



# Clash Gour Wind Farm ACP-2021-046

## Initial Options Appraisal

Date: 9th June 2022

Author:

Revision: Issue 1

Osprey Ref: 71609 019

This document is of UK origin and has been prepared by Osprey Consulting Services Limited (Osprey) and, subject to any existing rights of third parties, Osprey is the owner of the copyright therein. The document is furnished in confidence under existing laws, regulations and agreements covering the release of data. This document contains proprietary information of Osprey and the contents, or any part thereof shall not be copied or disclosed to any third party without Osprey's prior written consent.

© Osprey Consulting Services Limited 2022

The Hub, Fowler Avenue, Farnborough Business Park, Farnborough, GU14 7JP

01420 520200 / enquiries@ospreycl.co.uk

Registered in England and Wales under No: 06034579



## Document Details

---

Reference	Description
<b>Document Title</b>	Clash Gour Wind Farm ACP-2021-046
	Initial Options Appraisal
<b>Document Ref</b>	71609 019
<b>Issue</b>	Issue 1
<b>Date</b>	9 <sup>th</sup> June 2022
<b>Client Name</b>	Force9 Energy
<b>Classification</b>	Public

Issue	Amendment	Date
Issue 1	Formal Submission	9 <sup>th</sup> June 2022

Approval Level	Authority	Name
Author	Osprey CSL	
Reviewer	Osprey CSL	
Client Approval	Force9 Energy	

# Glossary of Terms

Acronym/Term	Definition
ACP	Airspace Change Proposal
agl	Above Ground Level
amsl	Above Mean Sea Level
ANSP	Air Navigation Service Provider
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
ATC	Air Traffic Control
ATS	Air Traffic Service
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CGH	Clash Gour Holdings
CO <sub>2</sub>	Carbon Dioxide
dB	Decibel
DCO	Development Consent Order
DP	Design Principle
DPE	Design Principles Evaluation
EDFER	EDF Energy Renewables Limited
EIA	Environmental Impact Assessment
FOA	Full Options Appraisal
GA	General Aviation
GNSS	Global Navigation Satellite System
HazID	Hazard Identification

PUBLIC

IOA	Initial Options Appraisal
m	Metre
MoD	(UK) Ministry of Defence
NM	Nautical Mile
NO <sub>2</sub>	Nitrogen Dioxide
NP	National Park
NSA	National Scenic Area
RAF	Royal Air Force
RAG	Range Azimuth Gating
SAC	Special Area of Conservation
SoN	Statement of Need
SPA	Special Protection Area
TMZ	Transponder Mandatory Zone
UK AIP	UK Aeronautical Information Publication

Table 1 Glossary of Terms

# Table of Contents

---

<b>Table of Contents</b> .....	<b>1</b>
<b>1 Introduction</b> .....	<b>3</b>
1.1 Project Overview .....	3
1.2 Document Purpose and Scope .....	4
1.3 CAP 1616 Airspace Change Process .....	4
1.3.1 Progress So Far	5
1.3.2 Step 2A – Options Development	6
1.3.3 Step 2B – Initial Options Appraisal	7
<b>2 Initial Options Appraisal Methodology</b> .....	<b>8</b>
2.1 CAP 1616 Options Appraisal Requirements .....	8
2.2 IOA Minimum Requirements.....	8
2.3 FOA Evidence Capture.....	9
2.4 High-level Objectives & Assessment Criteria.....	9
2.5 Method.....	11
2.5.1 Shortlisting	12
<b>3 Baseline Definition</b> .....	<b>13</b>
3.1 Baseline Overview .....	13
3.2 Baseline Rationale .....	13
3.3 ‘Do Nothing Baseline’ Summary.....	13
<b>4 Qualitative Safety Assessment</b> .....	<b>15</b>
4.1 CAP 1616 Safety Assessment Requirements .....	15
4.2 Safety Assessment Method.....	15
4.3 Safety Assessment Results – Non-Technical Summary.....	15
<b>5 Initial Options Appraisal Results</b> .....	<b>19</b>
5.1 Introduction .....	19
5.2 IOA Considerations.....	19
5.2.1 Qualitative Noise Assessment Methodology	19
5.2.2 Track Mileage	20

5.2.3	Tranquillity 20	
5.2.4	Biodiversity 21	
5.2.5	Air Quality Management Areas 23	
5.3	Comprehensive List of Viable Options .....	24
5.4	Results Summary.....	25
<b>6</b>	<b>Design Options Shortlist .....</b>	<b>27</b>
6.1	Shortlist of Options Taken Forward.....	27
<b>7</b>	<b>References .....</b>	<b>28</b>

## Table of Figures

Figure 1	Clash Gour Wind Farm Location .....	3
Figure 2	CAP 1616 High-level Process.....	5
Figure 3	Clash Gour Statement of Need.....	5
Figure 4	National Scenic Areas and National Parks near Clash Gour (Source: NatureScot) .....	21
Figure 5	Special Protection Areas and Special Areas of Conservation near Clash Gour (Source: NatureScot) .....	22
Figure 6	Air Quality Management Areas near Clash Gour (Source: UK DEFRA) .....	23
Figure 7	IOA Full Analysis Table Extract .....	1-1

## Table of Tables

Table 1	Glossary of Terms .....	iv
Table 2	Finalised Design Principles .....	6
Table 3	IOA Assessment Criteria.....	11
Table 4	High-level Safety Assessment .....	18
Table 5	Comprehensive List of Viable Options .....	24
Table 6	Results Summary Colour Key.....	25
Table 7	IOA Results Summary.....	26

# 1 Introduction

## 1.1 Project Overview

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). Clash Gour will be a substantial onshore windfarm which will be located in the Moray Council Area, approximately 13 Nautical Miles (NM) southwest of Royal Air Force (RAF) Lossiemouth and 15 NM southeast of Inverness Airport. 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 three individual wind turbine array areas which will comprise Clash Gour.



Figure 1 Clash Gour Wind Farm Location

Due to the fact that this ACP is linked to a land development, a detailed Environmental Impact Assessment (EIA) has already been undertaken as part of the Development Consent Order (DCO). Consequently, there is a wealth of environmental information available to support the analysis any environmental assessments, noting that the EIA focuses on environmental impacts on the ground rather than in the air. The EIA concluded that the overall development would be carbon positive [Ref 1], which should be considered, on balance, with any potential adverse impacts on aviation.

