ("ATCRMS") to address the impact of wind turbines upon air safety has been submitted to and approved in writing by the Scottish Ministers in conjunction with the Ministry of Defence ("MOD"). (2) No wind turbine erected as part of this development shall be permitted to rotate its rotor blades about its horizontal axis, other than for the purpose of testing radar mitigation for this development for specific periods as defined in the	In the interests of aviation safety.

Condition Number	Condition	Reason
	approved ATCRMS or otherwise arranged in accordance with provisions contained the in approved ATCRMS, until: (a) those mitigation measures required to be implemented prior to any wind turbine being permitted to rotate its rotor blades about its horizontal axis as set out in the approved ATCRMS have been implemented; and (b) any performance criteria specified in the approved ATCRMS and which the approved ATCRMS requires to have been satisfied prior to any wind turbine being permitted to rotate its rotor blades about its horizontal axis have been satisfied and Scottish Ministers, in conjunction with the MOD, have confirmed this in writing. (3) Thereafter the development shall be operated strictly in accordance with the details set out in the approved ATCRMS for the lifetime of the development, provided the Radar remains in operation. *Reason: In the interests of aviation safety* *The Air Traffic Control Radar Mitigation Scheme ("ATCRMS") is a scheme designed to mitigate the impact of the development upon the operation of the Primary Surveillance Radar at RAF Lossiemouth ("the Radar") and the air traffic control operations of the MOD which are reliant upon the Radar. The ATCRMS shall set out the appropriate measures to be implemented to mitigate the impact of the development on the Radar and shall be in place for the lifetime of the development provided the Radar remains in operation.	
6	**Inverness Airport Radar Mitigation (Section 36 Condition)** (1) No wind turbine forming part of the Development shall operate, other than for testing and evaluation as agreed with the operator of Inverness Airport, unless and until a ** Radar Mitigation Scheme has been submitted to and approved in writing by the Scottish Ministers, after	*Reason: To secure mitigation of impacts and ensure the Development does not affect the safe operation of*

Condition Number	Condition	Reason
	consultation with the operator of Inverness Airport and the Civil Aviation Authority. (2) No wind turbine forming part of the Development shall be operational until and unless all measures required by the approved Radar Mitigation Scheme have been fully implemented. (3) Thereafter, the Company must exhibit such lights as detailed in the approved aviation lighting scheme. The lighting installed will remain operational for the life time of the development. *Reason: To secure mitigation of impacts and ensure the Development does not affect the safe operation of Inverness Airport through interference with the Primary Surveillance Radar.* ** "Radar Mitigation Scheme" means a scheme setting out measures to address and mitigate the impact of the wind turbines forming part of the development upon the operation and performance of the Primary Surveillance Radar at Inverness Airport. The scheme will include the appropriate measures to be implemented and that are to be in place for the operational life of the development provided the Radar remains in operation. It will also include provision for future and alternate agreement of the mitigation solution with the operator of Inverness Airport.	*Inverness Airport through interference with the Primary Surveillance Radar.*

Table 1 – Consent Conditions Relevant to Aviation Radar

The Air Traffic Control Radar Mitigation Scheme (ATCRMS) is required to be in place prior to operation of the wind farm. Despite the condition being 'suspensive' on operation of the wind farm, the practical steps to agreeing an ATCRMS with consultees needs to start well in advance of construction and operation. This ACP, entitled 'Clash Gour Wind Farm', has been initiated to create a path for CGH to satisfy the aviation related conditions attached to the grant of consent for the wind farm. It will provide a mitigation solution to the operational effects on Inverness Airport and RAF Lossiemouth created by visibility of wind turbines on PSR. Under the ACP, CGH will then be able to operate the wind farm to test technical mitigation solutions to fully discharge the relevant conditions and allow the windfarm to become fully operational.

1.4 Why We Need an Airspace Solution

When providing an ATS, air traffic controllers are able to use information provided by two radar systems; these are generally used together but can be used as

individual systems if required. These systems are known as the Primary Surveillance Radar (PSR) and the Secondary Surveillance Radar (SSR).

1.4.1 Primary Surveillance Radar (PSR)

The PSR is a conventional radar sensor that illuminates a large portion of space with an electromagnetic wave and receives back the reflected waves from targets within that space. Primary radar detects nearly all aircraft (and other objects, such as flocks of birds, weather phenomena, other environmental factors and wind turbines) without selection. It can also detect and report the position of anything that reflects its transmitted radio signals, including the rotating blades of the wind turbines. It indicates the position of targets to an air traffic controller but does not identify them.

1.4.2 Secondary Surveillance Radar (SSR)

SSR works together with transponders which are installed on the aircraft. The ground based SSR radar interrogates the transponder which transmits an electronic signal which is captured by the radar. The information transmitted by the transponder identifies the aircraft along with other details including the aircraft's altitude.

1.4.3 Primary Radar Interference

Because wind turbines blades are moving targets, it is difficult for a PSR to distinguish them from aircraft. Radar data processing connects returns from successive sweeps of the radar, and from this infers speed. Multiple wind turbines in a windfarm create multiple radar returns and these may appear as stationary or rapidly moving primary returns on the radar display. Therefore, a solution is required to mitigate the impact of the wind farm development upon the operation of the PSR's at both RAF Lossiemouth and Inverness Airport and the air traffic control service that is provided and reliant upon the primary radar. The presence of a wind farm should have no impact on a SSR since this system relies on electronic signals transmitted from a transponder unit.

As a result, radar detectable wind turbines may cause a significant amount of radar false plots, or 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 may be interpreted as aircraft targets. In addition, significant effects have been observed on radar sensitivity caused by the substantial Radar Cross Section (RCS) of the wind turbines structural components (blades, tower and nacelle) which can exceed that of a large aircraft. The effect 'blinds' the radar (or the operator) by obscuring real aircraft returns in the immediate vicinity of the wind turbine. False plots and reduced radar sensitivity may reduce the effectiveness of radar to an unacceptable level. This can therefore create an operational hazard and effect on the provision of an air traffic control service by compromising the provision of a safe radar service to participating aircraft and detection of aircraft targets.

Stationary objects do not cause an effect to radar systems as radar processing techniques remove stationary objects from the radar display; therefore, radar detectable wind turbines only create effects that may affect radar once they are in operation.

Generally, the larger a wind turbine is, the larger its RCS will be to a radar. This results in more energy being reflected and an increased chance of it creating

unwanted returns (clutter). This clutter will be processed by the radar and presented to the air traffic controller on their Radar Data Display Screens (RDDS). Additionally, the blades of wind turbines rotate which can give an indication that the target is moving with respect to the radar and thus defeating doppler processing techniques. This issue can be further compounded by many wind turbines located together which may cause a cumulative effect over a greater volume with higher densities of clutter produced.

The generalised effects wind turbines have on radar systems are as follows:

- Twinkling appearance/blade flash effect which can distract a controller.
- Masking of true aircraft targets by increased clutter on an RDDS.
- Increase in unwanted targets or false aircraft tracks.
- Receiver saturation.
- Target desensitisation causing loss of valid targets that are of a small RCS.
- Shadowing behind the wind turbines caused by physical obstruction (blocking of radar transmitted signal).
- Degradation of tracking capabilities including track seduction.
- Degradation of target processing capability and processing overload.

Radar detectability of wind 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 e.g.:

- 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.
- The type of radar service provided to air traffic using the airspace.

Wind turbine derived clutter appearing on radar displays through primary radar returns can affect the safe provision of an ATS as it can mask aircraft from the air traffic controller and/or prevent the controller from accurately identifying aircraft. In some cases, radar reflections from the wind turbines can affect the performance of the radar system itself. In providing a safe ATS, an air traffic controller must maintain standard separation distances between aircraft that are under control and those radar returns that are unknown or not in receipt of a radar service. Depending on the ATS being provided, the controller will need to provide a minimum of 5 NM radar separation between an aircraft receiving a radar derived ATS and any unwanted radar returns that have the potential to obscure unknown aircraft targets. The radar clutter presented on radar displays that would be associated with radar detectability of the wind farm development would require aircraft to be manoeuvred away from desired aircraft track to achieve the appropriate lateral separation criteria. Without specific wind turbine mitigation processing capabilities, radars 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 the wind farm; furthermore, identification of aircraft under control could be lost or interrupted.

If no mitigating actions are implemented for Clash Gour, the clutter created by the detectability of the operational wind turbines will affect the safe and effective

provision of a radar based ATS by both RAF Lossiemouth and Inverness Airport as set out in consultees responses to the Section 36 application for the development.

Each of these individual effects reduces the overall effectiveness of the primary radar in detecting targets, which can result in the misidentification of aircraft, loss of track position, and loss of track identity as aircraft symbols and track history may be obscured. These in turn can affect the accuracy and timeliness of controller instructions and potentially cause serious safety and operational issues to ATC and the flying community operating within the area of wind turbine induced radar clutter.

If mitigation is not introduced, RAF Lossiemouth and Inverness Airport air traffic controllers would be required to limit or suspend the ATC radar services that they provide to aviation whilst operating within the vicinity of the development areas. Furthermore, dependent on the type of radar service being provided, air traffic controllers would be required to vector aircraft around the wind turbine induced radar clutter which would inevitably lead to greater track distances flown, an increase in both pilot and controller workloads, greater noise exposure to communities, greater fuel burn and an increase in NO_2 and CO_2 emissions through extended the routing around the area of wind turbine clutter.

The proposed ATCRMS is to deploy Range Azimuth Gating (RAG) on the RAF Lossiemouth and Inverness PSR's to remove all primary radar returns from the wind turbines from the radar display. RAG radar blanking blocks any primary radar return within selected ranges and azimuth sectors. This can be mapped to suppress plots within wind turbine clutter regions. However, the primary blanking in any area is complete which means that RAG will also remove primary radar returns from aircraft within the blanked area. To mitigate against this removal of primary radar coverage, it will be necessary to establish an airspace solution over the consented wind farm to ensure that aircraft can be visible to ATC via another means.

2 Executive Summary

2.1 Introduction

The wind turbine generators which form the consented Clash Gour wind farm development have the potential to be detected by the Primary Surveillance Radar's (PSR) at both RAF Lossiemouth and Inverness Airport. This would cause unacceptable interference through the creation of false radar returns (radar clutter). This radar clutter could affect an Air Traffic Control Officer's (ATCO) ability to identify primary radar aircraft returns and increase the risk of an ATCO not detecting a potential confliction between aircraft.

To mitigate against this risk, an Air Traffic Control Radar Mitigation Scheme (ATCRMS) is required to be in place prior to wind farm operation. Agreements with consultees require to be in place prior to a financial investment decision in the wind farm project in November 2024 so that construction can commence in early 2025. The wind farm requires to be operational in October 2027 when the grid connection for the project will be available. The project is contracted to the Governments Low Carbon Contract Company to start to provide electricity in 2027/28.

The proposed ATCRMS is to deploy Range Azimuth Gating (RAG) on the RAF Lossiemouth and Inverness PSR's to remove all primary radar returns from the wind turbines from the radar display. RAG radar blanking blocks any primary radar return within selected ranges and azimuth sectors. The primary blanking in any area is complete which means that RAG radar blanking will remove primary radar returns from aircraft within the blanked area. To mitigate against this removal of primary radar coverage, it will be necessary to establish an airspace solution over the consented wind farm so that aircraft can be visible to ATC via another means.

2.2 Airspace Solution

To enable ATC to maintain an air picture and provide a safe ATS, it will be necessary to establish a Transponder Mandatory Zone (TMZ) over the Clash Gour wind farm location to ensure that aircraft equipped with a transponder will remain visible to ATC. Only aircraft fitted with a transponder will be permitted to overfly the RAG blanked area without first obtaining a clearance from ATC.

To facilitate the change summarised above, Clash Gour Holdings (CGH) instigated an Airspace Change Proposal (ACP) following the process set out in CAP 1616. A set of 7 Design Principles were developed which were used to evaluate and analyse the design options produced as possible solutions. Two design options were selected out of that process and were subject to consultation; both option comprised a TMZ over the wind farm location, one without a buffer zone (Option 7(E)) and one including a 2 NM buffer zone around the core wind farm area (Option 7(F)). CGH created a Consultation Strategy to identify, target and engage with specific stakeholders, launched, and completed a consultation exercise, and assessed, and analysed the 15 consultation responses. All the documentation relevant to this ACP can be found on the CAA airspace change portal - Airspace change proposal public view (caa.co.uk).

As covered in the Clash Gour Wind Farm Consultation Response document, there was one response identified as having the potential to impact the final design. Following

assessment, this response and suggestion was discounted and the proposed design was not revised.

After careful consideration of the responses to the consultation, Clash Gour Holdings Limited has decided to take forward Option 7(E) – RAG blanking over the proposed windfarm array locations with a simplified polygon TMZ 'rubber banded' around the proposed windfarm locations with no buffer, as described in the Consultation Document, through the formal ACP submission at Stage 4B in accordance with CAP 1616 with no additional changes to the proposal.

3 Current Airspace Description

3.1 Current Airspace Description

3.1.1 Structures and Routes

The proposed site for the Clash Gour Wind Farm, shown in red outline in Figure 3 below, is located within Class G airspace, which is established from ground level to Flight Level (FL)195 (approximately 19,500 ft). The airspace around the site is uncontrolled airspace where aircraft are permitted to fly without the need to submit a Flight Plan, be in radio contact with ATC or display any type of electronic conspicuity[1] that would allow the aircraft to be detected by ATC. There are no set routes and aircraft are free to fly anywhere, unrestricted and in any direction, as long as they abide by the weather minima stipulated for flight under Visual Flight Rules (VFR). Aircraft flying under Instrument Flight Rules (IFR) and in receipt of an ATS are also permitted to fly through this airspace. In this case, the air traffic controller will need to provide directional information to the aircraft to provide a minimum of 5 nm separation between the aircraft receiving a radar derived ATS and any unidentified aircraft in the area.

To the north of the windfarm site, there is a Military Aerodrome Traffic Zone (MATZ), controlled by ATC at RAF Lossiemouth. The MATZ is a circle radius 5 NM that extends vertically to 3,000 ft above the level of the aerodrome. Although civil recognition of the MATZ is not mandatory, it is good airmanship for pilots of civil aircraft to call ATC before entering the MATZ.

To the west, Inverness Airport has an Aerodrome Traffic Zone (ATZ) which is a circle radius 2.5 NM and extends vertically to 2,000 ft above the level of the aerodrome. The ATZ is established to provide protection to aerodrome traffic including those aircraft at the critical stages of flight (take-off and landing). At present, there is an Airspace Change Proposal in place that is looking to establish controlled airspace around Inverness to further protect inbound and outbound traffic.

Above Inverness Airport ATS routes flow roughly north to south. These are generally used by commercial air transport for routing between airports across Scotland. The heights of these routes vary depending on their location, but in the vicinity of Inverness Airport, the routes are generally from 9,500 ft and above. Although these routes are Controlled Airspace (CAS), their classification is such that aircraft flying VFR can fly through these routes without talking to ATC.

To the east of the proposed site lies the busy airspace around Aberdeen International Airport. The CAS around Aberdeen Airport, and the ATS routes to the south, are a higher classification of airspace where stricter rules are implemented should aircraft wish to fly in these areas.

[1] In the UK, CAA Policy states that all civilian aircraft must operate a transponder above FL100, although exceptions apply in certain areas.

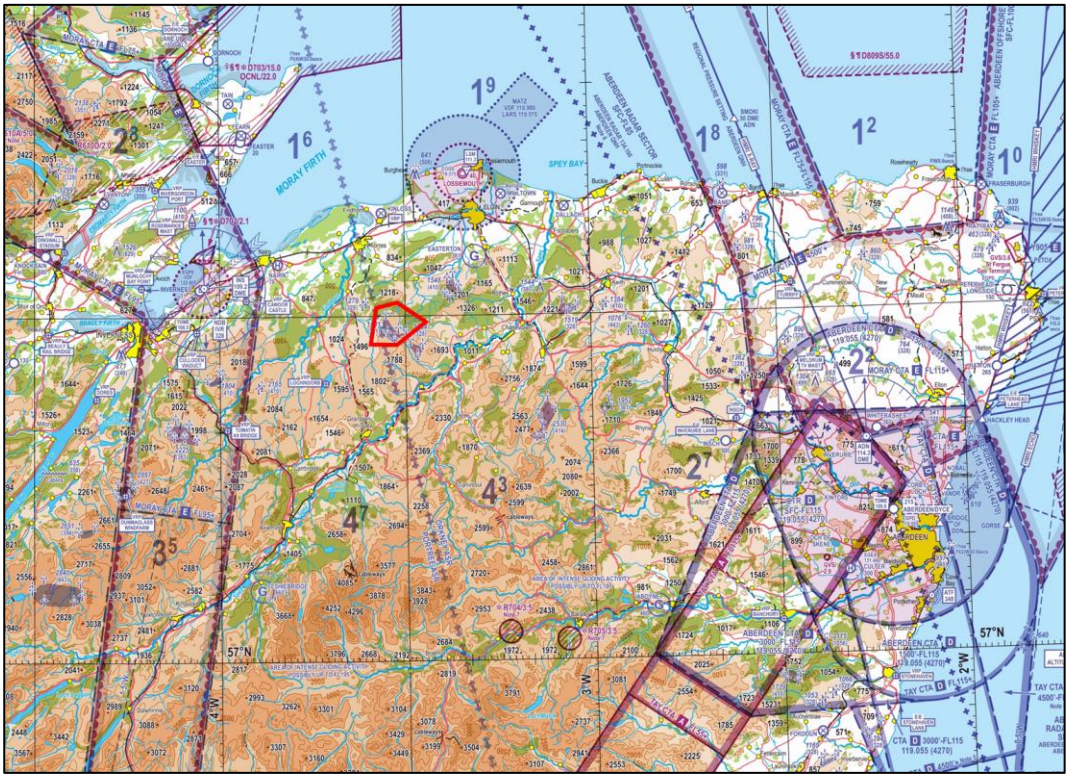


Figure 3 – Current Local Airspace Structure

In the UK, CAA Policy states that all civilian aircraft must operate a transponder above FL100 (approximately 10,000 ft). A transponder is a piece of electronic equipment that transmits a signal that identifies the aircraft, along with details of the aircraft's altitude. This signal is interrogated by a ground-based Secondary Surveillance Radar (SSR), which displays the information to ATC. However, some exemptions exist to the policy which enables aircraft to operate above FL100 without a transponder subject to specific rules and areas of operation. One such example of aircraft being permitted to operate above FL100 without a transponder are gliders.

