Moray Offshore Wind Farm (West) Ltd

Moray West

Gateway Documentation:

Stage 4

Airspace Change Proposal

Authorship

Action	Role	Date
Produced	[redacted] - Airspace Change Specialist NATS	April 2021
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1. Contents

2. Introduction

2.1 Moray Offshore Wind Farm (West) Ltd. (MOWWL) is intending to develop an offshore wind farm in the Moray Firth. The proposed wind farm will cover an area of approximately 225 km^2 and is located around 22.5 km (12.1 NM) from the Caithness coastline and 24 km (13 NM) from the Aberdeenshire coastline. It will be situated adjacent to the Beatrice and Moray East developments and will contain up to 85 Wind Turbine Generators (WTGs).

2.2 WTGs can interfere with air traffic control radars. Detection on the radar would have the potential to cause false radar returns to be displayed to an Air Traffic Control Officer (ATCO). This radar "clutter" could obscure primary returns from actual aircraft and could also interfere with radar tracking. This could affect an ATCO's ability to identify primary radar aircraft returns and increases the risk of the ATCO not detecting a conflict between aircraft. Large numbers of turbines could also lead to saturation of the radar processing systems.

2.3 Radar Range Azimuth Gating (RAG), more commonly known as Radar Blanking, is the proposed solution to be deployed over the area of the wind farm before it is constructed, to prevent primary radar detection of the WTGs. However, radar blanking will also remove primary radar returns of aircraft within the blanked area. As such, a Transponder Mandatory Zone (TMZ) will need to be established in the same area so that aircraft will remain visible to ATC using Secondary Surveillance Radar (SSR).

2.4 The changes in this Airspace Change Proposal (ACP) only impact flights over the sea (10.1 NM offshore). Hence, in accordance with the Levels as defined in CAP1616, the Civil Aviation Authority (CAA) has categorised this proposal as a Level 2B change. In line with the requirements for a Level 2B change, the environmental impact assessment has been conducted on the basis of CO_2 emissions only. There would be no perceptible change to noise impacts to stakeholders on the ground; hence no noise analysis has been undertaken; equally, there will be no discernible change in impact on tranquillity or biodiversity.

2.5 Previous documents (Refs 4-7 - please see the table of references on Page 19 for links to the relevant documents) have reduced the number of design concepts being considered to just one. This option can be summarised as follows:

RAG Blanking with a TMZ including a 2 NM buffer extended to align with Existing TMZs (Option C)[1]

This TMZ with the associated RAG blanking has been found to be the optimum solution to mitigate the impact of the WTGs on the Allanshill Primary Surveillance Radar (PSR). This will provide:

- Effective suppression of all primary radar clutter associated with the WTGs.
- Promulgation of a TMZ over the RAG blanked area will ensure that aircraft within the TMZ area must be transponder equipped and hence will remain visible to Air Traffic Control (ATC) via secondary radar.
- The dimensions of the TMZ include a 2 NM buffer which is adequate to ensure that ATC have sufficient time to identify when an infringement of the TMZ is taking place and take appropriate action.
- The proposed Option C (TMZ coupled with radar RAG blanking) provides effective and safe mitigation against the radar issues associated with WTGs.

2.6 MOWWL completed a consultation on the changes presented here; involving the targeted set of stakeholders who would be affected by this change. The stakeholders had been fully engaged on the proposed changes prior to consultation. The consultation was open for 10 weeks and allowed MOWWL to gather views and information on the proposed change. Stakeholders were requested to leave

[1] This is a temporary solution for MOD but an enduring solution for NERL.

feedback via the online portal, which included a summary of the changes and the Consultation Document (Ref 10).

2.7 The respondents categorised their level of support for the proposed changes as either SUPPPORT or NO COMMENT (neither support nor object). No respondents categorised their level of support for the proposed changes as AMBIVILANT (mixed feelings) or OBJECT. One response had the potential to impact the final design. However, following assessment, it was rejected and the design was not updated (Ref 11). As such, the proposed design submitted here is the same as the design detailed in the consultation document (Ref 10).

2.8 If the proposal is approved by the CAA, the proposed design would be implemented not before AIRAC 01/2024.

3. Executive Summary

3.1 The WTGs contained within the MOWWL development have the potential to be detected by the Allanshill PSR. This would cause unacceptable interference through the desensitization of the radar and the creation of 'false' radar returns (known as radar clutter). This radar clutter could affect an ATCO's ability to identify primary radar aircraft returns and increases the risk of an ATCO not detecting a conflict between aircraft. Large numbers of turbines could also lead to saturation of the radar processing systems.

3.2 To mitigate against this risk, MOWWL is proposing to deploy RAG on the Allanshill PSR to remove all primary radar returns from the wind farm's WTGs. However, RAG will also remove primary radar returns from any aircraft within the blanked area. Owing to the removal of primary radar coverage, it will be necessary to establish a TMZ over the consented wind farm so that only aircraft equipped with a transponder, and hence visible to ATC via SSR, will be permitted to overfly the wind farm (RAG blanked area) without first obtaining a clearance from ATC.

3.3 To facilitate the change summarised above, MOWWL developed a set of 12 relevant design principles, used to evaluate design options; and further analysed the leading option.

3.4 MOWWL created a consultation strategy to identify, engage and target specific stakeholders; launched and completed a focused consultation; and finally, assessed and analysed the thirteen consultation responses– please see the table of references on Page 19 for links to the relevant documents.

3.5 As covered in the Stage 3 Step 3 Collate and Review Responses (Incorporating Step 4A Update Design) document (Ref 11), there was one response element identified as having the potential to impact the proposed design. Following assessment, this was rejected, and the proposed design was not revised.

4. Current Airspace Description

4.1 Structures and Routes

The wind farm is proposed to cover an area of approximately 225 km^2. The proposed airspace change would include this entire area, with an additional 2 NM buffer surrounding the development.