## 1.2 Document Purpose and Scope

In developing the Clash Gour wind farm, Force9 have initiated an Airspace Change Proposal (ACP) under the process defined in Civil Aviation Publication (CAP) 1616 [Ref 2], regulated and approved by the UK Civil Aviation Authority (CAA).

The overall purpose of this document is to provide a narrative, explaining the steps, rationale, and outcomes of Step 2B, the Initial Options Appraisal (IOA). It must be highlighted that this document does not contain a detailed IOA analysis of each option. Full analysis can be found in the IOA Full Analysis Table, alongside this document on the CAA Airspace Change Portal, available via the link below.

<https://airspacechange.caa.co.uk/PublicProposalArea?pID=403>

This document includes the methodology, baseline definition and results summary of the detailed IOA analysis, along with a supporting Appendix, and is structured as follows:

1. Introduction (this section)
2. Initial Options Appraisal Methodology
3. Baseline Definition
4. Qualitative Safety Assessment
5. Initial Options Appraisal Results
6. Design Options Shortlist
7. References

In addition, this document also includes the following Appendix:

1. Initial Options Appraisal Full Analysis Table Extract (Appendix A1)

Please note, it is highly recommended that readers review this document either before or alongside the IOA Full Analysis Table (Appendix A1) to provide additional context, clarification, and rationale. In addition, it should be noted that all aviation specific altitudes referred to within this document are based on height Above Mean Sea Level (amsl) rather than Above Ground Level (agl).

## 1.3 CAP 1616 Airspace Change Process

In designing and implementing airspace changes, change sponsors are subject to the process described in CAP 1616 [Ref 2]. This is a seven-stage process, published by the CAA, which also provides guidance to those seeking to change the way in which airspace is used and managed. The seven-stage process is depicted in Figure 2 below.



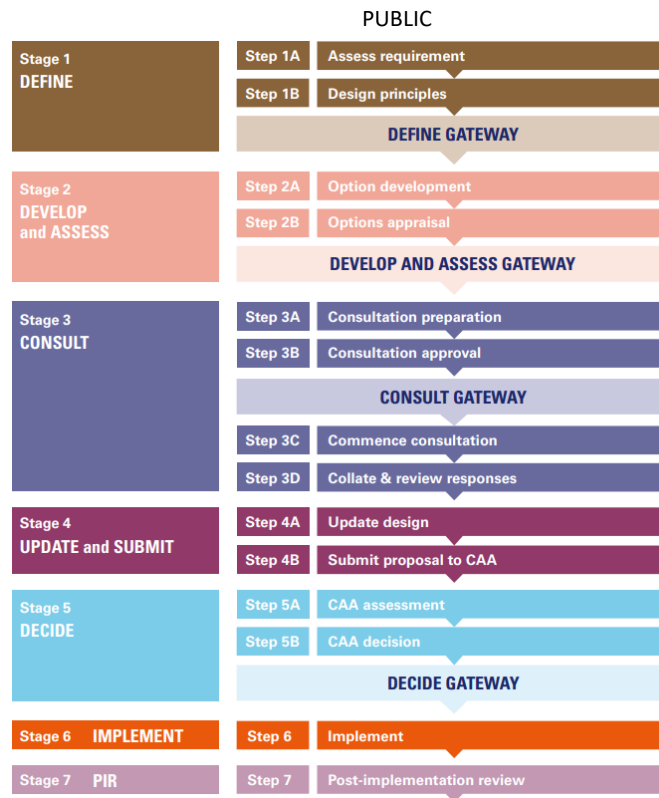


Figure 2 CAP 1616 High-level Process

### 1.3.1 Progress So Far

As per the defined process, the change sponsor has completed a Statement of Need (SoN) submitted as part of Stage 1 (Define). The SoN is shown in Figure 3 below.

**Current situation:**  
EDF Energy Renewables Limited (EDFER), jointly with Force 9 Energy is planning to developing Clash Gour Wind Farm in the name of its wholly owned subsidiary, Clash Gour Holdings Limited (CGH); Clash Gour will be a substantial onshore wind farm which will be located approx 13 nm southwest of Royal Air Force (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, EDFR/CGH have agreed with MoD that the planned wind farm development should not be built until a suitable mitigation solution has been established.

**Action:**  
EDFER/CGH have employed Coleman Aviation Ltd 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 Q3 2022. As a result, EDFR/CGH are keen that the Airspace Change Process is initiated as soon as possible.

Figure 3 Clash Gour Statement of Need

Following the submission of the SoN and the CAA Assessment Meeting, a number of Design Principles (DPs) were developed. As required by CAP 1616, stakeholders were engaged to provide feedback on the DPs during Stage 1. The finalised list of DPs is shown in below.

Design Principle	Description
DP 1: Safety	Ensure an acceptable level of safety for aircraft within and displaced by any proposed airspace solution.
DP 2: Operational (Resilience)	Minimise negative impact on all airspace users.
DP 3: Operational	Airspace change shall have no impact on operations/capacity of airport operators and Air Navigation Service Providers (ANSPs).
DP 4: Operational	Maintain operational resilience of the Air Traffic Control network.
DP 5: Environmental	Minimise environmental impacts to stakeholders on the ground.
DP 6: Economic	Endeavour to minimise economic impact on aircraft operators.
DP 7: Technical	<p>Base the airspace change on the latest technology available.</p> <ul style="list-style-type: none"> <li>• This technology could relate to navigation, radar enhancements or radar data processing etc.</li> <li>• The volume of airspace affected should be the minimum necessary to deliver requirements, whilst providing optimal safety buffer.</li> <li>• Seek to create simple, easily definable solution.</li> </ul>

Table 2 Finalised Design Principles

On successful completion of Stage 1, the ACP moved into Stage 2 (Develop & Assess) which is broken down into two steps:

1. Step 2A – Options Development
2. Step 2B – Initial Options Appraisal

### 1.3.2 Step 2A – Options Development

Within Step 2A the change sponsor is required to develop a comprehensive list of design options to address the issues identified in the SoN. For more information, please refer to the Design Options Engagement Document [Ref 3], available on the CAA Airspace Change Portal. In addition, the change sponsor is required to evaluate

the proposed design options against the DPs established at Stage 1 in what is known as the Design Principles Evaluation (DPE) [Ref 4]. For more information, please refer to the DPE Document, available on the CAA Airspace Change Portal.