Non-SSR Glider Areas have been established to accommodate non-transponder equipped glider operations at and above FL100. One such area (Area 1 in Figure 4 below) encompasses the area above the proposed Clash Gour wind farm site. Between FL100 and FL195 (approximately 19,500 ft), gliders are able to operate in this area without the use of a transponder or talking to ATC (unless they require access to CAS). In addition, further areas have been established to allow gliders to operate above FL195 also without use of a transponder. However, in these areas, the gliders must be equipped with a radio which must be operated in accordance with the instructions in the UK AIP ENR 1.11. The Scottish Area North Temporary Reserved Area (Gliding) (TRAG), as shown in Figure 4 below, is established above the proposed Clash Gour site and permits non-SSR glider operations up to FL270.

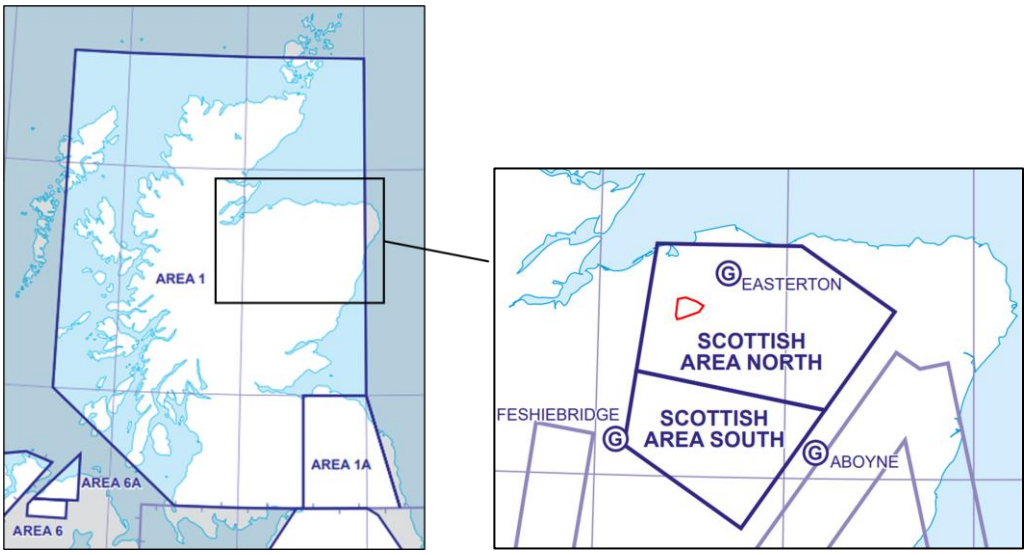


Figure 4 – Glider Areas

Source: NATS UK AIP ENR 6

3.1.2 Airspace Usage

An initial qualitative traffic assessment conducted at Stage 2 of the ACP process concluded that the proposed area for Clash Gour featured low traffic levels involving users such as local general aviation (GA) traffic; gliding; recreational and leisure aircraft; military transit and training traffic; as well as infrequent off-route commercial air traffic.

At Stage 3 of the ACP process, a more detailed quantitative analysis of traffic within the area surrounding the proposed wind farm development was conducted. The aim of the analysis was to determine the type and density of transiting traffic in the area and estimate the number of aircraft potentially affected by the proposed airspace solutions. The analysis was conducted using an online aircraft tracking system in an area extending 10nm from the centre of the proposed Clash Gour site, as shown in Figure 5 below. The survey was conducted for a time period of 2 weeks during August 2022, which was expected to be a busy period for recreational flight in the area and therefore representative of a high use period.

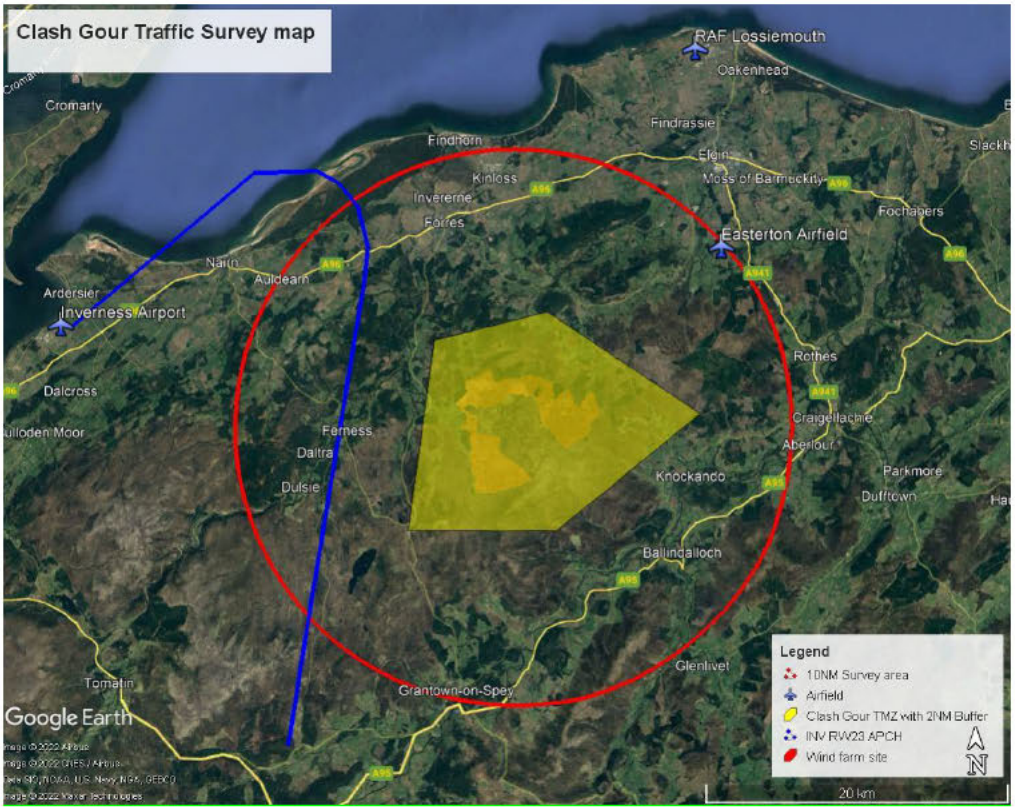


Figure 5 – Traffic Survey Area

Source: Google Earth

During the 2-week period, a total of 468 movements transited the surveyed volume of airspace. Of this total, 263 movements transited the surveyed volume below 20,000 ft, averaging approximately 19 movements per day. The most movements on a single day was 34 on the 10th August. The least was 6 movements on the 13th August. Fifty-nine of the movements were aircraft inbound to Inverness Airport and were concentrated on a path in the western side of the surveyed area that went from south to north to make a left turn for Runway 23. These can be seen on the left-hand side of Figure 6 below. Seventy-four of the movements were General Aviation (GA) aircraft, including single engine piston aircraft, twin engine GA aircraft, gliders or other GA aircraft. Figure 6 below provides a representation of the aircraft tracks in the vicinity of the proposed Clash Gour site for the 24-hour period on the 10th August, the busiest day.

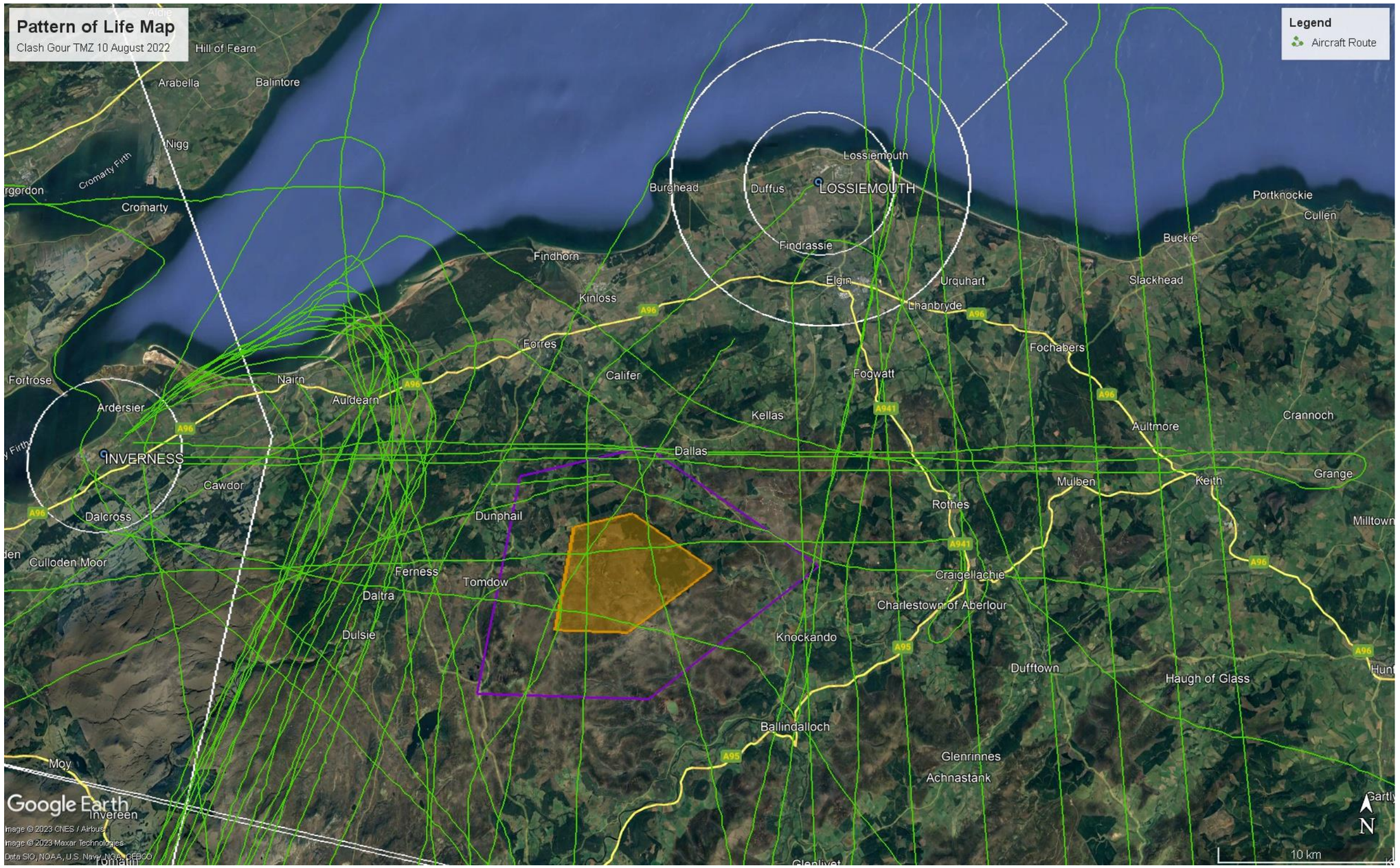


Figure 6 – Pattern of Life Map – 10th August 2022

Source: Google Earth

Only aircraft carrying the necessary transponder equipment were identified by the aircraft tracking system. As previously stated, it is not mandatory in the UK for all aircraft to carry a transponder and therefore movements of non transponding aircraft in the area (particularly GA) may have occurred that have not appeared in the survey. To estimate the maximum potential effect of the development, a scaling factor has been applied to the GA traffic data.

Although an exact figure is difficult to determine, a report produced as part of a project working on behalf of the CAA to Develop Minimum Technical Standards for Electronic Conspicuity and Associated Surveillance suggests that approximately 40% of GA aircraft are fitted with the appropriate equipment. It can therefore be estimated that as well as the 74 transponding GA aircraft identified in the survey, there would have been a further 111 aircraft not fitted with the equipment, and therefore not identified in the survey. This would give a total of 185 GA aircraft over the two weeks surveyed. This averages at approximately 13 movements per day and considering that the survey took place at the height of summer, when GA traffic is busiest, this figure is likely to be an upper estimate when compared to the rest of the year. Of these 13 aircraft, 5 are likely to be fitted with transponder equipment, and would not be required to avoid a TMZ. Therefore, it can be estimated that on average, only 8 aircraft per day would be flying in the area without the use of a transponder. Not all of these aircraft may need to avoid the TMZ as their routing may avoid the proposed area anyway.

From the data available, it was deduced from the traffic survey that the airspace above the wind farm is a low-density air traffic environment. However, although the data source used for the survey takes aircraft position data from Automatic Dependent Surveillance–Broadcast (ADS-B), Multilateration (MLAT[2]), FLARM and the Open Glider Network (OGN) and is one of the most comprehensive aircraft tracking sites available, it does not show the full air picture.

Following the consultation for the ACP, additional data was provided by the Highland Glider Club at Easterton Airfield to the Change Sponsor in the form of a SkyDemon Heatmap, as shown in Figure 7 below. SkyDemon is a flight-planning software tool used for VFR flights by General Aviation users that can also be used in flight to provide notification of potential hazards. The flights shown in Figure 7 cover a 3-year period from March 2020 to March 2023 and have been recorded using GPS data. They are comprised of SkyDemon users' log files that have been saved to the SkyDemon Cloud.

[2] Multilateration

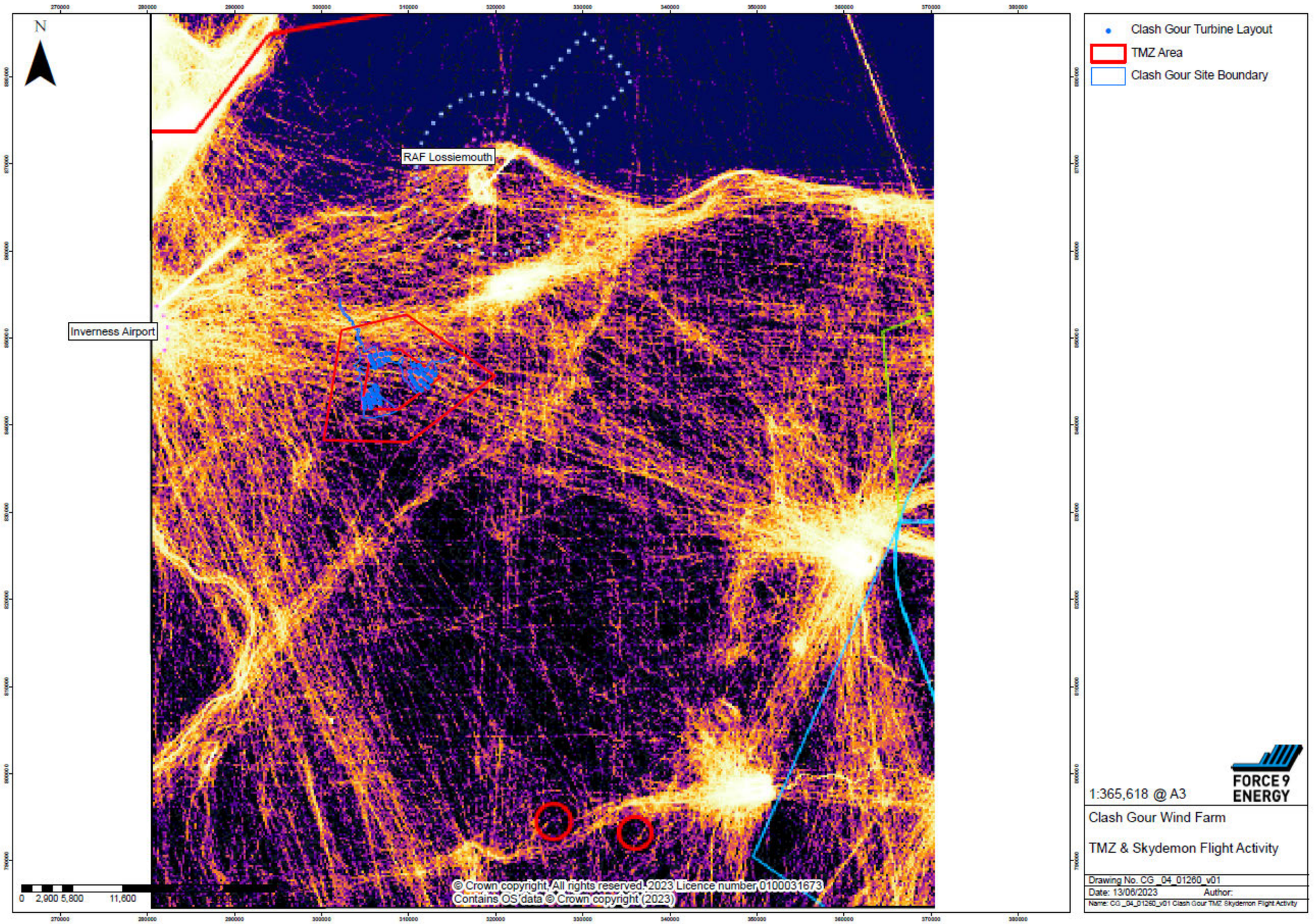


Figure 7 – SkyDemon Flight Activity

In addition to the SkyDemon image, a second image, Figure 8 below, was also provided that showed glider traces from the Highland Glider Club, based at Easterton Airfield. These traces were recorded on FLARM and provided by the Highland Glider Club which noted that it covered the same period to the SkyDemon image, and uploaded to the British Gliding Associations National Competition Ladder database. The image includes an estimate of the outline of the proposed TMZ with buffer zone imposed by the Highland Glider Club, shown as a black outline on Figure 8 below.