This airspace is currently Class G uncontrolled. The Eastern portion of the wind farm will sit underneath Air Traffic Service (ATS) Route Y904 and Helicopter Main Routing Indicators (HMRI) X-Ray, within an area covered by the existing Moray Firth TMZ[2] surrounding the Beatrice Offshore Wind Farm Ltd (BOWL) and the Moray Offshore Wind Farm (East) Ltd (MOWEL). developments. See Figure 1 below:

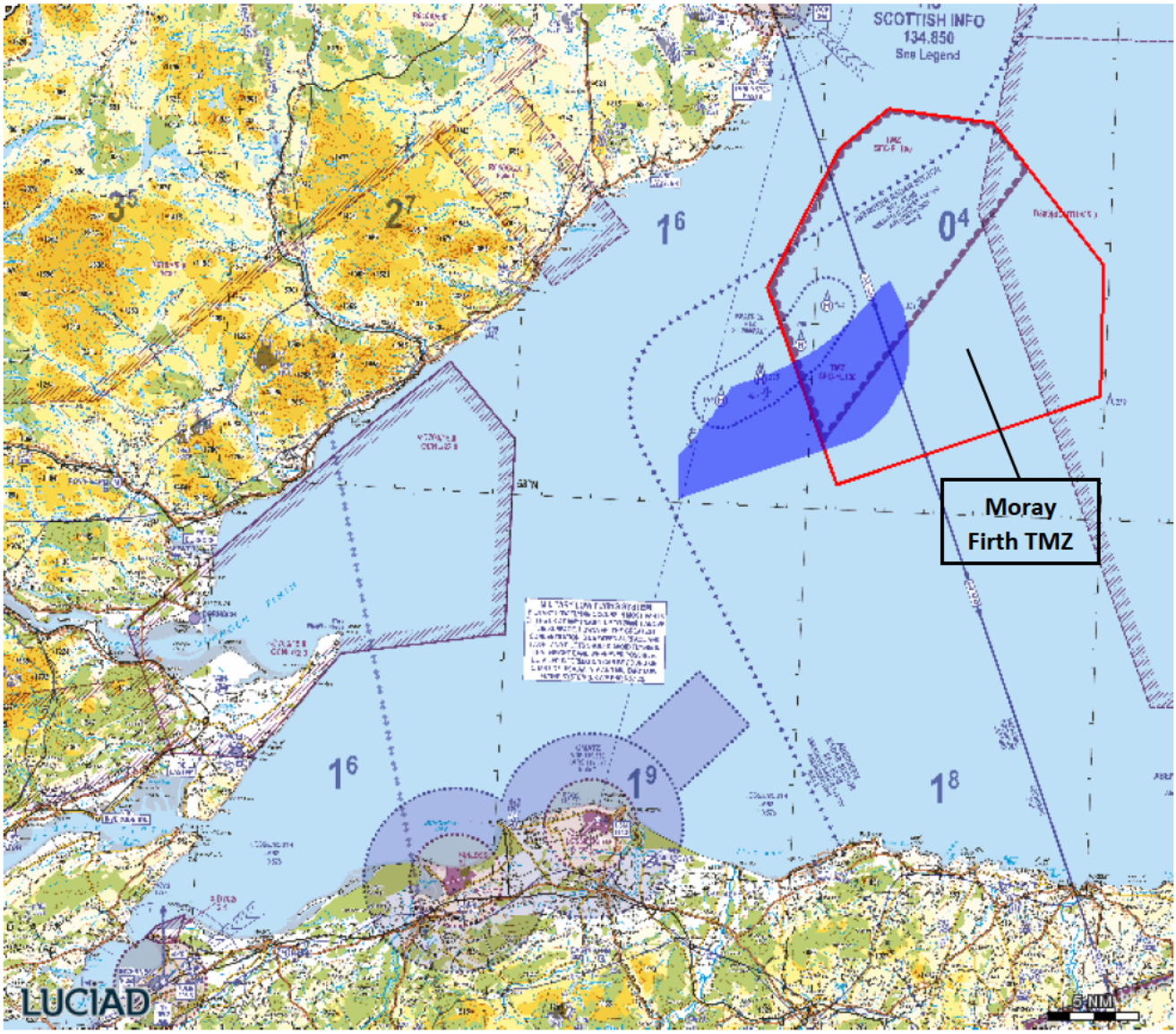


Figure 1: Current Airspace arrangements. Moray Firth TMZ (red outline) is shown as is the planned location of the MOWWL wind farm (Blue shape).

4.2 Operational efficiency, complexity, delays and choke points

There are no proposed changes to air traffic patterns so there will be no impact for operational efficiency, complexity, delays and choke points.

[2] The Moray Firth TMZ was implemented as part of the PRMS in place for the MOWEL and BOWL wind farms.

4.3 Safety issues

There are no current safety issues within the relevant areas of airspace. If the wind farm was constructed with no mitigation against radar clutter/interference implemented, this would have the following impacts:

- WTGs cause clutter on radar displays (up to 85 WTGs in the wind farm)
- The clutter would make ATC tracking and identification of non-transponder equipped aircraft in the cluttered area impossible
- The clutter makes ATC tracking and identification of transponder equipped aircraft in the cluttered area difficult due to obscuring.
- Interference and saturation of radar processing due to excessive radar returns can degrade radar performance across the whole operating area of the radar.

Due to the above impacts the suspensive Condition 23 requires that appropriate mitigation is put in place before the wind farm can be built. Hence 'do nothing' is not a viable option.

4.4 Environmental issues

There are no specific environmental issues within the relevant areas of airspace, in the current operation. However, as planning is subject to Section 36 Planning Consent Condition 23 due to the impact of this development on the Allanshill PSR, it would not be possible to build the wind farm in the current airspace without appropriate mitigation in place. This would prohibit the significant CO_2 benefits of ~ 1.0 Million Tonnes (MT) from the production of clean electricity which the wind farm will enable.

5. Statement of Need

5.1 The following text is from the DAP1916 Statement of Need form, as submitted in October 2019:

Current situation:

Moray Offshore Windfarm (West) Limited has planning consent to develop Moray West, a substantial offshore wind farm project 22km from the coast of Scotland.