### **1.3.3 Step 2B – Initial Options Appraisal**

At Step 2B, a change sponsor is required to conduct an IOA (this document). During the IOA, options that are assessed as viable within the DPE (the Comprehensive List of Viable Options) are assessed against a defined baseline with specific reference to defined criteria within CAP 1616, Appendix E, Table E2 [Ref 2], with the addition of qualitative assessments of noise, tranquillity, biodiversity, and safety impacts, as required for a Level 1 airspace change.

The methodology used to carry out the IOA is described in Section 2 of this document. Furthermore, a summary of the IOA results can be found in Section 0. Please note, an extract of the more detailed analysis can be found as an Appendix (Appendix A1) to this document. The complete IOA Full Analysis Table can be found as a stand-alone document on the CAA Airspace Change Portal.

The main output of the IOA, is a Short List of options (including preferred options[s]) which can be found in Section 6 of this document.

## 2 Initial Options Appraisal Methodology

---

### 2.1 CAP 1616 Options Appraisal Requirements

The Options Appraisal process was carried out in accordance with the guidance in CAP 1616, and in conjunction with The Green Book [Ref 5] and the Department of Transport's WebTAG [Ref 6], which constitute best practice in options appraisal.

Options Appraisal is used as an iterative tool throughout the CAP 1616 [Ref 2] process to help refine the options from an initial Comprehensive List of Viable Options, down to a Short List (including preferred option[s]).

The appraisal process typically consists of the following elements:

- High-level objectives and assessment criteria.
- Baseline definition – usually today's operations.
- Comprehensive List of Viable options (including a do-nothing/minimum option[s]).
- Shortlist of options.
- Preferred or final option(s).

The Options Appraisal requirement of CAP 1616 [Ref 2] evolves through three iterations with the CAA reviewing at each phase as follows:

1. 'Initial' Options Appraisal at Step 2B with the CAA review at the Stage 2, as part of the Develop and Assess gateway.
2. 'Full' Options Appraisal (FOA) at Step 3A with the CAA review at Step 3B and the subsequent Consult gateway.
3. 'Final' Options Appraisal at Step 4A, with the CAA review after the formal submission of the Airspace Change Proposal at the end of Stage 4.

The remainder of this section of the document focusses on the definition of the 'high-level objective and assessment criteria' and the assessment method.

### 2.2 IOA Minimum Requirements

CAP1616 prescribes that the following should be included within an IOA as a minimum:

- A Comprehensive List of Viable Options (including the 'Do Nothing/Minimum' option which will act as a baseline for analysis).
  - A description of the change proposal.
  - An indicator of likely noise impacts.
  - A high-level assessment of benefits and costs involved.
- The criteria for assessing the list of options and the application of these criteria to determine a shortlist of options.
- What evidence the change sponsor will collect, and how it will be collected in order to fill in its evidence gaps and to develop the FOA, during Stage 3. (See Section 2.3)

## 2.3 FOA Evidence Capture

Consistent with the requirements of CAP1616, the IOA is a qualitative analysis of each option against a defined baseline. This is expanded on within the FOA, which is conducted at Stage 3, to include quantitative analysis. The FOA, requires change sponsors to assess each of the design options against each other in relation to the criteria defined in CAP1616, Appendix E using primarily quantitative metrics. These metrics include the assessment of the environmental impacts of the proposed change.

As defined in CAP1616a [Ref 7], the FOA requires change sponsors to collect quantitative environmental metrics that describe the baseline scenario and conduct a series of modelling activities for each of the design options, to enable an environmental comparison. The required metrics include:

- 10-year traffic forecasts
- Standard noise metrics:
  - LAeq noise contours
  - 100% noise mode contours
  - Nx contours
  - Difference contours
  - Lmax spot point levels
  - Operational diagrams
  - Overflight (based on the CAA definition of overflight found in CAP1498 [Ref 8])

The modelling is intended to provide a comparison between today's operation (the baseline), in order to show the impact of the proposed change at the point of implementation and also 10 years post-implementation. Modelling is also required to show the situation at the proposed implementation date and 10 years post-implementation without applying the proposed change. More information regarding these metrics shall be provided during the FOA at Stage 3.

It is the view of the change sponsor that not all of the defined metrics are relevant to this particular airspace change and as such, it is unlikely that all the metrics listed above will be collected during Stage 3. More information on this rationale can be found in Section 5.2.1, specific to noise modelling and methodology.

## 2.4 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 [Ref 2]. These criteria are described in Table 3 IOA Assessment Criteria

below. Additionally, Safety Assessment, Tranquillity and Biodiversity (as defined in CAP 1616, Appendix B [Ref 2]) have been added at the bottom. It is worth stressing that the IOA provides a qualitative assessment only, therefore no numerical, statistical or noise contour analysis has been conducted at this stage. This approach has been chosen because of the relatively small scale of the proposed change compared to other in progress ACPs along with the minimal population in the vicinity, nature of the light aircraft operations in the area and expected limited environmental impacts, and it is therefore deemed proportionate. The change sponsor will be conducting

more detailed quantitative analysis in the FOA as part of subsequent stages of the process.

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 <sup>1</sup> .
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.

<sup>1</sup> Air Quality assessments are only applicable below 1,000 feet and includes the consideration of Air Quality Management Areas (AQMAs).

PUBLIC

	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) [Ref 9].
Wider Society	Tranquillity	The impact upon tranquillity need only be considered with specific reference to Areas of Outstanding Natural Beauty (AONB) <sup>2</sup> 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 3 IOA Assessment Criteria

## 2.5 Method

The IOA was carried out by comparing all the options side by side against the CAP 1616 [Ref 2] criteria in tabular form. The Appraisal also included the results of a Qualitative Safety Assessment (as described in Section 4), and the noise impact for communities was supported by a qualitative noise assessment methodology (as described in Section 5.2.1). An extract of the full analysis of all the options is described in Appendix A1 and included as a separate document, which can be accessed via the CAA Airspace Change Portal.

Each option was compared against the 'Do Nothing baseline' which was established as the baseline for this ACP. This is explored further in Section 3 of this document.

<sup>2</sup> AONBs are not applicable in Scotland and the equivalent designation is a National Scenic Areas which shall be assessed instead. See Section 5.2.3 for more details.

### **2.5.1 Shortlisting**

Once all the options had been assessed against the criteria, the list of options was refined to identify the Short List to be taken forward to Stage 3. The Short List is contained in Section 6, which also specifies the preferred options.