It should be noted that both images contain flight data obtained during two lockdown periods so levels of activity are likely to be lower than the norm.

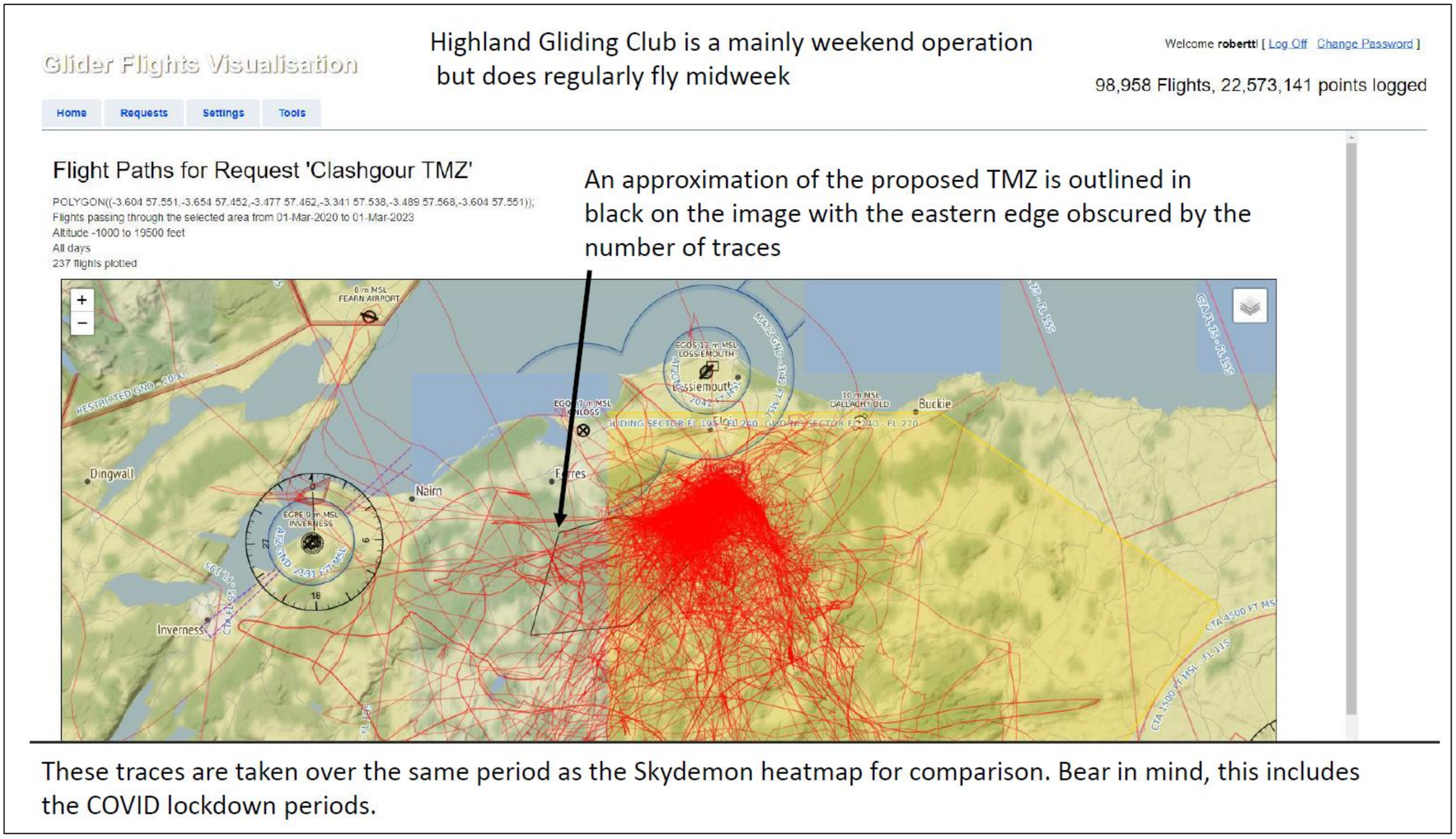


Figure 8 – Highland Glider Club Flight Activity

Figure 9 below shows the same FLARM data but the image has been georeferenced for position accuracy and includes the outline of the proposed TMZ, with and without the buffer zone, as shown in orange outline in Figure 9 below.

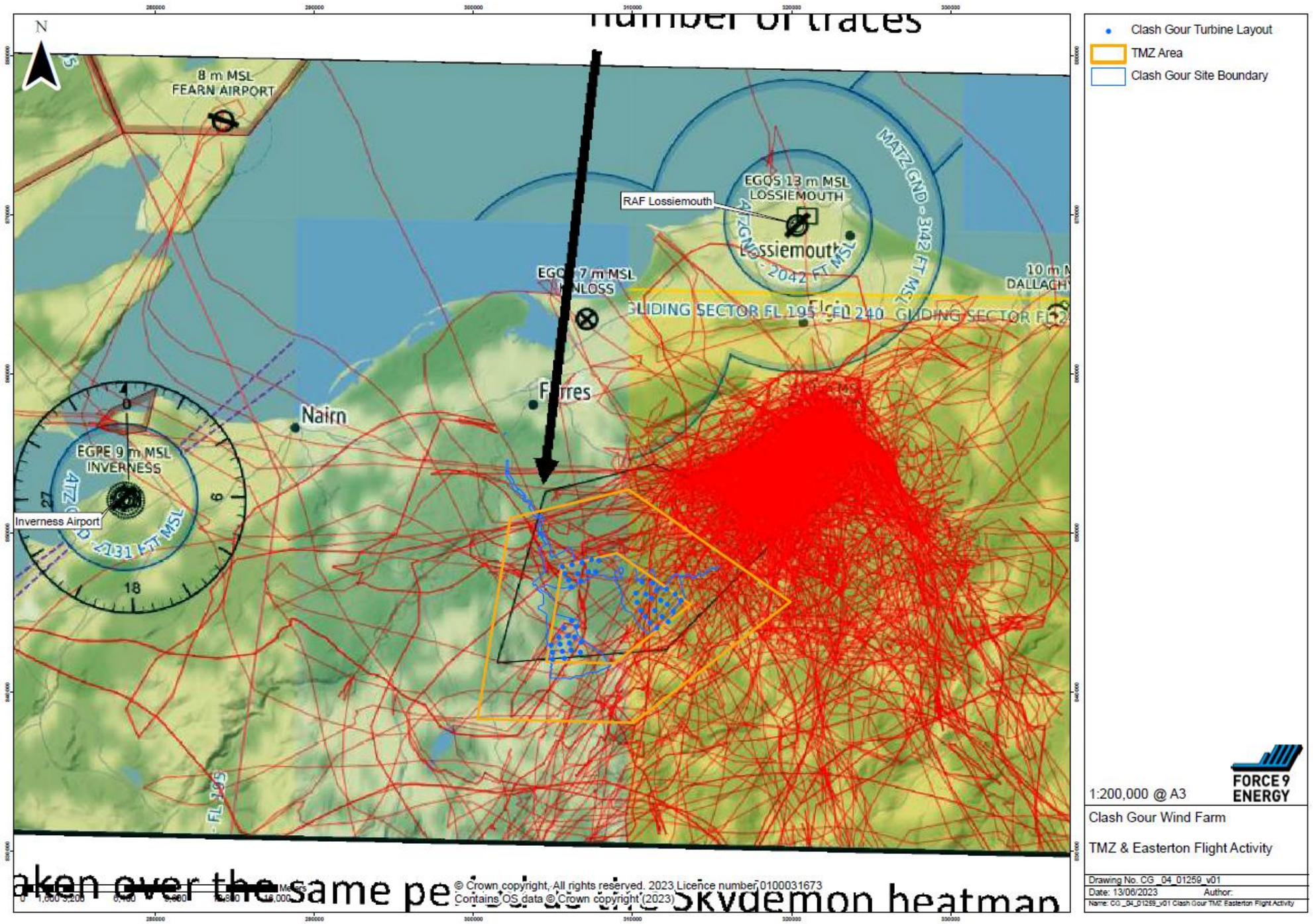


Figure 9 – Highland Glider Club Flight Activity - Georeferenced

Information provided from the Highland Glider Club suggests that 237 flights passed through the proposed area including the buffer zone (based on the black outline provided by the club) during the 3-year period.

In relation to Figure 7 above, although the SkyDemon image does not contain any information relating to the number of aircraft flying through the area, concentration of tracks can be seen to the north of the proposed TMZ, along the River Spey valley and between Insch Airfield (west of Aberdeen) and Inverness Airport. Aircraft flying between Insch Airfield and Inverness Airport would currently route through the area of the proposed TMZ.

In relation to Figure 8 above, the FLARM data indicates that 237 flights would have flown through the approximate area of the TMZ, indicated by the black outline (an estimated location for the TMZ imposed on the image provided by Highland Glider Club), with a concentration of tracks in the northeast area close to Easterton Airfield, over the three-year period. When the position of the TMZ is georeferenced for position accuracy, per Figure 9 above it is clear there are less tracks within the proposed TMZ, including the buffer zone than the estimate provided by the Highland Glider Club.

The traffic survey conducted by the Change Sponsor determined that there could be up to 8 aircraft per day would be flying in the area without the use of a transponder. As the survey took place at the height of summer, when GA traffic is busiest, this figure is likely to be an upper estimate when compared to the rest of the year.

3.1.3 Proposed Effect

The effect of the proposed mitigation is to remove the clutter created by the detectability of the operational wind turbines by deploying Range Azimuth Gating (RAG) on the RAF Lossiemouth and Inverness PSR's. RAG radar blanking blocks any primary radar return within selected ranges and azimuth sectors. This can be mapped to suppress plots within wind turbine clutter regions. However, the primary blanking in any area is complete which means that RAG will also remove primary radar returns from aircraft within the blanked area.

To mitigate against this removal of primary radar coverage, aircraft entering the blanked area will either be required to operate a serviceable transponder so that aircraft can be visible to ATC through secondary radar or obtain radio clearance from the controlling Authority to transit the area. Should a non-transponder aircraft be unable to obtain the required clearance, they will be required to re-route to avoid the TMZ area.

3.1.4 Operational Efficiency, Complexity, Delays and Choke Points

There is no impact for operational efficiency, complexity, delays and choke points in the current situation. The flight patterns detected based on the evidence collected suggests that GA activity tends to be concentrated north of the proposed site for the wind farm, around the ridges associated with the Hill of Wangie and along the River Spey valley to the east of the site.

3.1.5 Safety Issues

There are no current safety issues within the relevant areas of airspace.

3.1.6 Environmental Issues

There are no specific environmental issues within the relevant area of airspace, in the current operation.

4 Statement of Need

4.1 Introduction

A DAP1916 Statement of Need was submitted to the CAA Airspace Change Portal in June 2021. However, following guidance from the Airspace Regulator at the Assessment Meeting with the CAA, an updated Version 2 was submitted to the Airspace Change Portal in October 2021.

Since the submission of the Statement of Need, the principle of the development was established through an application to Scottish Ministers under the Electricity Act 1989 and that application was consented by Scottish Ministers on 21st October 2022. The standard conditions mentioned below in the Statement of Need have been attached to the grant of consent relating to aviation matters. Each condition requires the development and agreement of an Air Traffic Control Radar Mitigation Scheme (ATCRMS) each in respect of both RAF Lossiemouth and Inverness Airport. The conditions require to be discharged before turbines can be operated on site. Details of the conditions can be found in Section 1.

4.2 Statement of Need

The following text is from the DAP1916 Statement of Need Version 2 form, as submitted in October 2021:

Current Situation:

EDF Energy Renewables Limited (EDFER), jointly with Force 9 Energy, are planning to develop Clash Gour Wind Farm in the name of its wholly owned subsidiary, Clash Gour Holdings Limited (CGH). Clash Gour will be a substantial, strategically important onshore wind farm with significant environmental, economic and regional benefits. It shall be located approx. 13 nm southwest of RAF Lossiemouth and 15 nm southeast of Inverness Airport.

Issue:

As part of the planning process, EDFER/CGH have engaged with all relevant aviation stakeholders to determine the impact of Clash Gour's wind turbines on aviation radar systems and operations. In particular, the Ministry of Defence (MOD) has confirmed that the development will have an adverse impact on their ability to provide Air Traffic Services (ATS) due to interference caused by wind turbine generators to the Primary Surveillance Radar at RAF Lossiemouth. As a result, EDFER/CGH have agreed the wording of standard conditions with the MOD which are expected to be attached to the grant of any consent for the wind farm. The condition controls implementation of the planned wind farm development so that it "cannot operate until a suitable mitigation solution for its Air Traffic Control Radar has been tested, proven and implemented".

Action:

EDFER/CGH have employed Osprey Consultancy Services Limited to investigate potential impacts of wind turbines on MOD and other aviation stakeholder operations. Discussion with MOD has suggested that the Airspace Change Process (CAP 1616)

should be initiated in order to manage the development of airspace-related mitigation options.

Clash Gour Wind Farm will be a strategically important onshore wind farm development and EDFER/CGH require the mitigation options to be investigated and understood prior to a funding decision in Q4 2022. As a result, EDFER/CGH are keen that the Airspace Change Process is initiated as soon as possible.

5 Airspace Change Proposal

5.1 Introduction

5.1.1 Objectives/Requirements for Proposed Design

Force9 Energy (Force9), jointly with EDF Energy Renewables Limited (EDFER) is developing the Clash Gour Wind Farm (Clash Gour) in the name of its wholly owned subsidiary Clash Gour Holdings (CGH).

CGH intend to develop an onshore wind farm in the Moray Council area which will be capable of providing electricity to approximately 200,000 houses. The principle of the development has been established through an under the Electricity Act 1989 which was consented by Scottish Ministers on 21st October 2022.

Two conditions are attached to the grant of consent which require to be discharged before turbines can be erected and operated on site. Each condition requires the development and agreement of an Air Traffic Control Radar Mitigation Scheme (ATCRMS) each in respect of both RAF Lossiemouth and Inverness Airport. This ACP does not discuss or consult upon the principle of the development itself and deals solely with proposed airspace solutions as mitigation to any effect the windfarm may have on the Air Traffic Control (ATC) capability of the two units.

The justification for this airspace change is to enable the construction of the Clash Gour Wind Farm. In its decision on Clash Gour wind farm Scottish Ministers recognised that "The proposed Development makes a significant contribution towards meeting greenhouse gas emission and renewable electricity targets" and "Scottish Ministers are satisfied that the proposed Development would provide carbon savings, and that these savings would be of an order that weighs in favour of the proposed Development". These benefits will only be realised if the airspace change is implemented, and the wind farm is built.

The objectives of this proposal are to:

- Ensure aviation safety, with no increased risk to an ATC Officer's ability to detect aircraft conflictions.
- Meet the terms of the conditions requiring an ATRMS for this wind farm development to enable its construction and realise significant environmental benefits by the generation of renewable energy.

The TMZ is intended to come into effect for wind turbine testing and then operation and the requirement to retain it will be removed once technical mitigation options are available and working to satisfaction of the relevant authorities, subject to the agreement of those authorities.

5.1.2 Proposed New Airspace/Route Definition and Usage

The proposed Air Traffic Control Radar Mitigation Scheme (ATCRMS) for the Clash Gour Wind Farm development is radar blanking of the wind farm array locations with a complimentary TMZ around the proposed wind farm locations (Option 7(E)[3]),

[3] As described in Section 4 of the Clash Gour Wind Farm ACP Consultation Document

Figure 10 illustrates the lateral extent of the proposed TMZ. The vertical extent of the TMZ will be from the surface to Flight Level (FL)195.

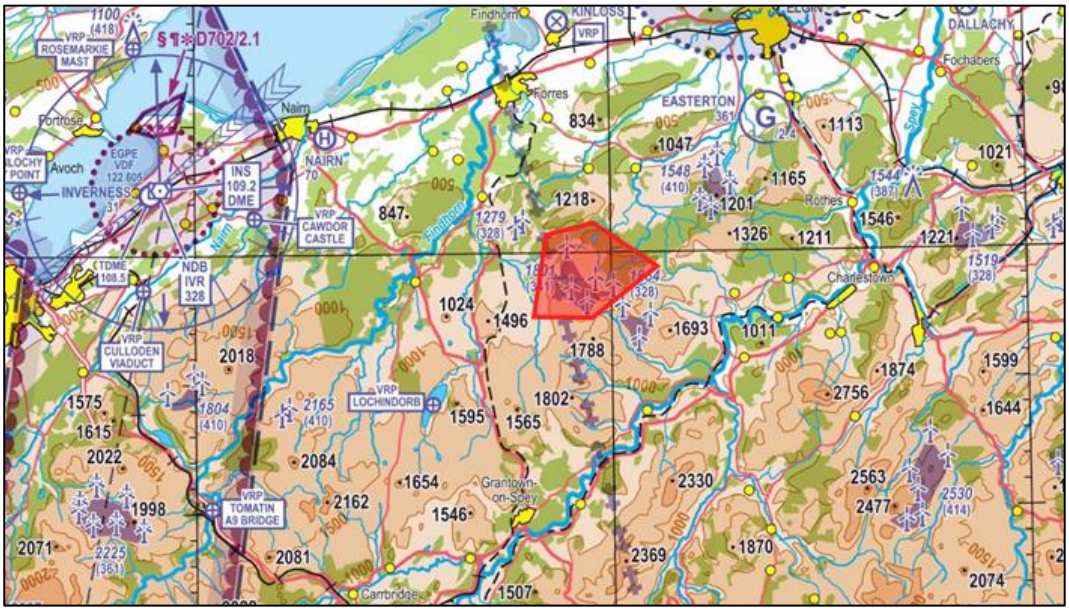


Figure 10 – Proposed Clash Gour Wind Farm Transponder Mandatory Zone

The proposed wind farm is located approximately 13 NM southwest of RAF Lossiemouth and 15 NM southeast of Inverness Airport. The TMZ will be located in Class G airspace, which is established from surface to FL195. To the north of the site, there is a Military Aerodrome Traffic Zone (MATZ), controlled by ATC at RAF Lossiemouth and to the west, there is an Aerodrome Traffic Zone (ATZ) for Inverness Airport. Above the site, there is a Non-SSR Glider Area to accommodate non-transponder equipped glider operations at and above FL100. Between FL100 and FL195, gliders are able to operate in this area without the use of a transponder or talking to ATC.