Issue:

As part of the planning process, Moray Offshore Windfarm (West) Limited has engaged with relevant aviation stakeholders to determine the impact of the Moray West wind turbines on aviation radar systems and operations. In particular, NATS En-Route PLC (NERL) has confirmed that without mitigation the development will have an adverse impact on their ability to provide Air Traffic Services (ATS) in the vicinity of Moray West due to interference caused by wind turbine generators to the Allanshill Primary Surveillance Radar (PSR). As a result, Moray Offshore Windfarm (West) Limited has agreed with NERL that the planned wind farm development should not be built until a suitable Primary Radar Mitigation Scheme (PRMS) mitigation has been established, and this condition is attached to the s .36 planning consent for the scheme.

Action:

Moray Offshore Windfarm (West) Limited has employed NATS Services Ltd (NSL) to investigate potential impacts of wind turbines on NERL and other aviation stakeholder operations. Discussion with NERL has suggested that the Airspace Change Process (CAP 1616) should be initiated in order to manage the development of airspace-related mitigation options.

6. Proposed Airspace Description

6.1 Objectives/Requirements for Proposed Design

The justification for this proposed airspace change is to enable the construction of the wind farm. Construction of the wind farm is expected to enable CO_2 benefits of approximately 1 MT per annum. This CO_2 benefit will only be realised if the airspace change is implemented and the wind farm can be built.

The objectives of this proposal are to:

- Ensure aviation safety, and no increased risk to Air Traffic Controllers' ability to detect aircraft conflictions; and
- Meet the planning consent condition for this wind farm development to enable its construction and realise significant environmental benefits by the generation of renewable energy[3]

6.2 Proposed New Airspace and Usage

The proposed PRMS for the MOWWL development is radar blanking of the wind farm array location with a complimentary TMZ with 2 NM buffer extended to align with Existing TMZs – Option C. This TMZ will be an extension of the existing Moray Firth TMZ. In line with the extant Moray Firth TMZ, the vertical extent of the TMZ will be from the surface to FL100. Above FL100, all civilian aircraft must operate a transponder (UK AIP ENR 1.6, para 2.2.2.1). This option is shown in Figure 2.

[3] Planning was granted, subject to Section 36 Planning Consent Condition 23, which states that no turbine shall be erected until a PRMS has been implemented, due to the impact of this development on the Allanshill PSR.

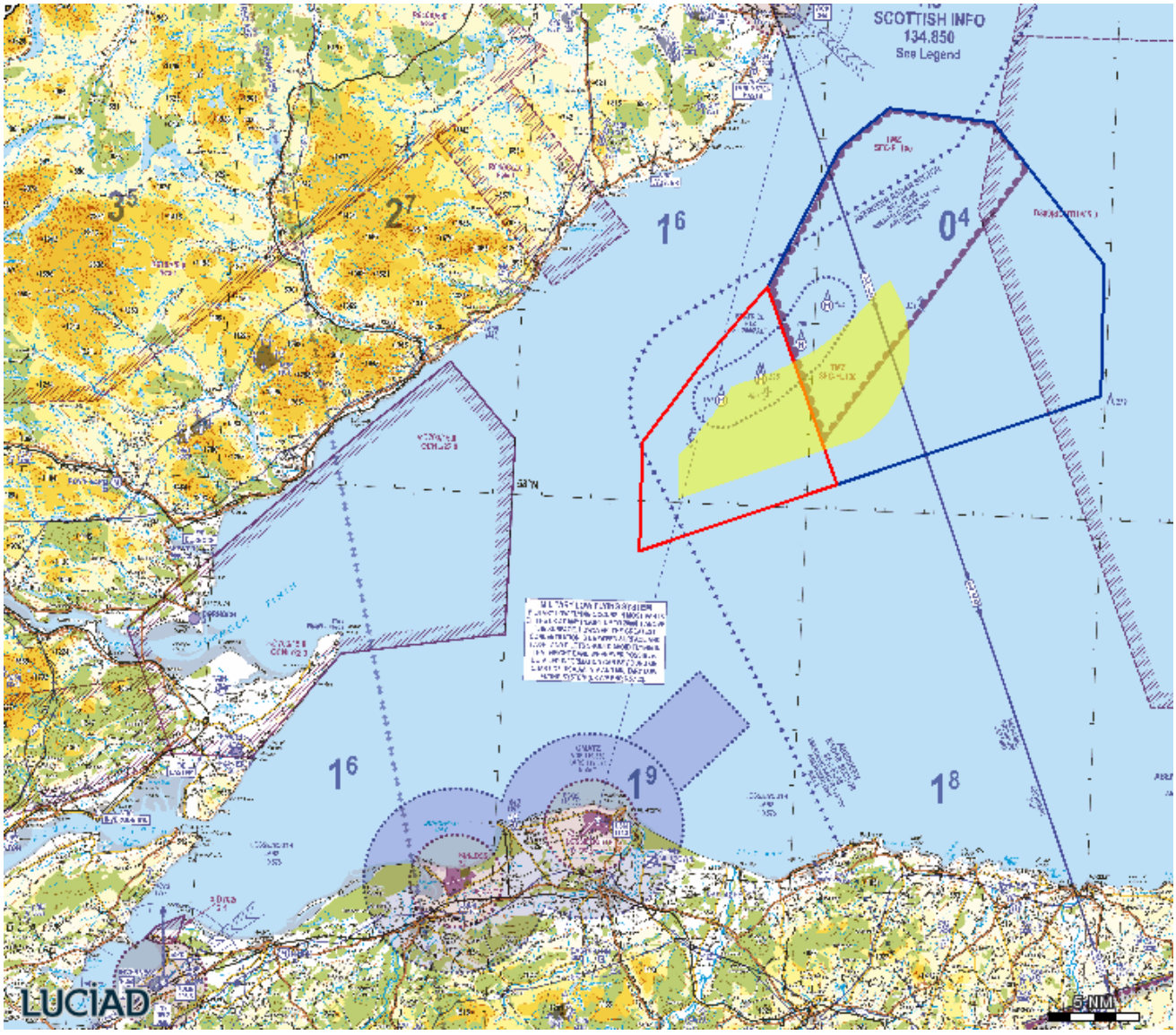


Figure 2: Proposed extension to the Moray Firth TMZ Option C (Red outline). MOWWL Development (RAG blanked area) is shown as a yellow shape.