## 3 Baseline Definition

---

### 3.1 Baseline Overview

In accordance with CAP 1616 [Ref 1], a baseline is required for the IOA along with subsequent environmental assessments. CAP 1616, Appendix J [Ref 2] defines the baseline as:

*“Scenario in analysis of different options where the impacts of the change not being implemented are analysed (also known as ‘do nothing’ or ‘do minimum’ option)”* [Ref 2]

An established baseline will allow the change sponsor to conduct an assessment to understand the current impacts so that a comparison can be made with the impacts of the proposed options.

### 3.2 Baseline Rationale

As the change sponsor, Force9 Energy has established a baseline scenario against which each proposed option will be compared.

CAP 1616, Appendix E, Paragraph E20 states:

*“The change sponsor must do an assessment to understand its current impacts so that a comparison can be made with the impacts of the options – the baseline for the appraisal from which the change is assessed. In most cases this baseline will also be the ‘do nothing’ option.”* [Ref 2]

As specified in the statement above, in most cases, ‘Do Nothing’ is the most appropriate baseline to assess against within the IOA. On the assumption that the Clash Gour wind farm is built, Force9 Energy deem it appropriate to use the ‘Do Nothing’ baseline for comparative purposes.

Option 0 (see the Design Options Engagement Document [Ref 3] and DPE [Ref 4]) is a do-nothing scenario whereby the wind farm is built but no radar mitigation solution is put in place, causing radar clutter and interference. As such, although Option 0 was rejected within the DPE [Ref 4], it will be used within the IOA for comparison purposes only.

### 3.3 ‘Do Nothing Baseline’ Summary

To summarise, the change sponsor has elected to proceed with the IOA using a ‘Do Nothing Baseline’. The scenario within ‘Do Nothing Baseline’ (Option 0) is that there is no mitigation put in place against radar clutter. As a result, the operational wind turbines at Clash Gour would be detected by primary radar, effecting the level of service provided at both Inverness Airport and RAF Lossiemouth. Further information regarding the specific effects can be found in Section 1.3 within the Design Options Engagement document, available on the CAA Airspace Change Portal.

Ultimately, this scenario may 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

PUBLIC

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 it provides to aviation operating within the vicinity of the Development Areas. Furthermore, dependent on the radar service being provided, controllers would be required to vector all 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<sub>2</sub> and CO<sub>2</sub> emissions through extended routing around the area of wind turbine clutter.

The 'Do Nothing option' (Option 0) was considered as part of the DPE in Step 2A. Within the DPE, said option was rejected on the grounds that it is not a feasible option from both a flight safety and planning conditions perspective. However, as the 'Do Nothing baseline', Option 0 has been carried forward into the IOA for comparative purposes only.

## 4 Qualitative Safety Assessment

### 4.1 CAP 1616 Safety Assessment Requirements

A qualitative Safety Assessment is required for all options identified during Step 2A, and a detailed final safety assessment must be completed by the change sponsor prior to submission in Step 4B. The change sponsor is carrying out the safety assessment activities in accordance with CAP 760 [Ref 9], the separate guidance provided by the CAA for safety assessment.

The change sponsor is developing a full four-part Safety Case iteratively throughout the CAP 1616 [Ref 2] process which will be submitted to the CAA at Step 4B.

### 4.2 Safety Assessment Method

The Qualitative Safety Assessment uses the results of a formal Hazard Identification (HazID) workshop held in February 2022 during which the hazards, causes and consequences relating to each of the options (within the Comprehensive List of Viable Options) were identified.

The HazID comprised a structured sequence of “Sessions”, as follows.

- Session 1: Hazards Implicit in Baseline Service Capability.
- Session 2: Hazards Due to Clash Gour Wind Turbines.
- Session 3: Hazards Implicit in Airspace Design Concept.
- Session 4: Airspace Design Concept Implementation Functional Hazards.

With reference to the above sessions, Sessions 3 and 4 are most applicable to the options which make up the Comprehensive List of Viable Options.

### 4.3 Safety Assessment Results – Non-Technical Summary

The safety work to date implies that all the options in the Comprehensive List of Viable options will meet acceptable levels of flight safety while acknowledging that existing hazards (e.g., loss of surveillance, loss of GNSS signal in space) will remain.

Table 4 below describes the high-level safety assessments for the Comprehensive List of Viable Options.

Option No	Variation	High-level Safety Assessment
7	C	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

PUBLIC

	<p>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. Having said that, the size and shape of this proposed TMZ option would add additional complexity for both pilots and controllers, leading to increased workload. 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.</p> <p>It is worth noting that during stakeholder engagement, both Inverness Airport and RAF Lossiemouth agreed that a possible technical solution could be found to further mitigate any adverse impacts. However, such a solution is not currently in place. These particular stakeholders raised objections and agreed a set of suitably worded consent conditions. Adherence to these conditions may trigger both parties to remove their objections.</p>
D	<p>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. In the case of this option, an additional mitigation is the 2 NM buffer which will give the controller additional warning of an unauthorised aircraft entering the TMZ. 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</p>

PUBLIC

	<p>hazard which is not impacted by the establishment of a TMZ, especially within Class G airspace. Having said that, the size and shape of this proposed TMZ option would add additional complexity for both pilots and controllers, leading to increased workload. 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.</p> <p>It is worth noting that during stakeholder engagement, both Inverness Airport and RAF Lossiemouth agreed that a possible technical solution could be found to further mitigate any adverse impacts. However, such a solution is not currently in place. These particular stakeholders raised objections and agreed a set of suitably worded consent conditions. Adherence to these conditions may trigger both parties to remove their objections.</p>
E	<p>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.</p> <p>It is worth noting that during stakeholder engagement, both Inverness Airport and RAF Lossiemouth agreed that a</p>

PUBLIC

		possible technical solution could be found to further mitigate any adverse impacts. However, such a solution is not currently in place. These particular stakeholders raised objections and agreed a set of suitably worded consent conditions. Adherence to these conditions may trigger both parties to remove their objections.
F		<p>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. In the case of this option, an additional mitigation is the 2 NM buffer which will give the controller additional warning of an unauthorised aircraft entering the TMZ. 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.</p> <p>It is worth noting that during stakeholder engagement, both Inverness Airport and RAF Lossiemouth agreed that a possible technical solution could be found to further mitigate any adverse impacts. However, such a solution is not currently in place. These particular stakeholders raised objections and agreed a set of suitably worded consent conditions. Adherence to these conditions may trigger both parties to remove their objections.</p>

Table 4 High-level Safety Assessment

## 5 Initial Options Appraisal Results

---

### 5.1 Introduction

This section provides some additional clarification to assist the reader in understanding the rationale behind the IOA Results, which are presented in full, at the end of this section. The Results Summary, presented in Section 5.4 is a high-level extract of the Full Analysis Table, which is on the airspace change portal as a separate document. It is highly recommended that this section should be read before proceeding to read the Full Analysis Table (found in Appendix A1) to provide context and to understand the terminology used.