The proposed TMZ shape is a simplified polygon that will be tight around the wind farm location to cover the wind farm array and the radar blanking region and does not include a Buffer Zone. The simplified TMZ boundary shape is advantageous for the simplicity of display to pilots on in-cockpit electronic flight information system (EFIS) displays and ATC operators on radar displays. It will also mean the TMZ will be clearly recognisable from the array as the extent of the wind farm development itself, A simple shape is preferable for Human Factors reasons. This reasoning has been utilised in previous wind farm TMZ mitigations to design the TMZ boundary and has been effective.

5.1.3 Changes Between Consultation and Final Proposal

There are no changes to Option 7(E) as a result of the consultation, as described in the 3D – Categorisation of Consultation Responses and the Clash Gour Wind Farm Consultation Response documents.

The coordinates of the proposed TMZ boundary and draft AIP changes for the proposed TMZ area are in Appendix A2.

5.1.4 Controlling Authority

The MOD have confirmed that RAF Lossiemouth ATC would be able to take on the Controlling Authority responsibilities for the proposed TMZ.

Designating Lossiemouth ATC as the Controlling Authority for the TMZ may result in an increase in ATC workload caused by additional radio communications for aircraft wanting to transit through the area of the TMZ. However, the numbers requiring this service is anticipated to be low and this is therefore not expected to increase ATC workload beyond a safe level. There will continue to be a requirement for ATC to tactically manage aircraft operating in Class G airspace, but this is expected to remain the same as under current operating conditions.

A Letter of Agreement will be agreed between RAF Lossiemouth and Inverness ATC detailing the procedures that will be required to allow Inverness ATC an understanding of when non-transponding traffic has been given permission to fly through the TMZ, so Inverness traffic is able to re-route or safely transit the TMZ under an SSR-alone service.

5.2 Engagement and Consultation Activity

During Stages 1 and 2 of the ACP, CGH engaged with stakeholders identified as those being most likely to be affected by the proposed implementation of a TMZ, with the aim to define design principles, drawing up a comprehensive list of options, and appraise the impacts of those options. These stakeholders are listed in Appendix A1. Details of the engagement activities completed prior to the consultation going live, including a summary of the responses received, can be found in the Design Principles Engagement Report V1.1 and Stakeholder Engagement Issue 2 documents on the Clash Gour Wind Farm airspace change portal.

In Stage 3, CGH commenced a 9-week consultation period on this proposed airspace change and the two options (7(E) and 7(F)) to be considered on Wednesday 29th March 2023. The consultation was conducted via an online portal where users could submit a formal response alongside viewing the Consultation Document. The consultation document provides information on how the consultation was administered; an overview into the current airspace; the proposed changes and impacts of the proposed changes. The consultation period was closed on Wednesday 31st May 2023. A total of 15 responses were received during this period. A full summary of how the consultation was run and assessment of responses can be found in the Consultation Response document.

5.3 Impacts and Consultation

5.3.1 Net Impacts Summary for Proposed Route

Due to the small scale of the proposed TMZ, any re-routing required by aircraft (without a transponder and not in communication with ATC) is expected to be minimal, resulting in minimal additional noise, greenhouse gas and fuel burn impacts. The wind farm is expected to provide a greater environmental benefit by saving of approximately 0.5 million tonnes of CO_2 emissions per annum, which will only be realised if the airspace change is implemented, and the wind farm is built.

This must be considered in balance against the minimal environmental impacts of displaced air traffic.

This proposal would require all aircraft entering the area without ATC clearance to be transponder equipped. This will have a minor impact on airspace access for some GA users. This is applicable to those GA aircraft that are not equipped with a transponder and are not in communication with ATC. There may also be some consequential impacts on other airspace users caused by the displacement of some traffic from the area of the TMZ. See paragraphs 5.3.3 to 5.3.6 below.

5.3.2 Units Affected by the Proposal

Air Traffic Services in this region are provided by Inverness Airport, RAF Lossiemouth and NATS En-Route (NERL). The change sponsor has engaged with these units and consulted with them during the CAP 1616 process both directly and through the National Air Traffic Management Advisory Committee (NATMAC). Consultation responses were received from the MOD through DAATM for RAF Lossiemouth, HIAL, on behalf of Inverness Airport and NATS. Further details of these responses can be found in the Consultation Response document and paragraphs 5.3.4 to 5.3.6 below.

Local GA airfields and clubs were engaged and consulted with directly. In addition, as the area of the proposed TMZ is in Class G airspace, open to any airspace users, national GA organisations were engaged and consulted with through the NATMAC. Consultation responses were received from representatives of local GA clubs at Easterton Airfield, as well as members of the NATMAC. Further details of these responses can be found in the Consultation Response document and paragraph 5.3.5 below.

5.3.3 Access by Non-Transponder Equipped Aircraft

This proposal would require all aircraft entering the area of the TMZ without ATC clearance to be transponder equipped. In line with the Safety and Airspace Regulation Group (SARG) policy on TMZs, provision should be made by the TMZ Controlling Authority for aircraft that are unable to comply with the notified requirements for flight in a TMZ to gain access, where a demonstrable requirement exists. Such provisions will be promulgated in the AIP. Should a non-transponder aircraft be unable to obtain the required clearance, then they will be required to re-route to avoid the TMZ area.

5.3.4 Military Impact and Consultation

CGH has engaged and consulted directly with the MOD throughout the ACP process.

An initial response to the consultation was received from the MOD through DAATM which noted the MoD had concerns with the proposal based on the negative impact the proposal would have on RAF Lossiemouth operations. The MOD stated in their initial response that they considered Option 7(F) (TMZ with a 2 NM Buffer Zone[4]) to be the least-worst option. However, despite their initial objection, the MOD recognised in its response that for the short term there will need to be airspace mitigation, until a permanent technical mitigation solution is determined by the

[4] As described in Section 5 of the Clash Gour Wind Farm ACP Consultation Document

Change Sponsor. The MOD noted that it would continue to engage in open and honest conversations throughout the ACP process.

The Change Sponsor acknowledges the respondents concerns regarding flight safety primarily caused by the displacement of non-transponding traffic from the area of the TMZ. Evidence provided by the Highland Glider Club suggests that implementing the proposed TMZ with a 2 NM Buffer Zone would cause GA aircraft to be displaced to the north, into an area that may impact RAF Lossiemouth operations (see paragraph 5.3.5 below).

Without the buffer zone, Option 7(E) is the smallest area required to be able to blank the wind turbines from the radar displays and the impact is likely to be reduced relative to the proposal with a buffer because fewer non transponding aircraft are likely to be affected. Evidence obtained highlights that there is already GA activity in this area and it is considered that the number of non-transponding aircraft that would need to route around the TMZ to the north would not change the current impact.

CGH have continued to engage with the MOD and RAF Lossiemouth with respect to the issues raised in the consultation response. In particular, the main concern for RAF Lossiemouth remains that non-transponding aircraft that route around the TMZ are likely to be pushed closer to RAF Lossiemouth arrival and departure patterns. This has the potential to impact the air safety of RAF Lossiemouth arrivals and departures or preclude efficient arrivals and departures for Lossiemouth aircraft that require a Deconfliction Service. However, following discussions, the MOD has stated that Option 7(E) would be the 'least-worst option'.

Further discussion has led to an agreement that RAF Lossiemouth ATC would act as the Controlling Authority for the TMZ. This may result in an increase in ATC workload caused by additional radio communications for aircraft wanting to transit through the area of the TMZ. However, the numbers requiring this service is anticipated to be low, based on the evidence presented in section 3 and below and this is therefore not expected to increase ATC workload beyond a safe level. This could however increase the situational awareness for Controller's at RAF Lossiemouth, therefore reducing any negative impact on RAF Lossiemouth operations.

CGH considers that the proposed TMZ creates a path to future testing of technical radar-based mitigation options and creates a path to satisfy the aviation related conditions attached to the grant of consent for the wind farm.

5.3.5 General Aviation Airspace Users Impact and Consultation

CGH has engaged and consulted directly with local GA clubs and members of the NATMAC representing the GA community throughout the ACP process. Responses were received from three NATMAC members (Light Aircraft Association, British Gliding Association and General Aviation Alliance) as well as five responses from members of the GA community (three of which were from the same individual representing 2 separate organisations). All responses received from the GA community objected to the proposed changes (both options) based generally on the impact the changes would have on GA operations.

Design Principle 2 states that the airspace change should minimise the negative impact on all airspace users. It is considered that there may be some impact caused by the implementation of a TMZ on some stakeholder operations, but the Change

Sponsor considers that this impact is likely to be minimal, for the reasons outlined below.

Following the consultation for the ACP, additional data was provided to the Change Sponsor in the form of a SkyDemon Heatmap, as shown in Figure 11 below and previously described in Section 3. The flights shown in Figure 11 cover a 3-year period from March 2020 to March 2023 and have been recorded using GPS data. The original SkyDemon image provided has been georeferenced for position accuracy and the outline of the proposed TMZ has been included for reference.

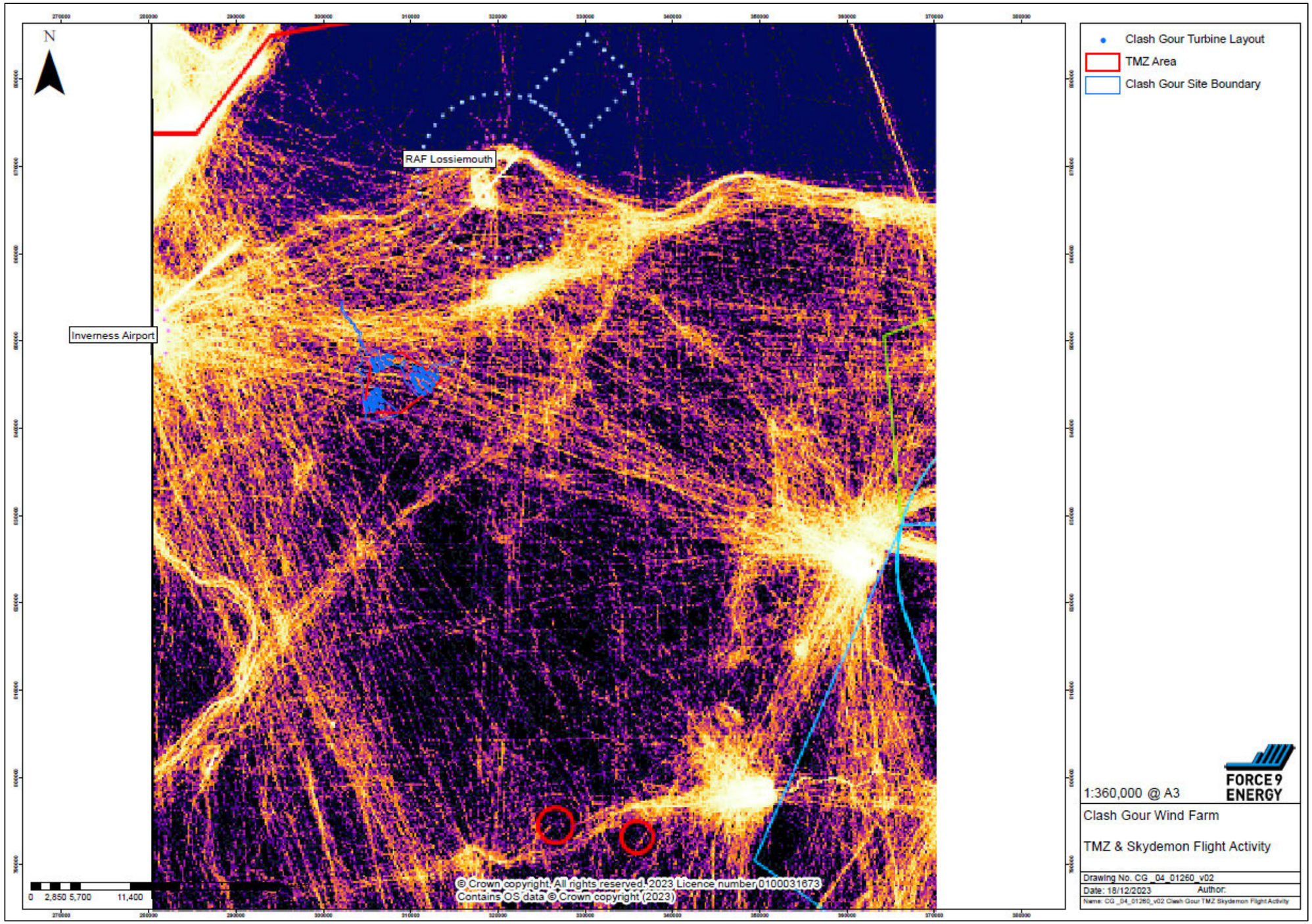


Figure 11 – SkyDemon Flight Activity with Proposed TMZ

Figure 12 below shows an enlarged area of the same image around the proposed area of the TMZ. Although the image does not contain any information relating to the number of aircraft flying through the area, concentration of tracks can be seen to the north of the proposed TMZ, along the River Spey valley and between Insch Airfield (west of Aberdeen) and Inverness Airport. Aircraft flying between Insch Airfield and Inverness Airport would currently route through the area of the proposed TMZ and if any of those aircraft are not equipped with a transponder or radio, they would need to amend their route to avoid the TMZ.

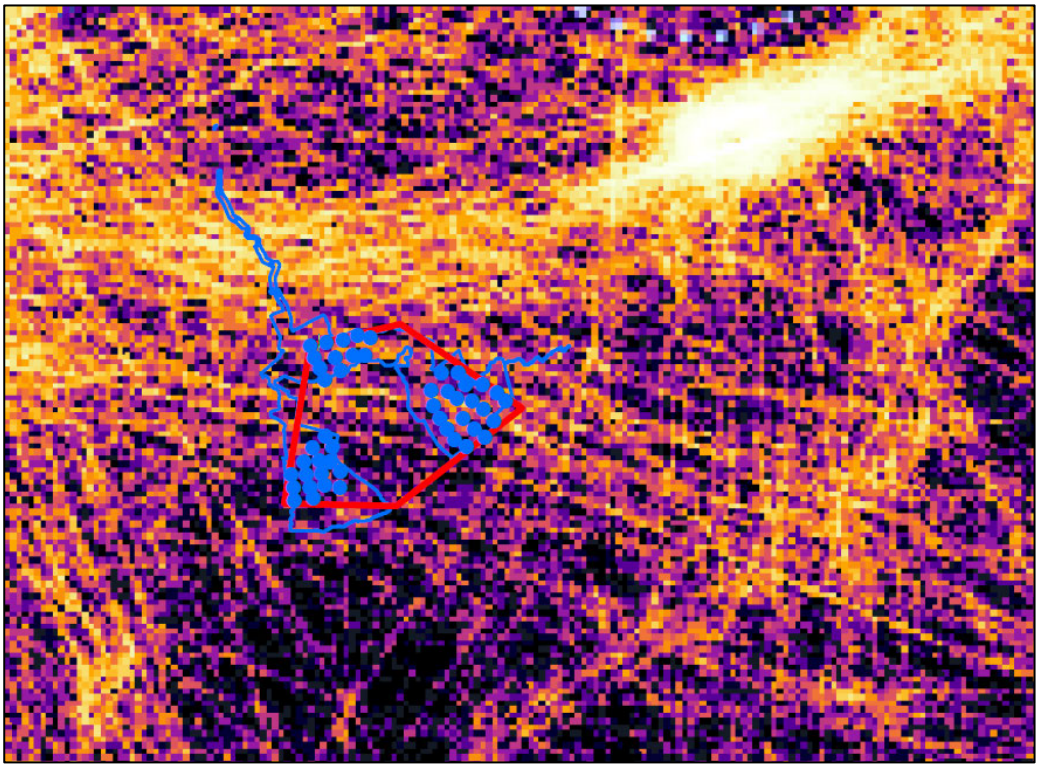


Figure 12 – SkyDemon Flight Activity - Enlarged

In addition to the SkyDemon image, a second image was provided that showed glider traces from the Highland Glider Club, based at Easterton Airfield. These traces were recorded on FLARM over the same period to the SkyDemon image, as described in Section 3. The image includes estimate of the outline of the proposed TMZ with buffer zone imposed by the Highland Glider Club, shown as a black outline on Figure 13 below.

It should be noted that both images contain flight data obtained during two lockdown periods so levels of activity are likely to be lower than the norm.

The original image provided has been georeferenced for position accuracy, and includes an approximate outline of the proposed TMZ with buffer zone (black outline) and the outline of the proposed TMZ (orange outline).