The proposed wind farm is located within UK airspace within the Moray Firth. At its closest, it will be 22.5 km from the Caithness coastline and 24 km from the Aberdeenshire coastline. The Eastern portion sits underneath ATS Route Y904 and HMRI X-Ray, within an area covered by the existing Moray Firth TMZ. This is the area, shown in yellow in Figure 2, that will be radar blanked.

The proposed design of the TMZ aligns with and extends the existing Moray Firth TMZ, forming a single larger TMZ with a simplified perimeter when compared with the inner radar blanking region. This design includes a 2 NM buffer, between the TMZ perimeter and the blanked region, which is intended to give ATC some delay (and hence time to react) should an infringement occur:

- An example non-transponding infringing aircraft travelling at 200 kt will take c.36 seconds from crossing the proposed TMZ perpendicular to the boundary, until it enters the blanked region (and disappears). An air traffic controller monitoring the radar would have that time to notice the aircraft has infringed the TMZ and take appropriate action.

The TMZ boundary shape is advantageous for the simplicity of display to pilots on in-cockpit electronic flight information system (EFIS) displays and to ATC operators on radar displays. A simple shape is preferable for

Human Factors reasons. This reasoning has been used in previous wind farm TMZ mitigations to design the outer TMZ boundary and is effective.

6.3 Changes between Consultation and Final Proposal

There are no changes to the final proposal as a result of the consultation, as described in the Stage 3 Step 3D Collate and Review Responses (Incorporating Step 4A Update Design) document (Ref 11).

The coordinates of the proposed TMZ boundary and draft AIP changes for the proposed TMZ area are in Annexes 15.3 and 15.4

7. Impacts and Consultation

MOWWL completed engagement activities with stakeholders identified as those being most likely to be affected by the proposed design. These stakeholders are listed in Annex 15.2. This engagement was primarily conducted via email exchanges and by telephone as needed. The Consultation Strategy Document (Ref 8) details all the engagement activities completed prior to the consultation going live.

MOWWL commenced a focused consultation on this proposed airspace change on Monday 9th November 2020. The consultation was conducted via an online portal where users could submit a formal response alongside viewing the Consultation Document (Ref 10). 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 was open for ten weeks; closing on Sunday 17th January 2021. A total of 13 responses were received during this period. A full summary of how the consultation was run and assessment of responses can be found in the Stage 3 Collate and Review Responses Report (Ref 11).

7.1 Net impacts summary

Category	Impact	Evidence
Safety/Complexity	No impact on complexity. There would be significant safety issues should no mitigation be in place and the wind farm be constructed.	See Sections 4.2 and 4.3
Capacity/Delay	No impact on capacity or delay.	See Section 4.2
Fuel Efficiency/CO_2	No impact for commercial airlines. Negligible impact for GA users.	See Section 7.5 – 7.6
Noise – Leq/SEL	No impact	See Section 7.9
Tranquillity, visual intrusion (AONBs & National Parks)	No impact	See Section 7.9
Local Air Quality	No impact	See Section 7.9
Other Airspace Users	This proposal would require all aircraft entering the area without ATC Clearance to be transponder equipped. In line with the SARG policy on TMZs, "a pilot wishing to operate in a TMZ without serviceable transponder equipment may be granted access subject to specific arrangements agreed with the TMZ Controlling Authority."[4] All affected users and stakeholders have been engaged and consulted with.	See Sections 7.2 to 7.6

7.2 Units affected by the proposal

This section determines the likely impact on operations based on consultation responses and operational analysis.

There will be no impact on any aircraft operations at levels above FL100 as above FL100 transponder carriage is mandatory and for this reason the TMZ ceases at FL100.

ATC services are provided in this region by Aberdeen Radar, RAF Lossiemouth and Scottish FIS. Lossiemouth Departures are the current controlling authority for the Moray Firth TMZ and will remain the controlling authority following the MOWWL extension.

During Stage 1 of this process, twelve Design Principles (DPs) were agreed with the CAA. These can be found in the Stage 1 Design Principles document (Ref 4). DP3 stated that the 'Airspace change will maintain or enhance operational resilience of the ATC network'.

To ensure adherence with this DP, MOWWL engaged with the Ministry of Defence (MOD) through Defence Airspace Air Traffic Management and the following ATC units and Airports throughout this airspace change process:

- Aberdeen ATC
- NATS En-route (NERL)
- Highlands and Islands Airports Ltd. (HIAL)
- NATS Prestwick
- Aberdeen Airport

[4] SARG Policy for Radio Mandatory Zones and Transponder Mandatory Zones. August 2015.

- Wick Airport
- Inverness Airport

A response was received to the consultation from the MOD through DAATM stating that they had no objections to the change.

Responses were received from NERL, NATS Prestwick, Aberdeen ATC, and Aberdeen Airport to the consultation. They stated that they SUPPORT the proposed changes, and they were satisfied this would meet the required mitigation for the Allanshill PSR.

A combined response was received from HIAL which included the HIAL, Wick and Inverness airports responses to the consultation. This rated their level of support as NO COMMENT (Neither Support nor object). The feedback they provided suggested that the TMZ would have *no additional impact* on their operation.

A response was received from GATCO supporting the proposed changes.

All consultation feedback is summarised in the Stage Collate and Review Responses document (Ref 11).

7.3 Access by Non-transponder Equipped Aircraft

This proposal would require all aircraft entering the area without ATC Clearance to be transponder equipped. In line with the SARG policy on TMZs, "a pilot wishing to operate in a TMZ without serviceable transponder equipment may be granted access subject to specific arrangements agreed with the TMZ Controlling Authority."[4] Should a non-transponder aircraft be unable to obtain the required clearance, they will be required to reroute to avoid the TMZ area.

7.4 Military impact and consultation

DP5 stated that the 'Airspace change should be compatible with the requirements of the MOD'.

It is considered that there will be no adverse impact on military and public transport flights (including offshore helicopter operations) as these categories of aircraft are transponder equipped.