### 5.2 IOA Considerations

#### 5.2.1 Qualitative Noise Assessment Methodology

To support the assessment of the noise related criteria, the change sponsor has carried out a qualitative assessment of the likely noise impacts of each option on people on the ground. Within the IOA, consideration has also been given to the overflight of AONBs (NSAs<sup>3</sup>), NPs and Biodiversity receptors, as described below.

Please note, at this stage no quantitative analysis has been carried out with regards to track mileage or noise contouring. As per the CAP 1616 process, environmental assessments will be carried out in Stage 3 (Consult).

As part of the ACP process, change sponsors are required to consider the noise modelling throughout the lifecycle of the proposed change. At Stage 2 of the CAP 1616 process, the change sponsor is required to provide the CAA with an indication as to what level of noise modelling, they feel is applicable as defined in Tables 4.1 and 4.2 within CAP 2091 [Ref 10].

In response to this requirement, the change sponsor feels it is inappropriate to define a noise modelling category. The rationale being that the measurement of noise as part of CAP 2091 requirements is defined with specific reference to operating airfields which have an existing level of traffic. However, this is not the case for this ACP as it does not involve an operational airfield. Therefore, existing traffic levels, traffic forecasts and population thresholds (affected by noise within the defined 51dB and 45 dB contours) cannot be compared. CAP 2091, Paragraph 4.7 [Ref 10] states:

*“It will be up to the entity providing the CAA with noise calculations to demonstrate both the required Category of Noise Modelling from the tables above and to provide evidence to show that the noise modelling used by that entity meets the requirements for that Category. It will be acceptable for an entity to use its current noise modelling methodology to undertake the assessment of the required Category of Noise Modelling for that airport, even if the assessment shows that the entity needs to move to a higher Category noise modelling to provide noise calculations to the CAA for the requisite purpose. If the entity has no current noise modelling methodology, then it will be acceptable for it to use Category E to assess the required Category that applies to that*

---

<sup>3</sup> See Section 5.2.3 for details.



*airport.”*

The change sponsor acknowledged that the paragraph above states that an entity with no current noise modelling methodology can be assessed within Category E. However, it must be stressed that this still relates to airfields with an existing operation, which provides an effective comparator, no such comparator exists for this ACP.

With specific reference to population data, in their Mid-2020 Population Estimates (Scotland) report published on 25 Jun 21 [Ref 11], National Records of Scotland identified that population density in the vicinity of Clash Gour was, on average, fewer than 50 people per square kilometre and the population of the nearby Highlands region was, on average, 9 people per square kilometre. This emphasises the minimal affect that any proposed airspace change will have on local communities.

On the other hand, should the CAA deem it appropriate, it would be expected that Category E noise modelling [Ref 10] would be applicable to this ACP based on the fact that there is no existing noise modelling methodology (as there is no airfield), the proposed options are unlikely to change light aircraft operations and the relatively small population count within the vicinity of the proposed change.

### **5.2.2 Track Mileage**

Please note, this sub-section is for information only. No quantitative comparison of track milage has been carried out as part of the IOA. Such analysis will be conducted in subsequent environmental assessment throughout the CAP 1616 process.

As no quantitative analysis has been carried out at this stage, it is not possible to determine the specific track mileage applicable to any aircraft that may be required to route around a proposed TMZ, located above the wind farm. Having said that, due to the small scale of this change (in terms of TMZ dimensions) any re-routing by light aircraft is unlikely and in the remote eventuality it did occur then this would be expected to have a minimal impact.

In addition, as part of the IOA, track mileage has been used as a substitute for assessing greenhouse gas emmissions and fuel burn. The logic being that the greater number of track miles flown, the more fuel burn required and therefore, more greenhouse gas emmissions are released. It must be stressed that a detailed Environmental Impact Assessment (EIA) has been conducted as part of the wind farm development consent process [Ref 1]. The EIA included a carbon balance assessment, which considered the manufacture, construction and transporttation of turbine components, showing the development is carbon positive for the majority of its operational period. Any additional greenhouse gas emmsions caused by the re-routing of light aircraft must be balanced against the fact that this ACP facilitates a carbon positive development.

### **5.2.3 Tranquillity**

As defined in Table 3 (see Section 2.4), CAP 1616, Appendix B [Ref 2] requires change sponsors to consider the impact of the proposed change on levels of Tranquillity with specific reference to AONBs and NPs. Please note, there were no additional areas identified through community engagement.

Under devolved legislation, there are no AONBs in Scotland. The equivalent designation is known as a National Scenic Area (NSA). The closest NSAs to the



PUBLIC

proposed wind farm site are shown in below. When compared to the proposed location of the Clash Gour wind farm, it can be seen that the site is well outside the Cairngorm Mountains and Dornoch Firth NSAs by approximately 20 NM and 23 NM respectively [Ref 12]. As such, it is anticipated that any ACP solution will have no impact on either NSAs. In addition, should aircraft be required to route around the wind farm, there is ample space between the wind farm and the two closest NSAs, meaning aircraft would not be required to overfly any NSAs as a result of re-routing.

There are currently only two NPs in Scotland. Loch Lomond & the Trossachs NP (located on the western side of Scotland) and the Cairngorms NP (located on the eastern side of Scotland). Figure 4 below shows the location of the Cairngorms NP. Like the Cairngorm Mountains NSA mentioned above, the proposed wind farm is located outside the Cairngorms NP boundary by approximately 3.2 NM due northeast [Ref 11]. As such, it is anticipated that any ACP solution will have a limited impact on NPs, especially given light aircraft operations in the area. In addition, it should be noted that the Cairngorms NP Authority did not object to the wind farm DCO and expressed no immediate concerns during initial stakeholder engagement.