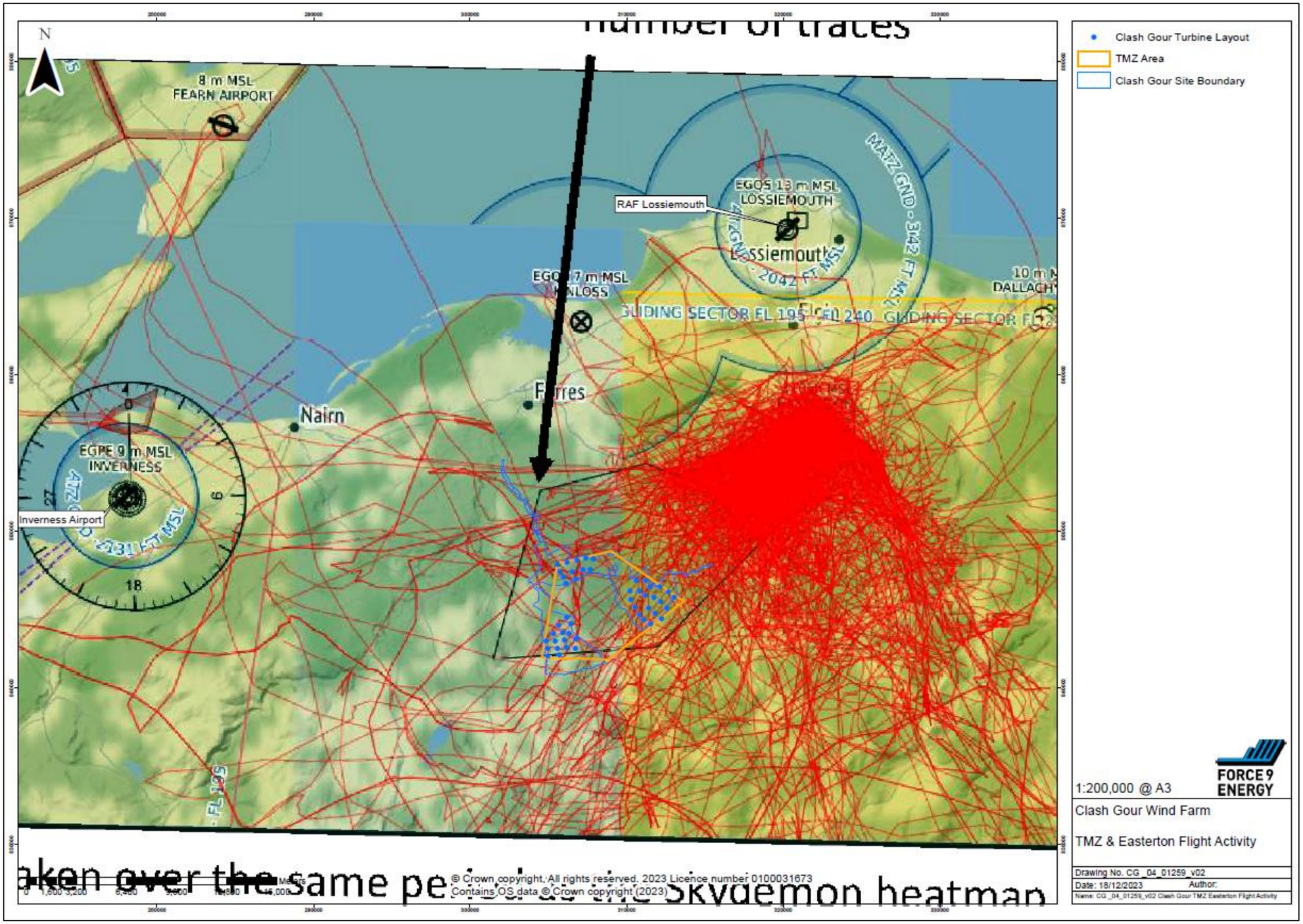


Figure 13 – Highland Glider Club Flight Activity with Proposed TMZ

Information provided from the Highland Glider Club suggests that 237 flights passed through the proposed area including the buffer zone (based on the black outline provided by the club) during the 3-year period.

Figure 14 below shows an enlarged area of the same image around the proposed area of the TMZ.

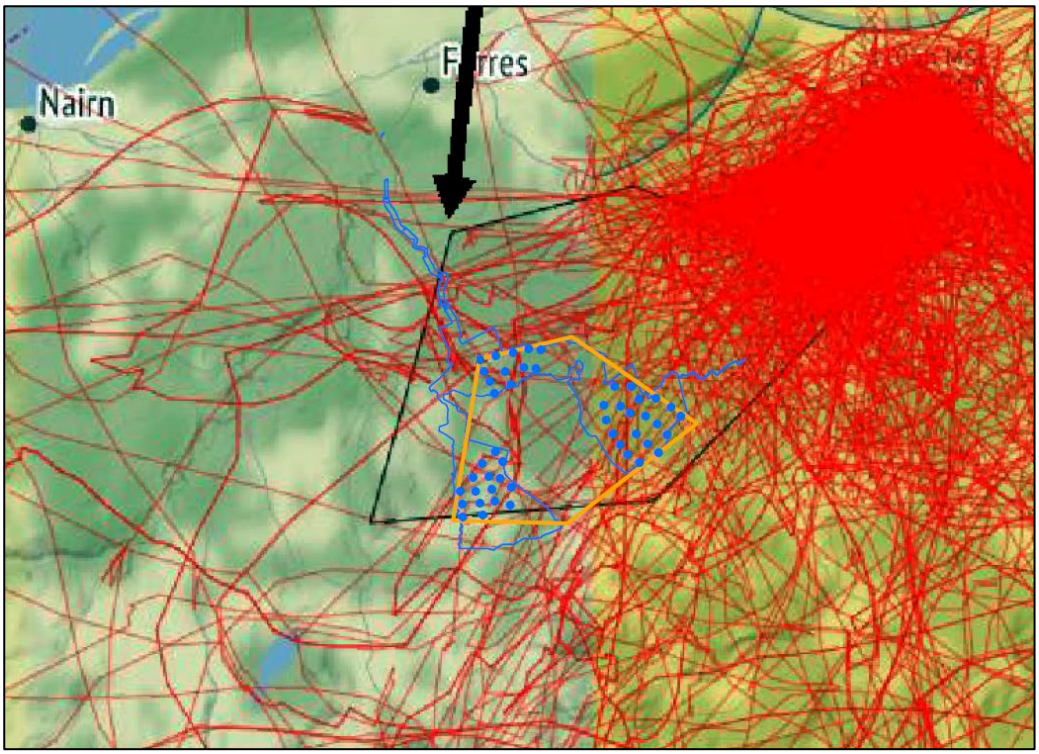


Figure 14 – Highland Glider Club Flight Activity - Enlarged

Although there are clearly tracks shown in both Figures 12 and 14 that routed through the area of the proposed TMZ, the level of activity in the area without the buffer zone is low, compared to the number of tracks observed to the northeast, considering the 3-year time period. There is no indication on either image as to whether the aircraft producing the tracks would be transponder and/or radio equipped. However, given the previous assumption, as described in a report produced as part of a project working on behalf of the CAA to Develop Minimum Technical Standards for Electronic Conspicuity and Associated Surveillance, that approximately 40% of GA aircraft would be suitably equipped, approximately 60% of those tracks that are shown routing through the proposed area of the TMZ may be required to avoid it in future. Given the current levels of activity in the areas around the proposed TMZ, and the airspace available in the surrounding area, the Change Sponsor considers that the displacement of traffic from the area of the TMZ would not result in the creation of choke points or induce any more funnelling of aircraft than is currently experienced.

The FLARM image in Figure 14 indicates that 237 flights would have flown through the approximate area of the TMZ, indicated by the black outline, with a concentration of tracks in the northeast area close to Easterton Airfield, over the three-year period. However, the number of tracks that flew through the area of the proposed TMZ is

considerably less than the total of 237 flights based on accurate georeferencing of the proposed TMZ area against the tracking data. As previously described, some of these flights may also be transponder or radio equipped so would not be required to avoid the area if the TMZ is implemented.

The traffic survey conducted by the Change Sponsor determined that there could be up to 8 aircraft per day flying in the area without the use of a transponder. As the survey took place at the height of summer, when GA traffic is busiest, this figure is likely to be an upper estimate when compared to the rest of the year. Not all of these aircraft may need to avoid the TMZ as their routing may avoid anyway or they may be radio equipped so would be able to gain clearance to transit through the area of the TMZ.

Although exact numbers are difficult to determine, the above information shows that the number of aircraft that would be required to re-route to avoid the area would be small.

5.3.6 Commercial Air Transport Impact and Consultation

CGH has engaged and consulted directly with Inverness Airport through Highlands and Islands Airports Limited (HIAL) throughout the ACP process. HIAL responded to the consultation, objecting to the proposed TMZ on the basis of the potential for:

- increased risk of airborne conflict
- increase controller workload
- funnelling of non-EC equipped aircraft, unwilling or unable to utilise the TMZ crossing service, into areas that will have an increased impact on the traffic patterns at Lossiemouth and Inverness
- the re-routing of IFR aircraft and increased noise profile, additional track miles, increased carbon footprint, as a result of avoidance of aircraft re-routing to avoid the TMZ

Evidence obtained highlights that there is already GA activity in the area around the site of the proposed wind farm. As evidenced above in section 5.3.5 the Change Sponsor considers that the area of the proposed TMZ has low traffic density and any displacement of non-transponding traffic that would need to route around the TMZ would not change the current intensity of re-routing for commercial aircraft. Therefore there would not be any increase in the risk of airborne conflict or any significant impact on the environmental issues.

Following the formal consultation period, CGH continued to engage with HIAL, with a view to Inverness ATC becoming the Controlling Authority for the TMZ. HIAL provided a further consultation response reiterating their objection to the proposed TMZ and stating that they would be unwilling to take on the responsibility of Controlling Authority for the TMZ. HIAL stated that they had invested in a new radar that would provide a technical wind farm mitigation solution and that it had full confidence in ensuring the radar picture from which ATS will be delivered will not be vitiated by Clash Gour wind turbines and as such an airspace solution was not required.

HIAL also stated at a meeting to discuss the proposal for a Controlling Authority for the TMZ that, although they will have a technical mitigation solution, testing protocol dictates that the final discharge of the planning conditions would not be done until after optimisation of the radar system, which would include flight trials over the

constructed wind farm. CGH considers that this reaffirms the requirement for a TMZ to be implemented to create a path to satisfy the aviation related conditions attached to the grant of consent for the wind farm.

However, HIAL also stated that, if a TMZ was deemed to be necessary, their preferred and most practicable solution for implementation would be Option 7(E) (TMZ with no buffer zone), active H24 from surface to FL195, with RAF Lossiemouth as Controlling Authority.

CGH has engaged and consulted directly with airline operators through the NATMAC as listed in Appendix A2 of this document. Commercial Air Transport Aircraft are transponder equipped and will remain unaffected by this airspace change.

No consultation responses were received from airlines.

5.3.7 CO_2 Environmental Analysis Impact and Consultation

The introduction of the wind farm is anticipated to provide CO_2 benefits of approximately 0.5 million tonnes per annum, which is a wider benefit enabled by, but not directly attributable to, this proposal. In their decision letter, Scottish Ministers recognised "The proposed Development makes a significant contribution towards meeting greenhouse gas emission and renewable electricity targets."

There is no expected change to fuel burn for commercial airlines as flight plannable routes will remain unchanged and commercial aircraft will not be affected by this proposal as they are all transponder equipped. There is the possibility that commercial aircraft in Class G airspace positioning to make an approach to Runway 23 at Inverness Airport, may require ATC deconfliction from non-transponder equipped aircraft avoiding the TMZ to the west. This deconfliction could increase track miles flown with an associated increase in CO_2 emissions; however, as evidenced in section 5.3.5 the Change Sponsor considers that the area of the proposed TMZ has low traffic density and any displacement of non-transponding traffic that would need to route around the TMZ would not change the current intensity of re-routing for commercial aircraft. In addition, without the buffer zone, the number of aircraft that are likely to infringe the required ATC deconfliction minima (5 NM) as a result of avoiding the TMZ would be low and any increase in fuel burn and CO_2 emissions would be insignificant in comparison to the CO_2 saved by the wind farm.

GA users may incur increased fuel burn if they are not equipped with a transponder or radio and are required to route around the TMZ. However, the likely volume of non-transponder equipped aircraft which may pass through this area is considered to be low and the small size of the proposed TMZ would mean that any potential increase in fuel burn as a result would be small.

5.3.8 Local Environmental Impacts and Consultation

The development proposal itself was subject to detailed environmental assessment to inform the determining authority as to the acceptability of the project. Scottish Ministers noted in their decision that "The proposed Development makes a significant contribution toward meeting greenhouse gas emissions and renewable electricity targets". The development also brings with it a Habitat and Forest Management plan to improve peatland and woodland on site. It also proposes a community benefit scheme worth up to £1.125 million per annum to communities in Moray as well as the opportunity for shared ownership in the project.

The wind farm is expected to provide an environmental benefit by saving of approximately 0.5 million tonnes of CO_2 emissions per annum, which will only be realised if the airspace change is implemented, and the wind farm is built.

The recognised environmental and social benefits associated with the wind farm cannot be brought forward without discharge of the Section 36 conditions associated with bringing forward the ARCRMS in respect of radars at Lossiemouth and Inverness Airports.

The benefits of the wind farm will significantly outweigh any environmental effects associated with the displacement of non transponding GA traffic. An aircraft routing from Aberdeen Airport to Inverness Airport could travel as little as an additional 0.5 NM to avoid the TMZ.

5.3.9 Economic Impacts

The development of this airspace change proposal has not been informed by any economic constraints or opportunities. All costs relating to implementation and adaptation are being met by the developer. Should the airspace change be implemented, and the wind farm built, the enabled 0.5 million tonnes of CO_2 benefit per annum would be significant. In addition, a Community Benefit scheme, if the wind farm is built at its proposed 225 MW capacity, would mean a payment to local communities of up to £1.125 million per annum for each year of operation (anticipated to be up to 30 years); a total of up to £33.75 million over the operational period of the development. The wind farm also comes with an offer of community shared ownership and 12 communities groups are currently exploring the opportunity. The Decision letter for proposal notes that "Scottish Ministers consider that overall there would not be significant adverse effects on tourism or recreation and are satisfied that there would be economic benefits arising from both the construction and operational phases of the proposed Development."

5.4 Analysis of Options

5.4.1 Design Principles

In the initial stage of the Design Process, CGH identified seven Design Principles addressing Operational, Environmental, and Economic issues, against which all viable options would be assessed. Aviation and Community stakeholders and members of the NATMAC were engaged to review the proposed design principles and suggest if any additional design principles were necessary. These were subsequently approved by the CAA; the shortlist of Design Principles is shown in Table 2 below.

Design Principle	Description
Design Principle 1 Safety	Ensure an acceptable level of safety for aircraft within and displaced by any proposed airspace solution.
Design Principle 2 Operational (Resilience)	Minimise negative impact on all airspace users.
Design Principle 3 Operational	Airspace change shall have no impact on operations/capacity of airport operators and ANSPs.

Design Principle	Description
Design Principle 4 Operational	Maintain operational resilience of the Air Traffic Control (ATC) network.
Design Principle 5 Environmental	Minimise environmental impacts to stakeholders on the ground.
Design Principle 6 Economic	Endeavour to minimise economic impact on aircraft operators.
Design Principle 7 Technical	Base the airspace change on the latest technology available. • This technology could relate to navigation, radar enhancements or radar data processing etc. • The volume of airspace affected should be the minimum necessary to deliver requirements, whilst providing optimal safety buffer • Seek to create simple, easily definable solution

Table 2 – Prioritised Design Principles

5.4.2 Comprehensive List of Options and Design Principles Evaluation

Following successful completion of Gateway 1B, a number of options were identified to provide the required mitigation. The following comprehensive list of design options were proposed for consideration:

Option 0: Baseline (Do nothing).

Option 1: Temporary wind turbine suspension of operation.

Option 2: SSR Alone operations.

Option 3: The use of In-fill radar.

Option 4: Introduction of Class D, E Controlled Airspace.

Option 5: Class E+ Controlled Airspace.

Option 6: Radio Mandatory Zone (RMZ).

Option 7: Range Azimuth Gating (RAG) blanking and Transponder Mandatory Zone (TMZ) which falls into six possibilities of implementation as follows:

A. RAG blanking of the RAF Lossiemouth and Inverness Airport PSRs.
B. TMZ (without RAG blanking) over the windfarm array locations.
C. RAG blanking and TMZ over the proposed windfarm array locations.
D. RAG blanking and TMZ over the proposed windfarm array locations. TMZ extended to include a 2 NM buffer.
E. RAG blanking over the proposed windfarm array locations. Simplified polygon TMZ 'rubber banded[5]' around the proposed windfarm locations with no buffer.

[5] Rubber banded - shortest perimeter fully enclosing the wind farm development. It is used to smooth an irregular perimeter.

F. RAG blanking over the proposed windfarm array locations. Simplified polygon TMZ 'rubber banded' around the proposed wind farm locations extended to include a 2 NM buffer.

The options were evaluated against the Design Principles and Options 0-6 and 7(A) and 7(B) were rejected at the Design Principles Evaluation stage. Options 7(C)-7(F) were accepted and taken forward to the Initial Options Appraisal. Performance of these options against the Design Principles is shown in Table 3 below.

Design Principle	Option 7C	Option 7D	Option 7E	Option 7F
Safety: Ensure an acceptable level of safety for aircraft within and displaced by any proposed airspace solution.	MET	MET	MET	MET
Operational (Resilience): Minimise negative impact on all airspace users.	PARTIAL	PARTIAL	MET	PARTIAL
Operational: Airspace change shall have no impact on operations/capacity of airport operators and ANSPs.	PARTIAL	PARTIAL	PARTIAL	PARTIAL
Operational: Maintain operational resilience of the Air Traffic Control network.	PARTIAL	PARTIAL	PARTIAL	PARTIAL
Environmental: Minimise environmental impacts to stakeholders on the ground.	MET	PARTIAL	PARTIAL	PARTIAL
Economic: Endeavour to minimise economic impact on aircraft operators.	MET	PARTIAL	MET	PARTIAL
Technical: Base the airspace change on the latest technology available.	PARTIAL	PARTIAL	PARTIAL	MET

Table 3 – Design Principles Evaluation

5.4.3 Options Appraisal

At Step 2B of CAP 1616 process - the Initial Options Appraisal – CGH discounted Option 7(C) and Option 7(D) on the basis that although they met the Statement of Need, the design was a complicated shape which would cause unnecessary complexity for both air traffic controllers and pilots.

Options 7(E) and 7(F) were taken forward into the consultation stage.