In the event of transponder failure, pilots will need to request clearance from the controlling authority to transit the TMZ or to reroute around the TMZ as per paragraph 7.3.

The MOD was consulted as a stakeholder via DAATM throughout the entire airspace change process.

A response was received to the consultation from the MOD through DAATM stating that they had no objections to the change. The MoD confirmed in subsequent engagement that they would be willing to remain the controlling authority for the Moray Firth TMZ following the addition of the MOWWL TMZ as described in this ACP.

All consultation feedback is summarised in the Stage Collate and Review Responses document (Ref 11).

7.5 General Aviation (GA) airspace users' impact and consultation

DP 2 states that the airspace change should 'Minimise negative impact on other airspace users, specifically GA and helicopters in support of UK Oil, Gas and Renewables industries.'

It is considered that there will be negligible impact on general aviation as the majority of GA aircraft operating over the sea will be transponder equipped. GA users who fly without a transponder could be affected. This is assessed to be less than 1% of traffic in this area (Ref 9). These pilots will be required to request clearance to transit the TMZ from the controlling authority or to reroute around the TMZ as per paragraph 7.3.

NATMAC members representing the GA community and local helicopter operators were engaged throughout this airspace change process.

Responses were received from the following relevant NATMAC members; British Helicopter Association (SUPPORT) and British Gliding Association (NO COMMENT).

Five local helicopter operators responded. Four indicated their level of support to the proposal as SUPPORT (Bristow Helicopters, Babcock Offshore UK, GAMA Aviation and PDG Aviation), and one indicated their level of support to the proposal as NO COMMENT (NHV Helicopters Ltd.).

7.6 Commercial air transport impact and consultation

MOWWL has engaged and consulted directly with airline operators who were identified as being relevant carriers within the associated area of airspace; this was completed through the NATMAC as listed in Annex A of the Stage 3 Consultation Strategy document (Ref 8). Commercial Air Transport Aircraft are transponder equipped and should remain unaffected by this airspace change.

No consultation responses were received from airlines.

7.7 CO_2 environmental analysis impact and consultation

The introduction of the wind farm is anticipated to provide CO_2 benefits of approximately 1 MT per annum, which is a wider benefit enabled by, but not directly attributable to, this proposal.

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. GA users may theoretically incur increased fuel burn if they are not equipped with a transponder and are required to route around the TMZ. However, the likely volume of non-transponder equipped aircraft which may pass through this area is very low and any potential increase in fuel burn as a result would be negligible. (Ref 9).

7.8 Design differences since consultation

There are no changes made to the design as a result of the consultation, or since consultation completed.

7.9 Local environmental impacts and consultation

As the proposal is offshore approx. 10 NM from the Caithness coast and a Level 2B change, there are no local environmental impacts such as noise, visual intrusion, tranquillity or local air quality. MOWWL were not required to target organisations whose primary interest is environmental impacts.

7.10 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 1 MT of CO_2 benefit per annum would be significant (Ref 7).

8. Analysis of Options

8.1 Airspace Change Design Options

MOWWL initially identified one solution for mitigating the radar clutter associated with WTGs (Ref 5) (radar blanking with TMZ), with three options as to how it could be implemented, and a 'do nothing' option. The three options were:

- Option A: TMZ in line with proposed wind turbine locations
- Option B: TMZ in line with proposed wind turbine locations plus 2 NM buffer
- Option C: TMZ in line with proposed wind turbine locations plus 2 NM buffer extended to align with existing and planned TMZ boundaries.

8.2 Design Options Assessment

The options were evaluated against the design principles (Ref 4, 6). Only Option C fully met all the DPs. The design options were appraised (Ref 7) against the CAP1616 criteria. All options had the same impacts on communities and stakeholders. Option A was assessed as having a reduction in ATC Resilience owing to the absence of a 2 NM buffer. To do nothing would prevent the construction of the wind farm and therefore the realisation of substantial enabled CO_2 benefits.

MOWWL specified a preferred solution, termed Option C- TMZ with 2 NM buffer extended to align with Existing TMZs. A full options appraisal was completed for this solution, which confirmed the option was best to provide safe and effective mitigation against the radar issues associated with WTGs. This was the only option carried forward for consultation.

The consultation resulted in one element which suggested a change to the design; this was not progressed. A full summary of the consultation feedback received is provided at Ref 11.

The final design is hereby submitted because it best meets the design principles.

9. Airspace Description Requirements

	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	TMZ See Section 6.2 for proposal area. Draft AIP (Annex 15.4)
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/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 airspace usage – see Section 7
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 – see Section 4.2
g	Evidence of relevant draft Letters of Agreement, including any arising out of consultation and/or airspace management requirements	LoA between Wick Airport and RAF Lossiemouth will be updated to incorporate the new TMZ perimeter (Ref 13)
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 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	See section 7.3– 7.9
k	Details of and justification for any delegation of ATS	No change to the delegation of ATS

10. Safety Assessment

There is an overriding safety Design Principle (DP1) which states that the airspace change should 'Maintain or enhance current levels of safety.' Initial qualitative assessment from NATS Safeguarding (Ref 15) has confirmed that the proposed Option C TMZ design would provide adequate mitigation to fulfil the requirements of the NERL Allanshill: PSR Mitigation Scheme.

This proposal will provide:

- Effective suppression of all primary radar clutter associated with the WTGs
- The promulgation of a TMZ over the RAG blanked area will ensure that aircraft within the TMZ area must be transponder equipped and hence will be visible to ATC via secondary radar.
- The dimensions of the TMZ include a 2 NM buffer which is adequate to ensure that ATC have sufficient time to identify when an infringement of the TMZ is taking place and take appropriate action.

Experience from previous wind farm developments has demonstrated that the implementation of radar RAG blanking coupled with an associated TMZ provides effective and safe mitigation against the radar issues associated with WTGs.

11. 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	Minimal impact affecting only those aircraft flying without a transponder – sections 7.4 - 7.9
b	Impact on VFR operations (including VFR routes where applicable);	No impact on VFR operations.
c	Consequential effects on procedures and capacity, i.e. on SIDs, STARs, and/or holding patterns. Details of existing or planned routes and holds	N/A- No impact on procedures or capacity – see section 6.2
d	Impact on aerodromes and other specific activities within or adjacent to the proposed airspace	No impact on aerodromes or other relevant activities
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.