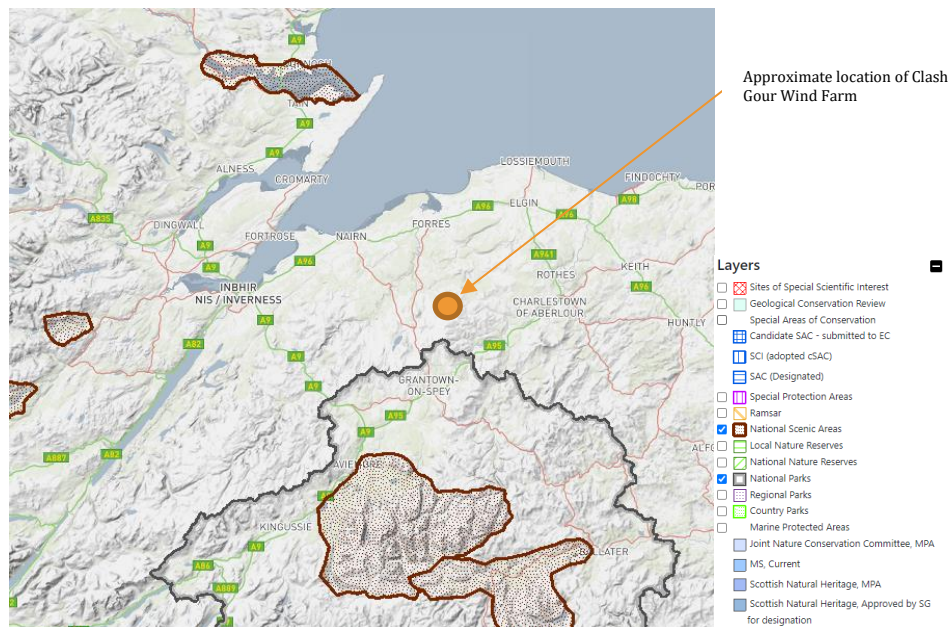


Figure 4 National Scenic Areas and National Parks near Clash Gour (Source: NatureScot)

## 5.2.4 Biodiversity

As defined in Table 3 (see Section 2.4), CAP 1616 [Ref 2] requires change sponsors to consider the impact the proposed change may have on biodiversity within the vicinity of the change. CAP 1616, Appendix B, Paragraph B80 states “In general, airspace change proposals are unlikely to have an impact upon biodiversity because they do not involve ground-based infrastructure” [Ref 2]. It is acknowledged that the development of the proposed wind farm may have an impact on biodiversity but as detailed in the EIA [Ref 1], proposed mitigation actions shall fully alleviate any adverse impacts of the turbines themselves. When the proposed airspace solution is considered in isolation, it is not expected to have a significant impact on biodiversity. Any consideration of the impact on biodiversity specific to the construction of the

PUBLIC

PUBLIC

wind turbines is considered within the planning consent process and is therefore outside the scope of this ACP.

Nevertheless, the change sponsor has investigated “terrestrial, marine and other aquatic ecosystems” that may be impacted, as per CAP 1616, Appendix B, Paragraph B79 [Ref 2].

With regards to maritime and other aquatic ecosystems, none of the proposed options within this ACP pass over any major water courses such as major rivers, lakes, or reservoirs. Consequently, it is deemed that the impact of this ACP on water-based ecosystems is the same as the baseline scenario (‘Do Nothing baseline’), of which there is currently no known adverse impact. This is reflected in the Full Analysis Table (as shown in Appendix A1).

The change sponsor acknowledges that any proposed airspace solution is likely to be directly above the Moidach More Special Area of Conservation (SAC). 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. [Ref 13]. The wind farm proximity to the Moidach More SAC was considered as part of the EIA and DCO and specifically refers to a ground-based eco-system. As such this ACP is expected to have a very minimal impact as the effects of fuel dispersion and mixing above 1,000ft are unlikely to cause an impact on local air quality in this area [Ref 2].

As specified in CAP 1616, Appendix B, Paragraph B80 [Ref 2], change sponsors are required to consider the impact of the change on any European Protected Species as defined in the Conservation of Habitats and Species Regulations 2010 [Ref 14]. Following the legislative changes associated with Brexit, European protected sites are now recognised in Scotland as Special Protection Areas (SPAs) and SACs [Ref 15]. Figure 5 shows the closest SPAs and SACs to the proposed Clash Gour wind farm development [Ref 12]. As part of the DCO process, the wind farm development has been subject to a Habitats Regulations Appraisal. A decision on this has not yet been reached, but early indications from NatureScot are that there should be no significant effects on nearby SACs and SPAs. Consequently, any airspace solution contained within this ACP is not expected to have an adverse impact on biodiversity (including European protected species).

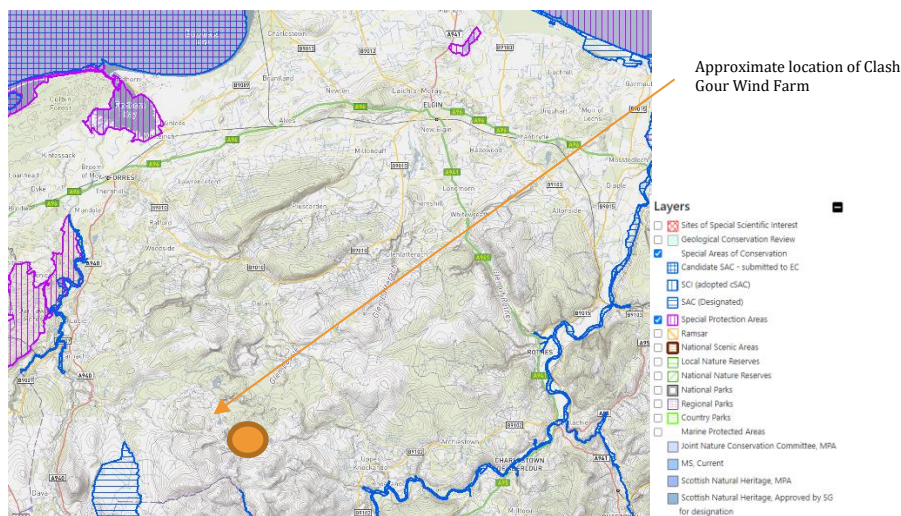


Figure 5 Special Protection Areas and Special Areas of Conservation near Clash Gour (Source: NatureScot)

### 5.2.5 Air Quality Management Areas

Like, AONBs (NSAs) and NPs, CAP 1616 [Ref 2] requires change sponsors to consider the impact of proposed changes on Air Quality Management Areas (AQMAs). AQMAs are areas within which local authorities are required to measure, review, and assess the impact of air quality on people’s health and the environment [Ref 16]; most are associated with road traffic emissions.