5.4.4 Final Options Appraisal

Option 7(E) has been taken forward for submission without any amendments following the consultation. Therefore, the Full Options Appraisal presented at Stage 3 of the ACP process will form the Final Options Appraisal for this ACP submission. The Final Options Appraisal can be found at Appendix A3 to this document.

6 Technical Criteria

6.1 Introduction

The change sponsor must bear in mind that the option that is chosen must be compliant with the relevant technical criteria set out in the proforma below. These criteria form the basic structure on which the change sponsor has built this formal proposal. It is vital that the change sponsor identifies any critical interdependencies with neighbouring air navigation service providers (operational, technical or training) and establishes plans to resolve any issues that arise.

6.2 Airspace Description Requirements

The change sponsor must complete those parts of the following proforma that are relevant to its proposal.

	The proposal should provide a full description of the proposed change including the following:	**Description for this proposal**
a	The type of route or structure; for example, airway, UAR, Conditional Route, Advisory Route, CTR, SIDs/STARs, holding patterns, etc	Transponder Mandatory Zone (TMZ)
b	The hours of operation of the airspace and any seasonal variations	H24
c	Interaction with domestic and international en-route structures, TMAs or CTAs with an explanation of how connectivity is to be achieved. Connectivity to aerodromes not connected to CAS should be covered	No impact on current connectivity.
d	Airspace buffer requirements (if any). Where applicable describe how the CAA policy statement on 'Special Use Airspace – Safety Buffer Policy for Airspace Design Purposes' has been applied	N/A – this proposal does not change any existing or introduce new buffers.
e	Supporting information on traffic data including statistics and forecasts for the various categories of aircraft movements (passenger, freight, test and training, aero club, other) and terminal passenger numbers	N/A – this proposal would have no impact on the traffic mix.
f	Analysis of the impact of the traffic mix on complexity and workload of operations	N/A – this proposal would have no impact on the traffic mix.

	The proposal should provide a full description of the proposed change including the following:	Description for this proposal
g	Evidence of relevant draft Letters of Agreement, including any arising out of consultation and/or airspace management requirements	A Letter of Agreement will be agreed between RAF Lossiemouth and Inverness ATC detailing the procedures that will be required to allow Inverness ATC an understanding of when non-transponding traffic has been given permission to fly through the TMZ, so Inverness traffic is able to re-route or safely transit the TMZ under an SSR-alone service.
h	Evidence that the airspace design is compliant with ICAO Standards and Recommended Practices (SARPs) and any other UK policy or filed differences, and UK policy on the Flexible Use of Airspace (or evidence of mitigation where it is not)	TMZ will be implemented in accordance with ICAO SARPS.
i	The proposed airspace classification with justification for that classification	No changes to existing airspace classifications, including no changes to CAS volumes or classifications.
j	Demonstration of commitment to provide airspace users equitable access to the airspace as per the classification and where necessary indicate resources to be applied or a commitment to provide them in line with forecast traffic growth. 'Management by exclusion' would not be acceptable	No impact for transponder equipped aircraft, access is not subject to ATC approval. Access without serviceable transponder equipment is subject to specific approval of the Controlling Authority.
k	Details of and justification for any delegation of ATS	No change to the delegation of ATS.

6.3 Safety Assessment

From a safety perspective, Option 7(E)[6] provides a radar mitigation solution suitable for managing traffic within the vicinity of the proposed wind farm. As a result of the introduction of primary radar blanking and a TMZ, air traffic controllers will have greater situational awareness of traffic operating in the vicinity and will not experience significant radar clutter caused by the presence of the wind farm. There may be a slight increase in controller workload, should an aircraft without a transponder and not in communication with ATC enter the TMZ; however, this is expected to be minimal. Option 7(E) also provides a simplified TMZ airspace design which reduces the complexity for both controllers and pilots.

The management and integration of GA traffic (including gliders) is a potential hazard associated with this option as GA aircraft may be required to route around

[6] As described in Section 5 above

the proposed TMZ, which may cause 'choke points'. However, given the current levels of activity in the areas around the proposed TMZ, and the airspace available without the inclusion of a buffer zone, the Change Sponsor considers that the displacement of traffic from the area of the TMZ would not result in the creation of choke points or induce any more funnelling of aircraft than is currently experienced (see paragraph 5.3.5 above).

It is acknowledged that any tactical management of the airspace may cause a slight increase in controller workload, however, due to the low traffic flows of light aircraft within the area, this is expected to be minimal (see paragraph 5.1.4 above).

To avoid the need for tactical management, there will be clear designation and promulgation of the TMZ within the UK AIP. Furthermore, within Class G airspace, the pilot is ultimately responsible for collision avoidance. It is recognised that adverse weather conditions may hamper a pilot's ability to maintain visual separation with the turbines. This is mitigated through the effective use of flight planning by pilots. Furthermore, loss of communication with non-transponding aircraft is acknowledged but is an existing hazard which is not impacted by the establishment of a TMZ, especially within Class G airspace. The size and shape of this proposed option means it is easier for both pilots and controllers to interpret/manage. A potential loss of the TMZ boundary (as displayed on the air traffic controllers display) is also acknowledged; however, this is an unlikely failure mode which may have more serious consequences for factors that do not relate to the establishment of TMZ and as such is an existing hazard, which can be mitigated procedurally.

6.4 Operational Impact

The change sponsor must complete the following proforma to outline the operational impact.

	An analysis of the impact of the change on all airspace users, airfields and traffic levels must be provided, and include an outline concept of operations describing how operations within the new airspace will be managed. Specifically, consideration should be given to:	**Evidence of compliance/proposed mitigation**
a	Impact on IFR general air traffic and operational air traffic or on VFR General Aviation (GA) traffic flow in or through the area	Impact affecting those aircraft flying without a transponder. Possible consequential impact on military and commercial operations outside of the designated airspace caused by the displacement of non-transponder equipped aircraft. Impact expected to be small – see paragraph 5.3.
b	Impact on VFR operations (including VFR routes where applicable)	Impact affecting only those aircraft flying without a transponder.

	An analysis of the impact of the change on all airspace users, airfields and traffic levels must be provided, and include an outline concept of operations describing how operations within the new airspace will be managed. Specifically, consideration should be given to:	Evidence of compliance/proposed mitigation
c	Consequential effects on procedures and capacity, i.e. on SIDs, STARs, and/or holding patterns. Details of existing or planned routes and holds	Possible consequential impact on RAF Lossiemouth procedures in Class G airspace outside of the designated airspace caused by the displacement of non-transponder equipped aircraft. Impact expected to be no different impact on current operations (see paragraph 5.3.4 above).
d	Impact on aerodromes and other specific activities within or adjacent to the proposed airspace	Possible consequential impact to adjacent aerodromes caused by the displacement of non-transponder equipped aircraft. Impact expected to be no different impact on current operations (see paragraph 5.3 above).
e	Any flight planning restrictions and/or route requirements	Only transponder equipped aircraft permitted to enter the airspace without prior clearance from the Controlling Authority.

6.5 Supporting Infrastructure/Resources

The change sponsor must complete the following proforma to outline the supporting infrastructure and resources.

	General requirements	Evidence of compliance/proposed mitigation
a	Evidence to support RNAV and conventional navigation as appropriate with details of planned availability and contingency procedures	N/A

	General requirements	Evidence of compliance/proposed mitigation
b	Evidence to support primary and secondary surveillance radar (SSR) with details of planned availability and contingency procedures	Primary radar will be blanked (Range Azimuth gating) to prevent clutter from the wind farm being displayed on radar screens. Implementation of the TMZ is to ensure only transponder equipped aircraft are within the blanked region unless they have been granted access by the controlling authority.
c	Evidence of communications infrastructure including R/T coverage, with availability and contingency procedures	Traffic uses the same region as today in a similar manner from a communications infrastructure perspective. Possible small increase in communications requirements for non-transponder equipped aircraft to gain permission to enter the airspace, but this is not expected to increase ATC workload beyond a safe level.
d	The effects of failure of equipment, procedures and/or personnel with respect to the overall management of the airspace must be considered	Existing contingency procedures and management protocol will continue to apply. Non-transponding aircraft unable to obtain clearance to transit the area due to communications failure will need to re-route to avoid the area.
e	Effective responses to the failure modes that will enable the functions associated with airspace to be carried out including details of navigation aid coverage, unit personnel levels, separation standards and the design of the airspace in respect of existing international standards or guidance material	Existing contingency procedures and management protocol will continue to apply. Non-transponding aircraft unable to obtain clearance to transit the area due to communications failure will need to re-route to avoid the area.
f	A clear statement on SSR code assignment requirements	No change.
g	Evidence of sufficient numbers of suitably qualified staff required to provide air traffic services following the implementation of a change	Activation times in line with Inverness Airport's operational hours. No additional staff or qualifications required. Some additional staff training may be required on TMZ operating procedures and any agreed procedures with Inverness ATC.

6.6 Airspace and Infrastructure

The change sponsor must complete the following proforma to demonstrate that the airspace change complies with the airspace and infrastructure requirements set out in UK/European law and policy, ICAO standards and recommended practices, and Eurocontrol standards.

	General requirements	Evidence of compliance/proposed mitigation
a	The airspace structure must be of sufficient dimensions with regard to expected aircraft navigation performance and manoeuvrability to fully contain horizontal and vertical flight activity in both radar and non-radar environments	The proposed TMZ is designed to be as small as possible. See Section 5.
b	Where an additional airspace structure is required for radar control purposes, the dimensions shall be such that radar control manoeuvres can be contained within the structure, allowing a safety buffer. This safety buffer shall be in accordance with agreed parameters as set down in CAA policy statement 'Safety Buffer Policy for Airspace Design Purposes Segregated Airspace'. Describe how the safety buffer is applied, show how the safety buffer is portrayed to the relevant parties, and provide the required agreements between the relevant ANSPs/airspace users detailing procedures on how the airspace will be used. This may be in the form of Letters of Agreement with the appropriate level of diagrammatic explanatory detail	No safety buffer required to contain manoeuvres.
c	The Air Traffic Management system must be adequate to ensure that prescribed separation can be maintained between aircraft within the airspace structure and safe management of interfaces with other airspace structures	Promulgation of the TMZ will ensure that the continued surveillance of aircraft is effective such that separation between aircraft can be maintained.
d	Air traffic control procedures are to ensure required separation between traffic inside a new airspace structure and traffic within existing adjacent or other new airspace structures	No change to ATC procedures. Operational procedures will be in accordance with TMZ policy.
e	Within the constraints of safety and efficiency, the airspace classification should permit access to as many classes of user as practicable	No change to airspace classification. The Transponder Mandatory restriction is designed to permit access to as many classes of airspace user as practicable.

	General requirements	Evidence of compliance/proposed mitigation
f	There must be assurance, as far as practicable, against unauthorised incursions. This is usually done through the classification and promulgation	Details will be promulgated in the AIP and published on aviation charts.
g	Pilots shall be notified of any failure of navigational facilities and of any suitable alternative facilities available and the method of identifying failure and notification should be specified	Existing contingency procedures would continue to apply.
h	The notification of the implementation of new airspace structures or withdrawal of redundant airspace structures shall be adequate to allow interested parties sufficient time to comply with user requirements. This is normally done through the AIRAC cycle	This change will be promulgated by AIRAC as per the typical cycle schedule.
i	There must be sufficient R/T coverage to support the Air Traffic Management system within the totality of proposed controlled airspace	Traffic uses the same region as today in a similar manner from a communications infrastructure perspective. Demonstrably adequate for the region – published Designated Operational Coverage (DOC) 40 NM/15,000 ft.
j	If the new structure lies close to another airspace structure or overlaps an associated airspace structure, the need for operating agreements shall be considered	Specific operating agreements not required. There is sufficient Class G airspace between the proposed TMZ and RAF Lossiemouth MATZ for normal Class G operations. Operational procedures will be in accordance with TMZ policy.
k	Should there be any other aviation activity (low flying, gliding, parachuting, microlight site, etc) in the vicinity of the new airspace structure and no suitable operating agreements or air traffic control procedures can be devised, the change sponsor shall act to resolve any conflicting interests	Operational procedures will be in accordance with TMZ policy. For transponder equipped aircraft, access is not subject to ATC approval. Access without serviceable transponder equipment is subject to specific approval of the Controlling Authority. Non-transponder aircraft unable to obtain the required clearance will be required to re-route to avoid the TMZ area.

	ATS route requirements	Evidence of compliance/proposed mitigation
a	There must be sufficient accurate navigational guidance based on in-line VOR/DME or NDB or by approved RNAV derived sources, to contain the aircraft within the route to the published RNP value in accordance with ICAO/Eurocontrol standards	N/A
b	Where ATS routes adjoin terminal airspace there shall be suitable link routes as necessary for the ATM task	No change – there are no new link routes required as part of this proposal.
c	All new routes should be designed to accommodate P-RNAV navigational requirements	N/A – no new routes.

	Terminal Airspace Requirements	Evidence of compliance/proposed mitigation
a	The airspace structure shall be of sufficient dimensions to contain appropriate procedures, holding patterns and their associated protected areas	No change – no procedures within the proposed area.
b	There shall be effective integration of departure and arrival routes associated with the airspace structure and linking to designated runways and published instrument approach procedures (IAPs)	No change – no proposed changes affecting departure and arrival routes and published IAPs.
c	Where possible, there shall be suitable linking routes between the proposed terminal airspace and existing en-route airspace structure	N/A
d	The airspace structure shall be designed to ensure that adequate and appropriate terrain clearance can be readily applied within and adjacent to the proposed airspace	No change to airspace structure.
e	Suitable arrangements for the control of all classes of aircraft (including transits) operating within or adjacent to the airspace in question, in all meteorological conditions and under all flight rules, shall be in place or will be put into effect by the change sponsor upon implementation of the change in question (if these do not already exist)	No change to the classification of airspace (remains Class G). Extant procedures for Air Traffic Services Outside of Controlled Airspace apply.
f	The change sponsor shall ensure that sufficient visual reference points are established within or adjacent to the subject airspace to facilitate the effective integration of VFR arrivals, departures and transits of the airspace with IFR traffic	The wind farm will be distinctive and recognisable visual reference points creating an easily identifiable visual reference to identify the TMZ area.

	Terminal Airspace Requirements	Evidence of compliance/proposed mitigation
g	There shall be suitable availability of radar control facilities	No change to radar control facilities.
h	The change sponsor shall, upon implementation of any airspace change, devise the means of gathering (if these do not already exist) and of maintaining statistics on the number of aircraft transiting the airspace in question. Similarly, the change sponsor shall maintain records on the numbers of aircraft refused permission to transit the airspace in question, and the reasons why. The change sponsor should note that such records would enable ATS managers to plan staffing requirements necessary to effectively manage the airspace under their control	Agreements will be established with the Controlling Authority to gather the necessary statistics to support the PIR undertaken as part of the CAP 1616 process.
i	All new procedures should, wherever possible, incorporate Continuous Descent Approach (CDA) profiles after aircraft leave the holding facility associated with that procedure	N/A – no new procedures proposed.

	Off-Route Airspace Requirements	Evidence of compliance/proposed mitigation
a	If the new structure lies close to another airspace structure or overlaps an associated airspace structure, the need for operating agreements shall be considered	N/A – the airspace will be established in Class G airspace.
b	Should there be any other aviation activity (military low flying, gliding, parachuting, microlight site etc) in the vicinity of the new airspace structure and no suitable operating agreements or air traffic control procedures can be devised, the change sponsor shall act to resolve any conflicting interests	Operational procedures will be in accordance with TMZ policy. For transponder equipped aircraft, access is not subject to ATC approval. Access without serviceable transponder equipment is subject to specific approval of the Controlling Authority. Non-transponder aircraft unable to obtain the required clearance will be required to re-route to avoid the TMZ area.

6.7 Environmental Assessment

The change sponsor must complete an environmental assessment including the following details:

- all environmental assessment requirements must be consistent with the information presented throughout the engagement and consultation process; there should be no new assessment outputs presented in the final proposal that have not already been presented to stakeholders
- where impacts have been modified since consultation, a rationale for the revision must be presented by the change sponsor; the change sponsor should be aware that changes to environmental impacts after consultation has closed may mean that the CAA advises on the need for re-consultation
- for all proposals submitted to the CAA, the underlying data and assumptions for assessment outputs must be made available to the CAA; if this is in the form of separate assessment reports, these must be provided
- more information on the metrics and methodology for an environmental assessment is set out in Appendix B and the environmental requirements technical annex.

The change sponsor must complete the following proforma:

	Theme	Content	Evidence of compliance/proposed mitigation
a	WebTAG analysis	Output and conclusions of the analysis (if not already provided elsewhere in the proposal)	The Change Sponsor has concluded that it is not proportionate to conduct TAG analysis due to the minimal impact of this ACP. The Full Options Appraisal contains the justification not to carry out any WebTAG analysis for noise and greenhouse gas impact. The CAA concluded in the CAA Full Options Appraisal Assessment[7] that the rationale to be sufficient for this airspace change and the detailed analysis requirements for Full and Final Options Appraisal are scaled down.

[7] Available on the Clash Gour Wind Farm airspace change portal

	Theme	Content	Evidence of compliance/proposed mitigation
b	Assessment of noise impacts	Consideration of noise impacts, and where appropriate the related qualitative and/or quantitative analysis, including whether the anticipated noise impact meets the criteria for a proposal to be called-in by the Secretary of State (paragraph 5(c) of Direction 6 of the Air Navigation Directions 2017) If the change sponsor expects that there will be no noise impacts, the rationale must be explained	There is expected to be a very limited noise impact by a small number of light aircraft (which are not equipped with a transponder or in communication with ATC) re-routing around the proposed TMZ. Given the figures noted in paragraph 3.1.2, the actual change in the noise environment as a result of light aircraft re-routing around the TMZ will be imperceptible. In re-routing around the TMZ, the light aircraft will remain over low density countryside. There are few receptors in the area to perceive any change to the noise environment. Traffic levels in the vicinity of the proposed Clash Gour Wind Farm would not produce adverse noise levels above those levels which DfT policy considers to be the point at which the adverse effects of noise on health and wellbeing begin to be seen on a community basis. The change sponsor has concluded that the airspace is a low-density air traffic environment and that the evidence suggests that the sponsor would be unable to conduct or provide any meaningful noise measurement. The CAA concluded in the CAA Full Options Appraisal Assessment that the rationale to be sufficient for this airspace change and the detailed analysis requirements for Full and Final Options Appraisal are scaled down. See Section 2 of the Full Options Appraisal.