12. Supporting Infrastructure/ 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
b	Evidence to support primary and secondary surveillance radar (SSR) with details of planned availability and contingency procedures	Primary radar will be blanked 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. Section 6.2
c	Evidence of communications infrastructure including R/T coverage, with availability and contingency procedures	Traffic uses the same regions as today in a similar manner from a communications infrastructure point of view. Demonstrably adequate for the region.
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 as today.
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	As above (12d)
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	No training or additional qualifications required.

13. Airspace and Infrastructure

	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 6.
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.	The TMZ includes a 2 NM buffer, intended for additional safety for ATC. See Section 6.2
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 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.
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.
f	There must be assurance, as far as practicable, against unauthorised incursions. This is usually done through the classification and promulgation	The addition of the 2 NM buffer is designed to allow ATC to identify and act against any infringing aircraft. Section 6.2
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 regions as today in a similar manner from a communications infrastructure point of view. Demonstrably adequate for the region. See item 12 c.
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	Will be captured in the revised extant LoA (Ref 13) for the Moray Firth TMZ
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	Should this occur, we would act appropriately and expeditiously.

	ATS route requirements	Evidence
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	As today – 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	As today - 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)	As today - 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	As today – no changes proposed.
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	As today - no change to the 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 ATSOCAS 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 WTGs will be distinctive and recognisable visual reference points creating an easily identifiable visual reference to identify the TMZ area.
g	There shall be suitable availability of radar control facilities	As today - 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	This will be undertaken as part of the PIR under CAP 1616
i	All new procedures should, wherever possible, incorporate Continuous Descent Approach (CDA) profiles after aircraft leave the holding facility associated with that procedure	As today – no new procedures.

	Off – route airspace requirements	Evidence of compliance/proposed mitigation
a	If the new structure lies closes to another airspace structure or overlaps an associated airspace structure, the need for operating agreements shall be considered.	The MOWWL TMZ is adjacent and designed as an extension to the current Moray Firth TMZ. No new operating agreements are required.
	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	Should this occur, we would act appropriately and expeditiously.

14. Environmental Assessment

	Theme	Content	Evidence of compliance/ proposed mitigation
a	WebTAG analysis	Output and conclusions of the analysis (if not already provided elsewhere in the proposal)	Not required due to negligible impact. See section 3.7 in stage 3 Full Options Appraisal (Ref 9)
b	Assessment of noise impacts (Level 1/M1 proposals only)	Consideration of noise impacts, and where appropriate the related qualitative and/or quantitative analysis If the change sponsor expects that there will be no noise impacts, the rationale must be explained	N/A - environmental analysis requirements scaled equivalent to a Level 2 change, see Section 7.12.
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	See Sections 7.7 and 7.10
d	Assessment of local air quality (Level 1/M1 proposals only)	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	N/A - environmental analysis requirements scaled equivalent to a Level 2 change, see Section 7.9
e	Assessment of impacts upon tranquillity (Level 1/M1 proposals only)	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	N/A - environmental analysis requirements scaled equivalent to a Level 2 change, see Section 7.9
f	Operational diagrams	Any operational diagrams that have been used in the consultation to illustrate and aid understanding of environmental impacts must be provided	N/A
g	Traffic forecasts	10-year traffic forecasts, from the anticipated date of implementation, must be provided (if not already provided elsewhere in the proposal)	See section 3.7 of the full options appraisal (Ref 9)
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	See Sections 7.1, 7.7 and 7.9

15. Annexes

15.1 References

Ref No	Description	Hyperlinks
1	Moray Offshore Wind farm (West) Ltd Phase 1 CAA web page – progress through CAP1616	Link
2	Stage 1 Assessment Meeting Presentation	Link
3	Stage 1 Assessment Meeting Minutes	Link
4	Stage 1 Design Principles	Link
5	Stage 2 Design Options	Link
6	Stage 2 Design Principle Evaluation	Link
7	Stage 2 Options Appraisal (Initial) & Safety Assessment	Link
8	Stage 3 Consultation Strategy	Link
9	Stage 3 Full Options Appraisal	Link
10	Stage 3 Consultation Document	Link
11	Stage 3 Collate and Review Responses Document	Link
12	Stage 4A Full Options Appraisal with Safety Assessment	Link
13	LoA between Wick Airport and RAF Lossiemouth	Supplied as part of ACP
14	Technical Definition Document WGS84	Supplied as part of ACP
15	ACP Assurance Report	Supplied as part of ACP
16	AIP Changes in support of change	Supplied as part of ACP

15.2 List of Stakeholders

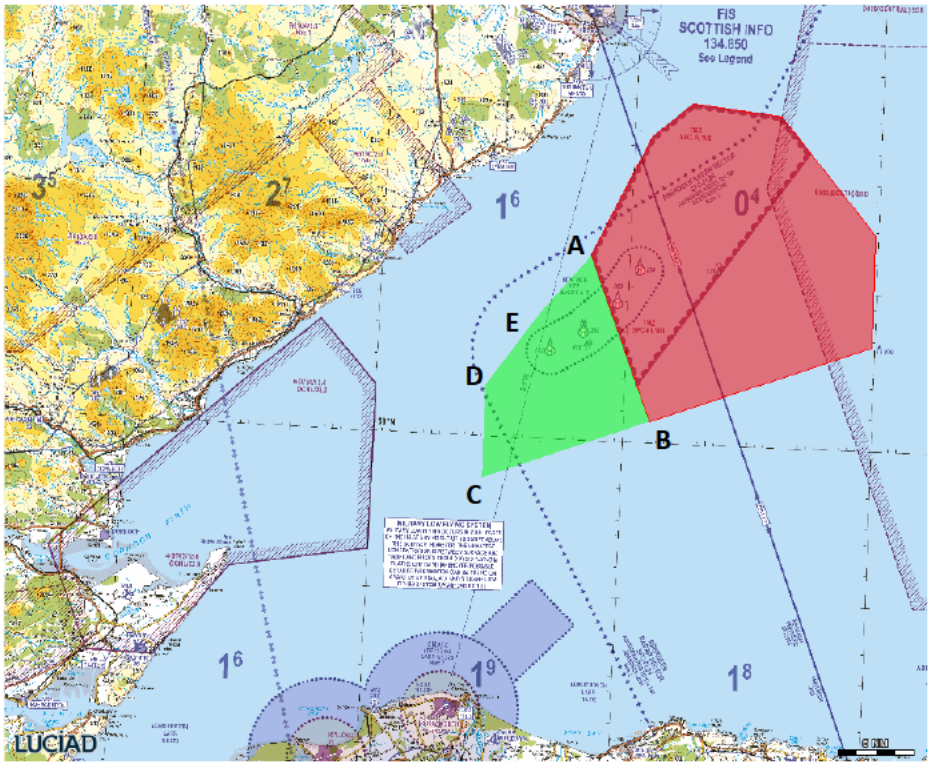
The consultation was considered most relevant to the targeted stakeholders listed below but was not exclusive to this list.