With reference to Clash Gour, Figure 6 below shows that there are no AQMAs in the area surrounding the proposed wind farm [Ref 17]. Therefore, there is expected to be no impact on AQMAs as a result of this ACP.

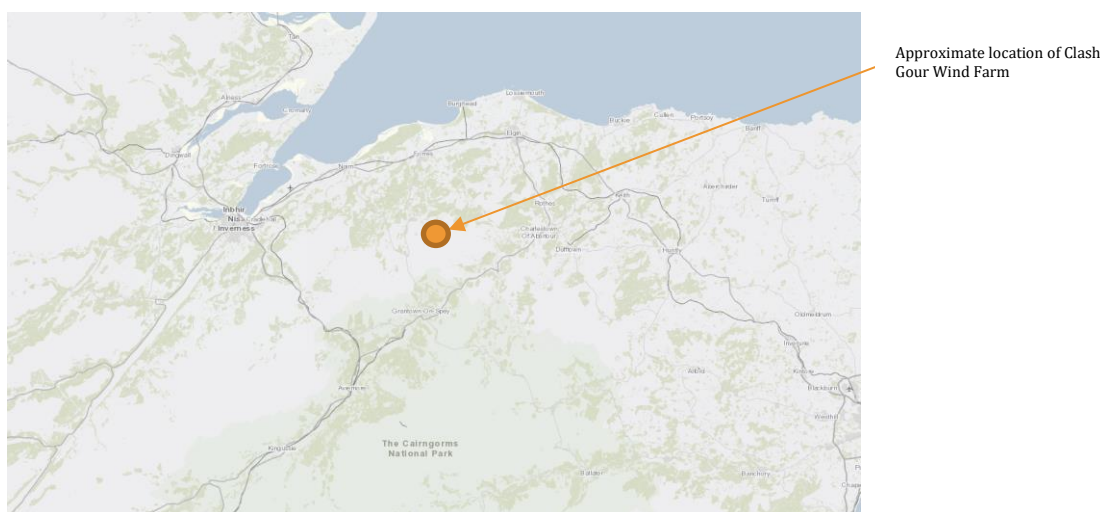


Figure 6 Air Quality Management Areas near Clash Gour (Source: UK DEFRA)

In addition, with regards to air quality, it is likely that the majority of aircraft would operate above 1,000ft to avoid nearby terrain and the proposed wind farm. Due to the effects of mixing and dispersion, there is therefore unlikely to be an impact on local air quality within the immediate vicinity of the proposed development, which is specifically attributed to aircraft movements. This is aligned with CAP 1616, Appendix B, Paragraph B74 [Ref 2].

### 5.3 Comprehensive List of Viable Options

Table 5 Comprehensive List of Viable Options

below provides a basic description of the Comprehensive List of Viable Options that was established after the DPE [Ref 4]. Please note that no discontinued or rejected options appear in Table 5 Comprehensive List of Viable Options

below.

Option No	Variation	Basic Description
7	C	Placement of a TMZ over the windfarm array locations including the use of RAG blanking to remove associated wind turbine induced radar clutter from RAF Lossiemouth and Inverness ATC displays but without a buffer.
	D	Placement of a TMZ over the windfarm array locations including the use of RAG blanking to remove associated wind turbine induced radar clutter from RAF Lossiemouth and Inverness ATC displays with a 2 NM buffer.
	E	Placement of a TMZ over the windfarm area (simplified shape) including the use of RAG blanking to remove associated wind turbine induced radar clutter from RAF Lossiemouth and Inverness ATC displays.
	F	Placement of a TMZ over the windfarm area (simplified shape) including the use of RAG blanking to remove associated wind turbine induced radar clutter from RAF Lossiemouth and Inverness ATC displays with a 2 NM buffer.

Table 5 Comprehensive List of Viable Options

A more detailed comprehensive list of viable options, including map overlays is published on the CAA airspace change portal as part of Step 2A.

## 5.4 Results Summary

This section provides a high-level summary of the IOA. An extract of the full analysis table is available in Appendix A1. The complete table can be found on the CAA airspace change portal.

Table 6 below outlines the colour coding scheme used in the subsequent table (Table 7) to distinguish between which options will be carried forward and which have not.

<b>Colour Key</b>	
Preferred Option	Meets objectives, insignificant impact, and is one of the Short-Listed options and is the most favourable.
Carry Forward	Meets objectives, insignificant impact, and is one of the Short-Listed options.
Not Carried Forward	Meets objectives or has an insignificant impact but is less attractive than other options.
Reject	Fails to meet one or more objectives or has a significant impact that cannot be effectively mitigated.
Baseline – Previously Rejected	Included for completeness.

Table 6 Results Summary Colour Key

Table 7 (the Comprehensive List of Viable Options) below contains a high-level summary of the IOA results, broken down by option number and variation. For details on the full analysis, please refer to the separate Appendix on the CAA airspace change portal, as detailed in Appendix A1 of this document. Please note, the same colour key is applicable to the Full Analysis Table (as shown in Appendix A1). A copy of Table 6 is included on the Full Analysis Table, when accessed as a separate document via the CAA airspace change portal.



Option No	Variation	Status
0	N/A	Baseline – Previously rejected – For comparative purposes only.
7	C	Not Carried Forward – Based on its performance in the IOA, Option 7C has not been carried forward on the basis that it does meet the objectives of the SoN but does not include an additional safety buffer. In addition, this option is a complicated shape which would cause unnecessary complexity for both controllers and pilots.
	D	Not Carried Forward – Based on its performance in the IOA, Option 7D has not been carried forward on the basis that it does meet the objectives of the SoN but is a complicated shape which would cause unnecessary complexity for both controllers and pilots.
	E	Carry Forward – Based on its performance in the IOA, Option 7E has been carried forward. This is on the basis that it meets the objectives of the SoN but also provides a simpler airspace solution when compared to Options 7C and 7D, leading to reduced complexity. However, Option 7E does not include an additional 2 NM safety buffer.
	F	Preferred Option – Based on its performance in the IOA, Option 7F has been selected as the Preferred Option. This is on the basis that this option meets the objectives of the SoN and provides a simpler airspace solution when compared to Options 7C and 7D, leading to reduced complexity. In addition, Option 7F includes an additional 2 NM safety buffer which further enhances safety when compared to Option 7E.

Table 7 IOA Results Summary

## 6 Design Options Shortlist

### 6.1 Shortlist of Options Taken Forward

Table below presents the Short List of options carried forward to Stage 3 along with a summary of the Initial Appraisal Outcome for that option.