	Theme	Content	Evidence of compliance/proposed mitigation
c	Assessment of CO_2 emissions	Consideration of the impacts on CO_2 emissions, and where appropriate the related qualitative and/or quantitative analysis If the change sponsor expects that there will be no impact on CO_2 emissions impacts, the rationale must be explained	Due to the small scale of this change (in terms of TMZ dimensions) and small number and nature of aircraft likely to be affected, any re-routing by light aircraft is expected to have an imperceptible impact. Any additional greenhouse gas emissions caused by the re-routing of light aircraft must be balanced against the fact that this ACP facilitates a carbon positive development. Therefore, no quantitative analysis of fuel burn and greenhouse gas emissions has been carried out. The CAA concluded in the CAA Full Options Appraisal Assessment that the rationale to be sufficient for this airspace change and the detailed analysis requirements for Full and Final Options Appraisal are scaled down. See Section 2 of the Full Options Appraisal.
d	Assessment of local air quality	Consideration of the impacts on local air quality, and where appropriate the related qualitative and/or quantitative analysis If the change sponsor expects that there will be no impact on local air quality, the rationale must be explained	This airspace solution is unlikely to result in more aircraft flying over the area, or at lower altitudes, than the current situation. It is likely that any aircraft that overfly the area within the vicinity of the proposed wind farm would be above 1,000 ft. Therefore, as per CAP 1616, Appendix B, Para B74, there is unlikely to be an impact on local air quality due to the effects of mixing and dispersion. In addition, any aircraft flying within the proposed TMZ or those required to re-route to avoid the turbines would not overfly an AQMA.

	Theme	Content	Evidence of compliance/proposed mitigation
e	Assessment of impacts upon tranquillity	Consideration of any impact upon tranquillity, notably on Areas of Outstanding Natural Beauty or National Parks, and where appropriate the related qualitative and/or quantitative analysis If the change sponsor expects that there will be no tranquillity impacts, the rationale must be explained	The location of the proposed TMZ is out with the boundaries of any Noise Sensitive Area or National Park. Due to the small scale of the proposed TMZ, any aircraft that may have to route around it would not overfly a National Scenic Area (NSA) but may overfly the northern extent of the Cairngorms National Park. However, as there are no restrictions on aircraft flying over the National Park, some aircraft already overfly this area (see the Impact on Tranquillity in the Final Options Appraisal, paragraph A3.4 in Appendix A3). In addition, the topography of the local area is more likely to result in aircraft re-routing to the north of the TMZ, rather than over the higher ground that forms part of the National Park. Therefore, the impact on Tranquillity is very limited with very small numbers of aircraft overflying the National Park. The impact on tranquillity is not expected to be significantly different to the current situation.
f	Operational diagrams	Any operational diagrams that have been used in the consultation to illustrate and aid understanding of environmental impacts must be provided	Paragraph 2.5 of the Consultation Document contains details of the traffic survey conducted to support the rationale for not conducting quantitative analysis of the environmental impacts. This includes a Pattern of Life Map to demonstrate traffic patterns in the area. This is also included in Section 3 of this document.
g	Traffic forecasts	10-year traffic forecasts, from the anticipated date of implementation, must be provided (if not already provided elsewhere in the proposal)	The number of GA aircraft operating in the UK and likely to be impacted by this ACP are expected to remain similar to today and therefore no significant changes are expected over the 10-year period. See paragraph 2.1.6 of the Full Options Appraisal.

	Theme	Content	Evidence of compliance/proposed mitigation
h	Summary of environmental impacts and conclusions	A summary of all of the environmental impacts detailed above plus the change sponsor's conclusions on those impacts	Due to the small scale of the proposed TMZ, any re-routing required by aircraft (without a transponder and not in communication with ATC) is expected to be imperceptible, resulting in minimal additional noise, greenhouse gas and fuel burn impacts. The development consent process for the wind farm development included a detailed Environmental Impact Assessment (EIA) which considered the potential for significant environmental effects and routes to mitigation for the development. This included a carbon assessment which showed that the development is carbon positive for approximately 27.5 years of its 30 year lifetime. This must be considered in balance against the minimal environmental impacts of displaced air traffic.

A1 List of Stakeholders

A1.1 Non-Aviation Stakeholders

Stakeholder	
Deeside Gliding Club	PPL/IR Europe
Gama Aviation	UK Airprox Board
General Aviation Alliance	Highland Aviation
Highland Gliding Club	Strathaven Airfield
Moray Flying Club	[redacted]Highland Gliding Club
PDG Aviation	[redacted]- Drone Major
[redacted]- General Aviation Alliance	[redacted]- Association of Remotely Piloted Aircraft Systems UK (ARPAS-UK)
[redacted]- Deeside Gliding Club	[redacted]- Airlines UK
[redacted]- Light Aircraft Association (LAA)	[redacted]- British Helicopter Association (BHA)
[redacted] Aviation Environment Federation (AEF)	[redacted] Airspace Change Organising Group (ACOG)
[redacted] PPL/IR (Europe)	[redacted] British Skydiving
[redacted]- Babcock International	[redacted]- NATS
[redacted]- Airport Operators Association (AOA)	[redacted]- British Gliding Association (BGA)
[redacted] UK Airprox Board (UKAB)	[redacted]- British Microlight Aircraft Association (BMAA)
[redacted]- Iprosurv	[redacted]- NATS

[redacted] - British Business and General Aviation Association (BBGA)	[redacted]- Airfield Operators Group (AOG)
[redacted]- British Hang Gliding and Paragliding Association	[redacted] - Airspace Change Organising Group (ACOG)
[redacted] - Aircraft Owners and Pilots Association (AOPA)	[redacted]- Airport Operators Association (AOA)
[redacted]- British Balloon and Airship Club	[redacted] British Airline Pilots Association (BALPA)
[redacted] - Drone Major	[redacted]- Ministry of Defence (MOD)
[redacted]- Honourable Company of Air Pilots (HCAP)	[redacted] - British Gliding Association (BGA)
[redacted]- Highlands and Islands Airports Limited (HIAL)	[redacted]- Highlands and Islands Airports Limited (HIAL)
[redacted]- Low Fare Airlines	[redacted]- Drone Major
[redacted] Heavy Airlines	[redacted]- Isle of Man CAA
[redacted]- Deeside Gliding Club	[redacted]- Airspace4All
[redacted]- United States Visiting Forces (USVF), HQ United States Country Rep-UK (HQ USCR-UK).	[redacted]- Helicopter Club of Great Britain (HCGB)
[redacted]- British Airline Pilots Association (BALPA)	[redacted]- Highlands and Islands Airports Limited (HIAL)
[redacted]	[redacted]- Navy Command HQ
[redacted] - Guild of Air Traffic Control Officers (GATCO)	[redacted] - British Microlight Aircraft Association (BMAA)
[redacted]- Babcock International	[redacted] - British Airways (BA)
[redacted]- Ministry of Defence (MOD)	[redacted]- Airfield Operators Group (AOG)
[redacted]- Highlands and Islands Airports Limited (HIAL)	[redacted]- Ministry of Defence (MOD)
[redacted] - NATS	[redacted]- BAE Systems

[redacted] - Strathaven Gliding Club	[redacted]- UK Flight Safety Committee (UKFSC)
[redacted] - Ministry of Defence (MOD)	[redacted]- British Model Flying Association (BMFA)

Table 4 – ACP Stages 1 and 2 Stakeholders

A1.2 Government and Local Authority Stakeholders

Stakeholder	
[redacted]- Energy Consents Unit	[redacted] - Highland Council
[redacted] - Energy Consents Unit	[redacted]- Moray Council
[redacted]- Energy Consents Unit	

Table 5 – Government and Local Authority Stakeholders

A1.3 Community Council Stakeholders

Stakeholder	
[redacted]- Forres Community Council	[redacted]- Grantown on Spey Community Council
[redacted] - Heldon Community Council	[redacted]- Speyside Community Council
[redacted] - Dyke Landward Community Council	[redacted]- Cromdale and Advie Community Council
[redacted]- Elgin Community Council	[redacted] East Nairnshire Community Council
[redacted] - Findhorn and Kinloss Community Council	[redacted]- Finderne Community Council

Table 6 – Community Council Stakeholders

A1.4 Community Groups Stakeholders

Stakeholder	
[redacted] - Forres Area Community Trust	[redacted] - Buchan Development Partnership
Moray Local Action Group	Fochabers Village Association
Moray Waste Busters	Archiestown Village Council
[redacted]- Third Sector Interface Moray	[redacted]- Knockando Community Trust
Transition Town Forres	

Table 7 – Community Groups Stakeholders

A1.5 Consultation Additional Stakeholders

Stakeholder	
[redacted]	[redacted]
[redacted]	[redacted]- Moray Council
[redacted]- Moray Council	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted] General Aviation Alliance
[redacted] - Highlands and Islands Airports Limited (HIAL)	[redacted] - Forres Area Community Trust

Table 8 – Consultation Additional Stakeholders

A2 Airspace Definition

A2.1 Coordinates of Proposed TMZ Perimeter

These coordinates are WGS84 presented in decimal degrees (DD) and degrees, minutes, seconds (DMS). Below is a figure showing the location of the proposed TMZ.

Point	Decimal Degrees		Degrees° Minutes' Seconds"	
	Latitude (DD)	Longitude (DD)	Latitude (DMS)	Longitude (DMS)
A	57.491416°N	003.441369°W	57°29'29.10"N	003°26'28.93"W
B	57.457283°N	003.520844°W	57°27'26.22"N	003°31'14.99"W
C	57.457313°N	003.591886°W	57°27'26.34"N	003°35'30.77"W
D	57.511835°N	003.578601°W	57°30'42.60"N	003°34'42.96"W
E	57.519507°N	003.520662°W	57°31'10.24"N	003°31'14.35"W

A2.2 Draft AIP Entry

AIP Section GEN 1.5 5.3.2.2 Notified 'Transponder Mandatory Zone' Airspace

Add the following to the list:

- The vertical and lateral boundaries of the Clash Gour TMZ as described in ENR 2.23 Paragraph 4.

AIP section ENR 2.2

4 EN-ROUTE TRANSPONDER MANDATORY ZONES

Designation and Lateral Limits	**Vertical Limits and Classification**	**Controlling Authority**
Clash Gour TMZ – the area bounded by: 57°29'29.10"N 003°26'28.93"W – 57°27'26.22"N 003°31'14.99"W – 57°27'26.34"N 003°35'30.77"W – 57°30'42.60"N 003°34'42.96"W – 57°31'10.24"N 003°31'14.35"W – 57°29'29.34"N 003°26'31.52"W	FL 195 SFC (Class G)	Lossie Departures (119.575 MHz) H24
Note: For aircraft equipped with and operating secondary surveillance radar equipment, as defined in GEN 1-5 paragraph 5.3, access to the Clash Gour TMZ is not subject to ATC approval. Access to the Clash Gour TMZ without serviceable transponder equipment, as defined in GEN 1-5 paragraph 5.3, is subject to specific approval of the Controlling Authority.		

A3 Final Options Appraisal

A3.1 Final Options Appraisal

Airspace Change Proposals vary greatly in terms of size and complexity. Therefore, the Airspace Change process is sufficiently scalable to accommodate different types of proposal. This means that not all airspace change proposals necessarily need to be subjected to each and every element of the process. As identified in the Initial Options Appraisal submission accepted at the Stage 2 Gateway, this ACP is expected to result in minimal change to the impacts over the ground when compared to the current environment.

The Initial Options Appraisal conducted at Stage 2 deduced that not all the environmental metrics are relevant to this particular airspace change and as such, were unlikely to be collected during Stage 3. This is due to the unique circumstances of this ACP, where very limited information is available as this development does not relate directly to an airport. The evidence suggested that the sponsor would have been unable to provide any meaningful noise measurement in Stage 3 and the change sponsor concluded that it was not appropriate to collect the standard noise metrics and conduct a full noise assessment in Stage 3.

Option 7(E) has been taken forward for submission without any amendments following the consultation. Therefore, the Full Options Appraisal presented at Stage 3 of the ACP process will form the Final Options Appraisal for this ACP submission. The Final Options Appraisal can be found below.

A3.2 High-level Objectives & Assessment Criteria

For an airspace change, the criteria against which appraisal options are assessed is defined within CAP 1616, Appendix E, Table E2. These criteria are described in Table 9 below. Additionally, Safety Assessment, Tranquillity and Biodiversity (as defined in CAP 1616, Appendix B) have been added at the bottom.

The scale of this airspace change proposal is considered by the Change Sponsor to be small relative to other ACPs that are currently being progressed. There is minimal population in the vicinity of the proposal and together with the nature of light aircraft operations in the area, the environmental impacts are expected to be limited. Therefore, the Change Sponsor has concluded that a Final Options Appraisal based on a qualitative assessment, backed up by the quantitative data of the traffic survey, is deemed proportionate and appropriate.

Affected Group	Impact	Description
Communities	Noise impact on health and quality of life	Requires consideration of noise impact on communities including residents, schools, hospitals, parks, and other sensitive areas.
	Air Quality	Any change in air quality is to be considered[8].
Wider Society	Greenhouse Gas impact	Assessment of changes in greenhouse gas levels in accordance with WebTAG is required.
	Capacity and resilience	A qualitative assessment of the impact on overall UK airspace structure.
General Aviation (GA)	Access	A qualitative assessment of the effect of the proposal on the access to airspace for GA users.
GA/commercial airlines	Economic impact from increased effective capacity	Forecast increase in air transport movements and estimated passenger numbers or cargo tonnage carried.
	Fuel burn	The change sponsor must assess fuel costs based on its assumptions of the fleets in operation.
Commercial airlines	Training costs	An assessment of the need for training associated with the proposal.
	Other costs	Where there are likely to be other costs imposed on commercial aviation, these should be described.
Airport/Air Navigation Service Provider	Infrastructure costs	Where a proposal requires a change in infrastructure, the associated costs should be assessed.
	Operational costs	Where a proposal would lead to a change in operational costs, these should be assessed.

[8] Air Quality assessments are only applicable below 1,000 feet and includes the consideration of Air Quality Management Areas (AQMAs).

Affected Group	Impact	Description
	Deployment costs	Where a proposal would lead to a requirement for retraining and other deployment, the costs of these should be assessed.
Safety Assessment	Safety Assessment	CAP 1616 requires a safety assessment of the proposal to be undertaken in accordance with CAP 760 (Guidance on the Conduct of Hazard Identification, Risk Assessment, and the Production of Safety Cases: For Aerodrome Operators and Air Traffic Service Providers).
Wider Society	Tranquillity	The impact upon tranquillity need only be considered with specific reference to Areas of Outstanding Natural Beauty (AONB)[9] and National Parks (NPs) unless other areas for consideration are identified through community engagement.
	Biodiversity	The variability among living organisms from all sources including, inter alia, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

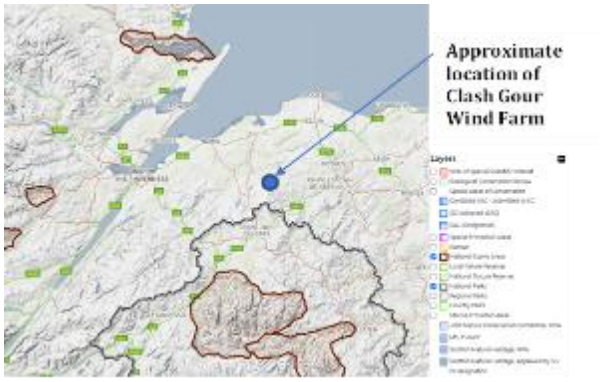
Table 9 – Final Options Appraisal Assessment Criteria

[9] AONBs are not applicable in Scotland and the equivalent designation is a National Scenic Areas which shall be assessed instead.

A3.3 Do Nothing Baseline

<table>
<tr><td colspan="3">Option 0 - Do Nothing Baseline – Clash Gour Wind Farm has not been constructed. Wind farms that are already established in the immediate vicinity of the proposed Clash Gour Wind Farm (i.e. Berry Burn) are included within the baseline scenario (current situation)</td></tr>
<tr><td colspan="3">Option 0 (the Do Nothing baseline) provides no change to the current situation and therefore the impacts of aviation activity in the area remain the same as they are today. Furthermore, it is assumed that the extant airspace arrangements are safe and remain so.

Option 0 was previously rejected as part of the Design Principle Evaluation but has been carried forward into the Full Options Appraisal for comparative purposes only.</td></tr>
<tr><td>Group</td><td>Impact</td><td>Qualitative Assessment</td></tr>
<tr><td rowspan="2">Communities</td><td>Noise impact on health and quality of life</td><td>In the Do Nothing baseline scenario, aircraft movements (and therefore noise) are exactly the same as they are today. In this scenario, aircraft operating in the vicinity of the proposed development site are able to fly anywhere within the realms of Glass G airspace and are not mandated to carry a transponder or communicate with ATC unless they wish to enter the Aerodrome Traffic Zone (ATZ) at Inverness Airport or the Military Air Traffic Zone (MATZ) at RAF Lossiemouth. As such, aircraft noise within this scenario is the same as it is today and may be widely dispersed. However, due to the limited population density in the area, the impact of aircraft noise on local communities is likely to be minimal.</td></tr>
<tr><td>Air Quality</td><td>In the Do Nothing baseline scenario, it is unlikely that local air quality is impacted by aircraft movements. The rationale being that to avoid terrain and nearby existing operational turbines, aircraft operating in the vicinity of the Clash Gour development are likely to be above 1,000 ft. As a result, there is unlikely to be an impact on local air quality due the effects of mixing and dispersion above 1,000 ft as per CAP 1616, Appendix B, Para B74. It should also be noted that there are no AQMAs in the area of the proposed development.
 