	Stakeholder
NATMAC	Aircraft Owners and Pilots Association (AOPA)
	Airlines UK
	Airport Operators Association (AOA)
	ARPAS - Association of Remotely Piloted Aircraft Systems
	Aviation Environment Federation (AEF)
	BAe Systems
	BBAC - British Balloon & Airship Club
	BHPA - British Hang gliding & Paragliding Association
	BMAA - British Microlight Aircraft Association
	BMFA - British Model Flying Association
	British Sky Diving
	British Airline Pilots Association (BALPA)
	British Business and General Aviation Association (BBGA)
	British Helicopter Association (BHA)
	BGA- British Gliding Association
	GAA- General Aviation Alliance
	Guild of Air Traffic Control Officers (GATCO)
	Heavy Airlines
	Helicopter Club of Great Britain (HCGB)
	Light Aircraft Association (LAA)
	Low Fare Airlines
	MoD DAATM
	PPL/IR (Europe)
	British Airways (BA)
Helicopter Operators	Babcock Helicopters
	Bristow Helicopters
	CHC Scotia
	NHV Helicopters
	Maritime and Coastguard Agency (MCGA)
	PDG Aviation
ATC	Aberdeen ATC
	Highlands and Islands Airports Ltd (HIAL)
	NATS En Route Limited (NERL)
	NATS Prestwick
Airports	AGS Airports Limited, Aberdeen
	Wick Airport
	Inverness Airport

15.3 Coordinates of Proposed TMZ Perimeter extension- Option C (Preferred)

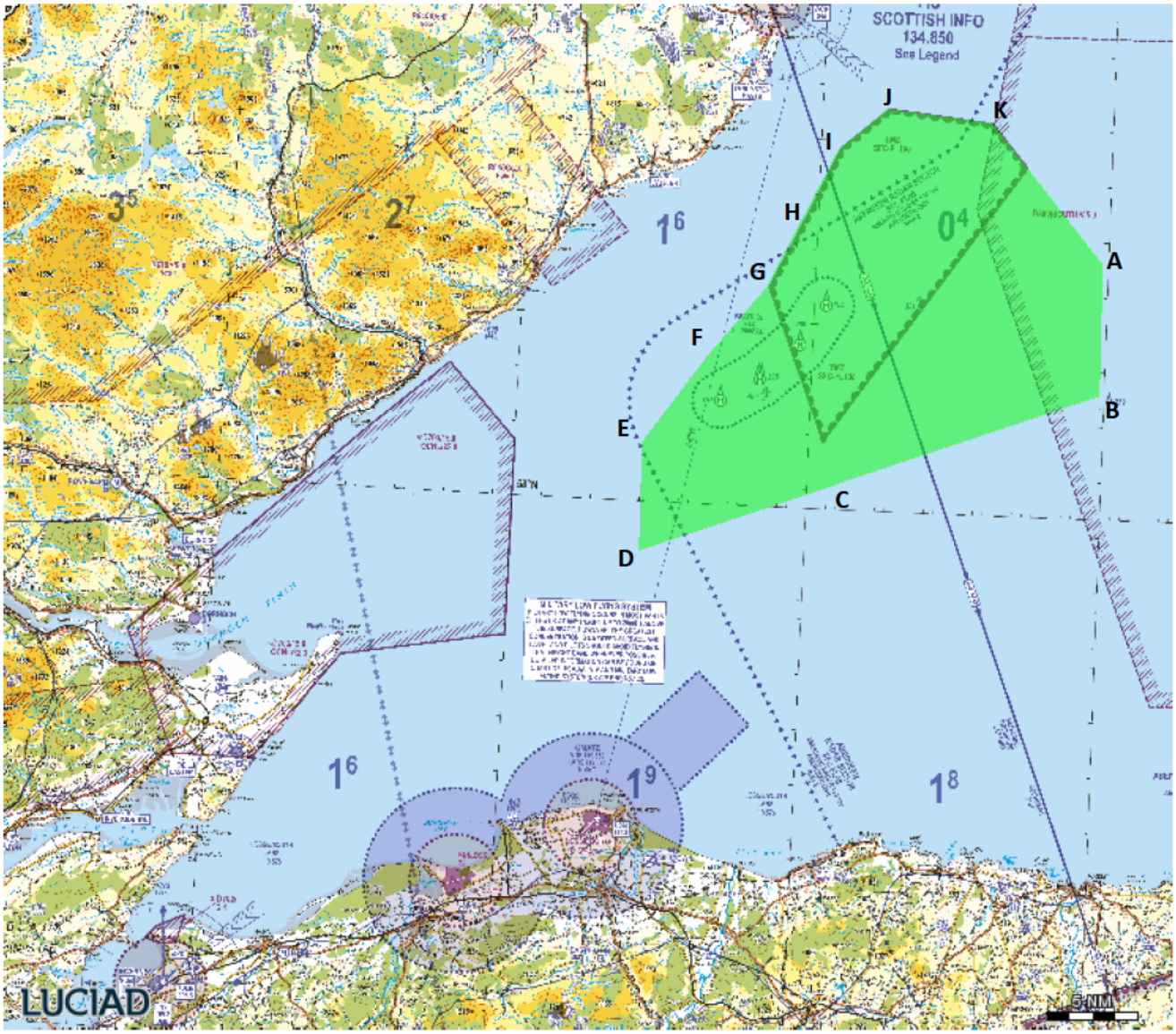
These coordinates are WGS84 presented in decimal degrees (DD) and degrees minutes seconds (DMS). Each row corresponds to the same location.