The IOA has shown that all of the options (within the Comprehensive List of Viable Options) have the same or minimal impact when compared to the Do-Nothing baseline, mainly due to the small scale of any of the proposed TMZ options. The change sponsor acknowledges that for all TMZ options, a small number of aircraft (that are not fitted with a transponder and are not in communication with ATC) may be required to route around any TMZ solution. Having said that, due to the geographic location and scale of the proposed options, any re-routing of light aircraft is expected to be minimal, reducing any adverse impacts such as greenhouse gas emissions, fuel burn and associated costs.

Shortlist Option	Initial Appraisal Outcome
7E – Carry Forward	Based on its performance in the IOA, Option 7E has been carried forward. This is on the basis that it meets the objectives of the SoN but also provides a simpler airspace solution when compared to Options 7C and 7D, leading to reduced complexity. However, Option 7E does not include an additional 2 NM safety buffer.
7F – Preferred Option	Based on its performance in the IOA, Option 7F has been selected as the Preferred Option. This is on the basis that this option meets the objectives of the SoN and provides a simpler airspace solution when compared to Options 7C and 7D, leading to reduced complexity. In addition, Option 7F includes an additional 2 NM safety buffer which further enhances safety when compared to Option 7E.

Table 8 Shortlist of Options Taken Forward

## 7 References

Ref No	Source	Link
1	Force9	<a href="http://www.force9energy.com/projects/current/clash-gour">http://www.force9energy.com/projects/current/clash-gour</a>
2	CAA	<a href="https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&amp;mode=detail&amp;id=8127">https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&amp;mode=detail&amp;id=8127</a>
3	CGH	<a href="https://airspacechange.caa.co.uk/PublicProposalArea?pid=403">https://airspacechange.caa.co.uk/PublicProposalArea?pid=403</a>
4	CGH	<a href="https://airspacechange.caa.co.uk/PublicProposalArea?pid=403">https://airspacechange.caa.co.uk/PublicProposalArea?pid=403</a>
5	UK Government	<a href="https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government">https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government</a>
6	UK Government	<a href="https://www.gov.uk/government/publications/webtag-transport-appraisal-process-may-2018">https://www.gov.uk/government/publications/webtag-transport-appraisal-process-may-2018</a>
7	CAA	<a href="https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&amp;mode=detail&amp;id=8128">https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&amp;mode=detail&amp;id=8128</a>
8	CAA	<a href="http://publicapps.caa.co.uk/modalapplication.aspx?appid=11&amp;mode=detail&amp;id=7749">http://publicapps.caa.co.uk/modalapplication.aspx?appid=11&amp;mode=detail&amp;id=7749</a>
9	CAA	<a href="https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&amp;mode=detail&amp;id=2119">https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&amp;mode=detail&amp;id=2119</a>
10	CAA	<a href="https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&amp;mode=detail&amp;id=10124">https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&amp;mode=detail&amp;id=10124</a>
11	National Records of Scotland	<a href="https://www.nrscotland.gov.uk/files/statistics/population-estimates/mid-20/mid-year-pop-est-20-report.pdf">https://www.nrscotland.gov.uk/files/statistics/population-estimates/mid-20/mid-year-pop-est-20-report.pdf</a>
12	NatureScot	<a href="https://sitelink.nature.scot/map">https://sitelink.nature.scot/map</a>
13	NatureScot	<a href="https://sitelink.nature.scot/site/8318">https://sitelink.nature.scot/site/8318</a>
14	UK Government	<a href="https://www.legislation.gov.uk/ukxi/2010/490/contents/made">https://www.legislation.gov.uk/ukxi/2010/490/contents/made</a>



PUBLIC

15	NatureScot	<a href="https://www.nature.scot/professional-advice/protected-areas-and-species/protected-areas/international-designations/european-sites">https://www.nature.scot/professional-advice/protected-areas-and-species/protected-areas/international-designations/european-sites</a>
16	UK Government (DEFRA)	<a href="https://uk-air.defra.gov.uk/aqma/">https://uk-air.defra.gov.uk/aqma/</a>
17	UK Government (DEFRA)	<a href="https://uk-air.defra.gov.uk/aqma/maps/">https://uk-air.defra.gov.uk/aqma/maps/</a>

Table 9 References

# A1 Initial Options Appraisal Full Analysis Table Extract

Figure 7 below presents an extract of the IOA Full Analysis Table. The full analysis of the options is contained in the Initial Options Appraisal Full Analysis Table, that can be found in PDF format alongside this document on the CAA Airspace Change Portal.

CLASH GOUR WIND FARM ACP - INITIAL OPTIONS APPRAISAL - FULL ANALYSIS TABLE				
Initial Options Appraisal Appendix A1 Issue 1				
Group	Impact	Level of Analysis	Option 0 - 'Do Nothing Baseline' - No mitigation against radar clutter	Option 7C - RAG blanking and TMZ over the proposed wind farm array locations
Communities	Noise impact on health and quality of life	Initial Options Appraisal: Qualitative	Due to the limited population density within the vicinity of the proposed wind farm, it is expected that there will be a very limited impact on local communities in terms of noise impact on health and quality of life. Data from National Records of Scotland indicates that there are less than 50 people per square kilometre within the vicinity of the proposed wind farm. Therefore, in this option, any aircraft (Light aircraft in particular) required to re-route as a result of the wind turbines would have a limited impact on noise, simply because of the minimal number of people within the area.	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 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.
Communities	Air Quality	Initial Options Appraisal: Qualitative	To avoid nearby terrain and the turbines, it is likely that any aircraft that overfly the area within the vicinity of the proposed wind farm would be above 1,000ft. 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 required to re-route to avoid the turbines would not overfly an AQMA.	Like the Do Nothing scenario, to avoid nearby terrain and the turbines, it is likely that any aircraft that overfly the area within the vicinity of the proposed wind farm would be above 1,000ft. 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.
Wider Society	Greenhouse Gas impact	Initial Options Appraisal: Qualitative	It is acknowledged that some light aircraft may have to re-route around the proposed wind farm in this scenario. This is particularly true for light aircraft which may lead to a small increase in greenhouse gas emissions. However, the limited size of the proposed wind farm is such that any re-routing is expected to be minimal and as such, additional greenhouse gas emissions is expected to be minimal. 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.	Like the Do Nothing scenario, 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, 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. 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.

Figure 7 IOA Full Analysis Table Extract