</td></tr>
</table>

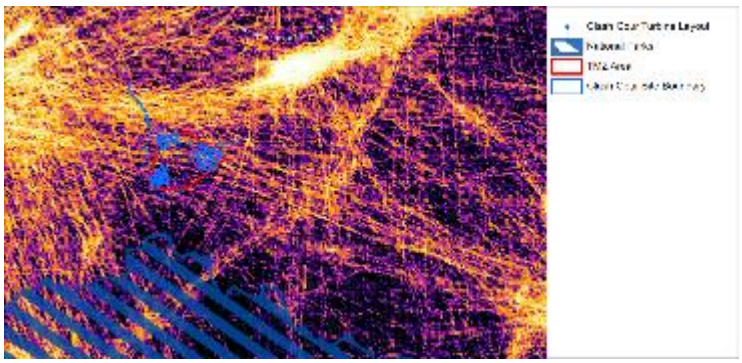
Wider Society	Greenhouse Gas impact	In the Do Nothing baseline scenario, aircraft operating in the vicinity of the proposed development are able to operate anywhere within Class G airspace. The greenhouse gas impact of the current situation is likely to be minor due to the fact that only a limited number of aircraft operate in the area.
	Capacity and resilience	As the Do Nothing baseline scenario reflects the current situation, it represents no change or impact on capacity and resilience.
	Tranquillity	The Do Nothing baseline represents the current situation in which, the proposed location of the Clash Gour wind farm is located approximately 20 NM outside the nearest National Scenic Area (NSA - equivalent to an AONB in Scotland) and approximately 3.2 NM outside the nearest National Park boundary. As such the proposed development area lies out with any NSA or National Park. There are no restrictions on aircraft flying over the National Park and although numbers are likely to be small, some aircraft may already overfly this area. 
	Biodiversity	In the Do Nothing baseline scenario (the current situation), the Clash Gour wind farm does not exist and therefore has no impact on Biodiversity. The change sponsor acknowledges the presence of a Special Conservation Area (SAC) and Special Protection Areas (SPAs) in the local area but this scenario will have no impact on these as there will be no change. 

General Aviation	Access	In the Do Nothing baseline scenario, there are no changes to the extant airspace arrangements. GA users in the current situation are able to operate freely within Class G airspace and are not mandated to carry a transponder or be in communication with ATC, unless they wish to enter the Aerodrome Traffic Zone (ATZ) at Inverness Airport or the Military Air Traffic Zone (MATZ) at RAF Lossiemouth. This scenario reflects and maintains this arrangement. Traffic analysis carried out by the change sponsor shows that airspace usage is currently low density.
General Aviation / commercial airlines	Economic impact from increased effective capacity	As specified in the Statement of Need, this ACP is aimed at mitigating the impacts of the proposed Clash Gour wind farm. Therefore, there will be no change to the number of air traffic movements in the area as a direct result of this ACP, which reflects the current situation.
	Fuel burn	In the Do Nothing baseline scenario, there are no changes to the extant airspace arrangements and as such there is no impact on aircraft fuel burn.
Commercial airlines	Training costs	As this is the Do Nothing baseline scenario there are no additional training costs for commercial airlines due to the fact that there is no change to the extant airspace arrangements.
	Other costs	As this is the Do Nothing baseline scenario there are no additional other costs for commercial airlines due to the fact that there is no change to the extant airspace arrangements.
Airport / Air navigation service provider	Infrastructure costs	As this is the Do Nothing baseline scenario there are no additional infrastructure costs for Airports/ANSPs due to the fact that there is no change to the extant airspace arrangements.
	Operational cost	As this is the Do Nothing baseline scenario there are no additional operational costs for Airports/ANSPs due to the fact that there is no change to the extant airspace arrangements.
	Deployment costs	As this is the Do Nothing baseline scenario there are no additional deployment costs for Airports/ANSPs due to the fact that there is no change to the extant airspace arrangements.
	Safety	As the Do Nothing baseline scenario includes the fact that the Clash Gour wind farm does not exist and reflects the current situation, there is no impact on aviation safety. The baseline assumption remains that the extant airspace arrangements are safe and continue to be so.

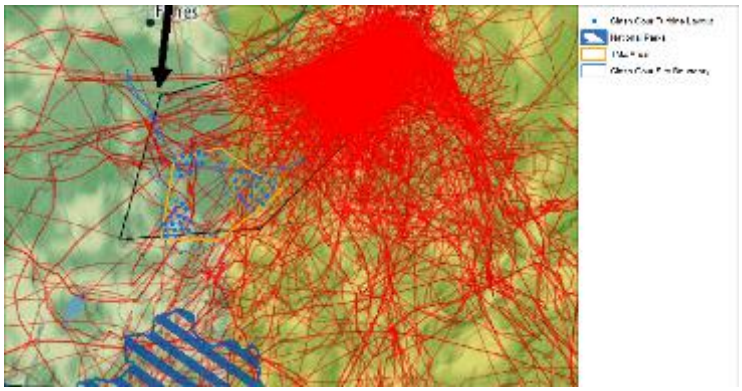
A3.4 Option 7(E)

Option 7(E) – RAG blanking over the proposed wind farm array locations. Simplified polygon TMZ 'rubber banded' around the proposed windfarm locations with no buffer.
From a safety perspective, Option 7(E) provides a radar mitigation solution suitable for managing traffic within the vicinity of the proposed wind farm. As a result of the introduction of primary radar blanking and a TMZ, controllers will have greater situational awareness of traffic operating in the vicinity and will not experience significant radar clutter caused by the presence of the wind farm. There may be a slight increase in controller workload, should an aircraft without a transponder and not in communication with ATC enter the TMZ, however, this is expected to be minimal. In addition, this option does present a hazard in terms of GA integration, however, this can be procedurally and tactically mitigated. Option 7(E) also provides a simplified TMZ airspace design which reduced complexity for both controllers and pilots. With regards to environmental factors, due to the small scale of the proposed TMZ, any re-routing required by aircraft (without a transponder and not in communication with ATC) is expected to be minimal, resulting in minimal additional noise, greenhouse gas, fuel burn, access and economic impacts. The development consent process for the wind farm development included a detailed Environmental Impact Assessment (EIA) which assessed the significant environmental effects of the development. This included a carbon assessment which showed that the development is carbon positive for approximately 27.5 years of its 30 year lifetime, a factor which was balanced against the environmental effects when Scottish Ministers consented the project. This must be considered in balance against the minimal environmental impacts of displaced air traffic. There is expected to be no or very little additional costs for commercial airlines, GA and ANSPs as a direct result of this option. There may be a minor cost associated with controller training and that a cost shall be incurred for the staffing and management of the TMZ, however, this cannot be quantified at this time (and is likely to paid for by the wind farm developer). It must also be noted that the development and construction costs of the wind farm itself are outside the scope of the CAP 1616 process and as such have not been considered. The Change Sponsor considers Option 7(E) to be the minimum option to achieve the objectives of this ACP.

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	Like the Do Nothing scenario, due to the limited population density within the vicinity of the wind farm development, there is expected to be a very limited impact by a small number of light aircraft (which are not equipped with a transponder or in communication with ATC) re-routing around the proposed TMZ, simply because of the minimal number of people within the area. However, it is acknowledged that aircraft may be concentrated around the periphery of the TMZ and not be as widely dispersed as they are in the baseline scenario, especially if they are not equipped with a transponder or are not in communication with ATC. As previously stated, it is estimated that, on average, only 8 aircraft per day will be flying in the vicinity of the TMZ without a transponder fitted; not all of these would have planned to route through the TMZ so would not be required to re-route. In addition, some of these aircraft may be fitted with radio equipment and would be able to gain clearance through the TMZ from the Controlling Authority. The conclusion from this is that the low traffic levels in the vicinity of the proposed Clash Gour Wind Farm would not produce adverse noise levels above those levels which DfT policy considers to be the point at which the adverse effects of noise on health and wellbeing begin to be seen on a community basis, as a result of implementing this option.
	Air Quality	This airspace solution is unlikely to result in more aircraft flying over the area, or at lower altitudes, than the baseline scenario. Like the Do Nothing scenario, to avoid nearby terrain/existing turbines and the proposed turbines, it is likely that any aircraft that overfly the area within the vicinity of the proposed wind farm would be above 1,000 ft. Therefore, as per CAP 1616, Appendix B, Para B74, there is unlikely to be an impact on local air quality due to the effects of mixing and dispersion. In addition, any aircraft flying within the proposed TMZ or those required to re-route to avoid the turbines would not overfly an AQMA. There will be no change in Air Quality over the baseline scenario with this option.

Wider Society	Greenhouse Gas impact	As part of this option, it is acknowledged that some light aircraft may have to re-route around the proposed wind farm in this scenario. Within this option, re-routing would likely only be required by a very small percentage of aircraft, estimated to be a maximum of 8 aircraft per day on average, who do not have a transponder or who are not in communication with ATC. As a result, the majority of aircraft should not require a re-route, but it is noted that a small percentage may do so, which will lead to increased track mileage and therefore increased greenhouse gas emissions. However, due to the small scale of the proposed TMZ this is expected to be minimal, when compared to the baseline scenario. For example, an aircraft routing from Aberdeen Airport to Inverness Airport could travel as little as an additional 0.5 NM to avoid the TMZ. It is also worth noting that a detailed Environmental Impact Assessment (EIA) has been carried out on the development as a whole as part of the development consent process. The EIA concluded that the overall development would be carbon positive, which should be considered, in balance against any adverse greenhouse gas emissions caused by the re-routing of aircraft.
	Capacity and resilience	The introduction of a TMZ is not expected to have any impact on capacity and resilience due to the small scale of the change and nature of operations in the vicinity.
	Tranquillity	Like the baseline scenario, the location of the wind farm (and proposed TMZ) is out with the boundaries of any NSA or NP. Due to the small scale of the proposed TMZ, any aircraft that may have to route around it would unlikely overfly an NSA but may overfly the northern extent of the Cairngorms National Park. However, as there are no restrictions on aircraft flying over the National Park, some aircraft already overfly this area, as shown in the SkyDemon and FLARM images below[10]. 

[10] SkyDemon and FLARM images previously described in paragraph 5.3.5 in Section 5.

		 The topography of the local area is more likely to result in aircraft re-routing to the north of the TMZ, rather than over the higher ground that forms part of the National Park. Some additional movement by light aircraft may occur as a result of displacement around the southern extent of the TMZ, but these aircraft may remain north of the National Park boundary and not impact the National Park. Therefore, the impact of this option on Tranquillity is very limited with very small numbers of aircraft overflying the National Park as a result of being displaced from the area of the TMZ. Any change in the circumstances of air traffic use in the area is unlikely to be perceptible and the impact on tranquillity with option is not expected to be significantly different to the Do Nothing scenario.
	Biodiversity	It is acknowledged that the development of the proposed wind farm may have an impact on biodiversity, when assessed as a stand-alone airspace solution, this option would have a minimal impact on biodiversity. Although the wind farm is located in close proximity to the Moidach More Special Conservation Area (SAC), any impacts of aircraft overflying this designated area are expected to be minimal. The rationale being that this particular designation specifically refers to the conservation of an area of blanket bog, which is subject to negative pressures such as burning or water management issues. As the Moidach More SAC specifically refers to a ground-based eco-system, this ACP is expected to be a very minimal impact as the effects of fuel dispersion and mixing above 1,000 ft are unlikely to cause on impact on local air quality in this area. No Special Protection Areas (SPAs) or European Protected species are expected to be adversely impacted by this option. Any impact on biodiversity as a result of the development of the wind farm itself is subject to development consent and is outside the scope of the CAP 1616 process.

General Aviation	Access	The change sponsor acknowledges that the implementation of a TMZ will have a minor impact on airspace access for some GA users. This is applicable to those GA aircraft that are not equipped with a transponder and are not in communication with ATC. As detailed in paragraph above, this is estimated to be a maximum of 8 aircraft per day on average. For these aircraft a route around the proposed TMZ would be required, however, given the size and scale of this option, any re-routing is expected to be minimal. For those aircraft equipped with a transponder and/or in communication with ATC, this option should have a very limited impact and will not hinder their level of airspace access. Based on traffic analysis conducted by the change sponsor, at this stage, it is not believed that this option would significantly alter the traffic levels within the area.
General Aviation / commercial airlines	Economic impact from increased effective capacity	As specified in the Statement of Need, this ACP is aimed at mitigating the impacts of the proposed Clash Gour wind farm. Therefore, there will be no change to the number of air traffic movements in the area as a direct result of this ACP, this is reflected in the baseline scenario. For those aircraft that are not equipped with a transponder or in communication with ATC, a minor re-route may be required which may lead to a minor additional fuel cost, but due to the scale of the proposed TMZ and the small number of aircraft likely to be affected, this is expected to be very minor.
	Fuel burn	The change sponsor acknowledges that the introduction of a TMZ would require some aircraft (those without a transponder and not in communication with ATC) to re-route around the TMZ, causing increased track mileage and fuel burn. However, due to the scale of the proposed TMZ, this re-route is expected to be minimal and is mainly only applicable to those aircraft which do not meet the requirements to fly within the TMZ. The number of aircraft impacted are anticipated to be small. It should be noted that all commercial aircraft are fitted with transponders and as such there should be no impact on commercial traffic.
Commercial airlines	Training costs	There is no anticipated training cost to commercial airlines as a result of this option, especially as there is a limited amount of commercial traffic within the vicinity of the proposed wind farm. In addition, all commercial aircraft are fitted with a transponder, therefore, there is no adverse impact on this group of airspace users.
	Other costs	There are no anticipated additional costs to commercial airlines associated with this option.

Airport / Air navigation service provider	Infrastructure costs	There is expected to be a possible small cost associated with software updates to accommodate for the RAG blanking and the establishment of the TMZ but these are expected to be minor.
	Operational cost	Any cost incurred by the controlling authority associated with the staffing and management of the proposed TMZ would be subject to commercial negotiations and likely a Letter of Agreement. At this stage of the CAP 1616 process, it is unclear how much this cost is likely to be but shall be investigated in subsequent stages of the process.
	Deployment costs	There may be a small amount of additional controller training associated with the management of the TMZ, however, this is expected to be minimal and are likely to be covered by the Change Sponsor in forming the agreements required to discharge the planning conditions.
	Safety	The management and integration of GA traffic (including gliders) is a potential hazard associated with this option as GA aircraft may be required to route around the proposed TMZ, which may cause 'choke points', however, this is mitigated by airspace design constraints and tactical management of traffic by ATC. To avoid the development of 'choke points' and need for tactical management, there will be clear designation and promulgation of the TMZ within the UK AIP. It is acknowledged that any tactical management may cause a slight increase in controller workload, however, due to the low traffic flows of light aircraft within the area, this is expected to be minimal. Furthermore, within Class G airspace, the pilot is ultimately responsible for collision avoidance. It is recognised that adverse weather conditions may hamper a pilot's ability to maintain visual separation with the turbines. This is mitigated through the effective use of flight planning by pilots. Furthermore, loss of communication with non-transponding aircraft is acknowledged but is an existing hazard which is not impacted by the establishment of a TMZ, especially within Class G airspace. The size and shape of this proposed option is simpler than some others meaning it is easier for both pilots and controllers to interpret/manage. A potential loss of the TMZ boundary (as displayed on the controllers display) is also acknowledged, however this is an unlikely failure mode which may have more serious consequences for factors that do not relate to the establishment of TMZ and as such is an existing hazard, which can be mitigated procedurally.

A4 Glossary

A4.1 Glossary

Term	Meaning
ACP	Airspace Change Proposal
ADS-B	Automatic Dependent Surveillance–Broadcast
agl	Above Ground Level
AIP	Aeronautical Information Publication
ANSP	Air Navigation Service Provider
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATCRMS	Air Traffic Control Radar Mitigation Scheme
ATS	Air Traffic Services
ATZ	Aerodrome Traffic Zone
CAA	UK Civil Aviation Authority
CAP	Civil Aviation Publication
CAS	Controlled Airspace
CGH	Clash Gour Holdings Limited
CO_2	Carbon Dioxide
DAATM	Defence Airspace and Air Traffic Management
DD	Decimal Degrees

DMS	Degrees Minutes Seconds
DOC	Designated Operational Coverage
EDFER	EDF Energy Renewables Limited
EFIS	Electronic Flight Information System
EIA	Environmental Impact Assessment
FL	Flight Level
FLARM	Traffic awareness and collision avoidance technology
ft	feet
GA	General Aviation
GPS	Global Positioning System
GW	GigaWatt
HIAL	Highlands and Islands Airports Limited
IAP	Instrument Approach Procedure
IFR	Instrument Flight Rules
m	metre
MATZ	Military Aerodrome Traffic Zone
MLAT	Multilateration
MOD	Ministry of Defence
MW	MegaWatt
NATMAC	National Air Traffic Management Advisory Committee
NERL	NATS En-Route Limited
NO_2	Nitrogen Dioxide
NSA	National Scenic Area
NM	Nautical Mile
OGN	Open Glider Network

PSR	Primary Surveillance Radar
RAF	Royal Air Force
RAG	Range Azimuth Gating
RCS	Radar Cross Section
RDDS	Radar Data Display Screen
RMZ	Radio Mandatory Zone
SAC	Special Area of Conservation
SPA	Special Protection Area
SSR	Secondary Surveillance Radar
TMZ	Transponder Mandatory Zone
TRAG	Temporary Reserved Area (Gliding)
VFR	Visual Flight Rules