Below is a figure showing the location of the extant Moray Firth TMZ (red shape) and the proposed extension covering the MOWWL development (green shape). The shown coordinates will be added to the Moray Firth TMZ in the UK AIP.



Point	Decimal Degrees		Degrees° Minutes' Seconds	
	Latitude (DD)	Longitude (DD)	Latitude (DMS)	Longitude (DMS)
A	58.19801767	-003.08037169	58° 11' 52.8636" N	003° 04' 49.3381" W
B	58.02297144	-002.94873611	58° 01' 22.6972" N	002° 56' 55.4542" W
C	57.95574736	-003.27737392	57° 57' 20.6905" N	003° 16' 38.5461" W
D	58.05358647	-003.28086542	58° 03' 12.9113" N	003° 16' 51.1155" W
E	58.13378419	-003.17753953	58° 08' 01.6231" N	003° 10' 39.1423" W

Below is the location of the Moray Firth TMZ including the new portion covering the MOWWL development. These coordinates are the complete list of what will be published in the UK AIP, see section 15.4.



Point	Decimal Degrees		Degrees° Minutes' Seconds	
	Latitude (DD)	Longitude (DD)	Latitude (DMS)	Longitude (DMS)
A	58.23132781	-002.508227972	58° 13' 52.7801" N	002° 30' 29.6207" W
B	58.11170203	-002.506521389	58° 06' 42.1273" N	002° 30' 23.4770" W
C	58.02297144	-002.94873611	58° 01' 22.6972" N	002° 56' 55.4542" W
D	57.95574736	-003.27737392	57° 57' 20.6905" N	003° 16' 38.5461" W
E	58.05358647	-003.28086542	58° 03' 12.9113" N	003° 16' 51.1155" W
F	58.13378419	-003.17753953	58° 08' 01.6231" N	003° 10' 39.1423" W
G	58.19801767	-003.08037169	58° 11' 52.8636" N	003° 04' 49.3381" W
H	58.24288861	-003.042725833	58° 14' 34.3990" N	003° 02' 33.8130" W
I	58.32671172	-002.967391917	58° 19' 36.1622" N	002° 58' 02.6109" W
J	58.36421864	-002.886311861	58° 21' 51.1871" N	002° 53' 10.7227" W
K	58.35449983	-002.706811972	58° 21' 16.1994" N	002° 42' 24.5231" W

15.4 Draft AIP Entry

AIP section ENR 2.2

4 EN-ROUTE TRANSPONDER MANDATORY ZONES

Designation and Lateral Limits	Vertical Limits and Classification	Controlling Authority
Moray Firth TMZ– the area bounded by: 581352.7801N 0023029.6207W – 580642.1273N 0023023.4770W – 580122.6972N 0025655.4542W – 575720.6905N 0031638.5461W – 580312.9113N 0031651.1155W – 580801.6231N 0031039.1423W – 581152.8636N 0030449.3381W – 581434.3990N 0030233.8130W – 581936.1622N 0025802.6109W – 582151.1871N 0025310.7227W – 582116.1994N 0024224.5231W – 581352.7801N 0023029.6207W.	FL 100 SFC (Class E & G)	Lossie Departures (119.575 MHz), H24 from surface up to and including FL 100. Class E approval for VFR transits only.
Note: For aircraft equipped with and operating secondary surveillance radar equipment, as defined in GEN 1-5 paragraph 5.3, access to the Moray Firth TMZ is not subject to ATC approval. Access to the Moray Firth TMZ without serviceable transponder equipment, as defined in GEN 1-5 paragraph 5.3, is subject to specific approval of the Controlling Authority. The TMZ incorporates parts of Y904 (Class E) and D809S; the more stringent relevant airspace classification regulations apply.		

15.5 Glossary

ACP	Airspace Change Proposal
AIP	Aeronautical Information Package
AIRAC	Aeronautical Information Regulation And Control
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATS	Air Traffic Service
ATSOCAS	Air Traffic Services Outside Controlled Airspace
BOWL	Beatrice Offshore Wind Farm Ltd.
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CAP1616	Civil Aviation Publication 1616- Airspace change: Guidance on the regulatory process for changing the notified airspace design and planned and permanent redistribution of air traffic, and on providing airspace information
CAS	Controlled Air Space
CO_2	Carbon Dioxide
DAATM	Defence Airspace Air Traffic Management
DD	Decimal Degrees
DMS	Degrees Minutes Seconds
DP	Design Principle
EFIS	Electronic Flight Information System
FLXXX	Flight Level XXX
GA	General Aviation
H24	24 Hours
HIAL	Highlands and Islands Airports Ltd.
HMRI	Helicopter Main Route Indicator
ICAO	International Civil Aviation Organization
km	Kilometre
kt	Knot
LOA	Letter of Agreement
MHz	Mega Hertz
MOD	Ministry of Defence
MOWEL	Moray Offshore Wind Farm (East) Ltd.
MOWWL	Moray Offshore Wind Farm (West) Ltd.
MT	Million Tonne (1 000 000 kg)
NATMAC	National Air Traffic Management Advisory Committee

NERL	NATS En-Route Ltd.
NM	Nautical Mile
NSL	NATS Services Ltd.
PIR	Post Implementation Review
PRMS	Primary Radar Mitigation Scheme
PSR	Primary Surveillance Radar
RAG	Range and Azimuth Gating
SARG	Safety and Airspace Regulations Group
SARPS	Standards and Recommended Practices
SSR	Secondary Surveillance Radar
TMZ	Transponder Mandatory Zone
VFR	Visual Flight Rules
WGS	World Geodetic Survey
WTG	Wind Turbine Generator

End of document

