



Galileo 03 Ltd.

Mynydd Ty-talwyn Energy Park - Environmental Statement Volume III

Appendix 4.4: Aviation Technical Appendix

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Wind Power Aviation Consultants Ltd

Aviation Technical Appendix for Mynydd Ty-talwyn Energy Park V3.4

Our Reference: WPAC 013/25

Your Reference: Mynydd Ty-talwyn Energy Park Instruction

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Scope

1. This report has been prepared by Wind Power Aviation Consultants Ltd on behalf of Galileo 03 Ltd (part of Galileo Empower UK Ltd) (hereinafter referred to as 'Galileo' or the 'Applicant'. This report is designed to be included in the Environmental Statement as a technical appendix and will inform the ES in relation to any aviation issues.

Introduction

2. Wind turbines have the potential to affect civil and military aviation infrastructure and activities. This report covers the methodology used to undertake the aviation safeguarding assessment, lists the aviation guidance and data sources used and describes the aviation baseline condition, consultation responses and potential mitigation needed. It assesses the potential for the Proposed Development to affect aviation communications, navigation and surveillance infrastructure in the vicinity of the site, and focusses on identifying where there could be an effect and if so, how this will be mitigated.

Legislation and Guidance

3. There are a number of aviation publications relevant to the interaction of wind turbines and aviation containing guidance and legislation, which cover the complete spectrum of aviation activity in the UK as shown below.

- Civil Aviation Authority (2020). Safeguarding of Aerodromes, Version 3, CAP738 CAA;
- Civil Aviation Authority (2010). Safe Operating Practices at Unlicensed Aerodromes, Ed 1, CAP 793 CAA;
- Civil Aviation Authority (2016) Policy and Guidance on Wind Turbines Version 6, CAP764 CAA;
- Civil Aviation Authority (2017). CAA Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level CAA;
- Civil Aviation Authority (2023). Manual of Air Traffic Services, Part 1, Ed 11.0, CAP 493 CAA;
- Civil Aviation Authority (2021). UK Flight Information Services, Ed 4, CAP 774 CAA;
- Civil Aviation Authority (2019). ATS Safety Requirements, Version 3, CAP 670 CAA;
- Civil Aviation Authority (2022). Licensing of Aerodromes, Version 12, CAP 168 CAA;
- Civil Aviation Authority (2020). Parachuting, Ed 5, CAP660 CAA;
- Civil Aviation Authority (2022). Implementation of Safeguarding of Instrument Flight Procedures (IFPs) in the UK, Ed 2, Version 2, CAP 785B CAA;

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- Civil Aviation Authority (2021) 'Guidance to crane users on aviation lighting and notification' CAP 1096 CAA:
 - Ministry of Defence (MoD) (2022). Military Aviation Authority Regulatory Article 2330 (Low Flying) and:
 - Future Wales: National Plan 2040 Policy 18 (8)

Scope of the Assessment

4. The assessment of effects of the proposed turbines will be based upon the guidance laid down in CAA Publication CAP 764 *Policy and Guidelines on Wind Turbines* Version 6 Dated February 2016. Consultation criteria for aviation stakeholders is defined in Chapter 4. These distances inform the size of the study area and include:

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

5. CAP 764 goes on to state that these distances are for guidance purposes only and do not represent ranges beyond which all wind turbine developments will be approved or within which they will always be objected to. These ranges are intended as a prompt for further discussion between developers and aviation stakeholders.

6. It is necessary to take into account the aviation and air defence activities of the Ministry of Defence (MOD) as safeguarded by the Defence Infrastructure Organisation (DIO).

7. It is also necessary to take into account the possible effects of wind turbines upon the National Air Traffic Services En Route Ltd (NERL) communications, navigation and surveillance (CNS) systems – a network of primary and secondary radars and navigation facilities around the country.

8. In addition to examining the technical impact of wind turbines on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations, using the criteria laid down in CAP 168 Licensing of Aerodromes, to determine whether a proposed development will

breach obstacle clearance criteria. In this case, there are no physical safeguarding issues associated with the Proposed Development.

Assessment Methodology

9. Radar modelling has been undertaken using specialist propagation prediction software (Rview Version 5). Developed over a number of years, it has been designed and refined specifically for the task. RView uses a comprehensive systems database which incorporates the safeguarding criteria for a wide range of radar and radio navigation systems. RView models terrain using the Ordnance Survey (OS) Terrain 50 digital terrain model, which has a post spacing of 50m and has a root mean square (RMS) error of 4m. The results are verified using the Shuttle Radar Topography Mission (SRTM) dataset, a separate smoothed digital terrain model with data spacing of 3 arc seconds. By using two separate and independently generated digital terrain models, anomalies are identified and consistent results assured. Rview models the refractive effects of the atmosphere on radio waves and the First Fresnel Zone. A feature of RView is that as well as performing calculations in the manner believed to be most appropriate, it also allows comparison with results from simpler models. For example, RView can perform calculations using the true Earth Radius at the midpoint between the radar and the wind turbine or the simplified 4/3 Earth Radius model. If needed, Rview is also capable of modelling a range of atmospheric refractive conditions. RView models the trajectory of radar signals at different elevations enabling modelling of both volume surveillance and pencil beam radars as well as the effects of angular sterilisation as applied, for example, in Met Office radars.

10. The following data sources were consulted to inform the assessment:

- UK Military Aeronautical Information Publication (MIL AIP);
- UK Aeronautical Information Publications (AIP);
- CAA 1:250,000 VFR and 1:500,000 Charts;
- UK Military Low Flying Charts; and
- WPAC in-house databases.

Assessing Significance

11. Assessing significance in an aviation context is highly controversial as there is no agreed definition of significance. This is due to the fact that whilst technical effects on communications, navigation and surveillance (CNS) systems are simple to identify and evaluate, operational and flight safety effects can be subjective and are often challenged by third parties. It is enough in this context to identify any technical effects and then, taking into account the statements in CAP 764 regarding the status of aviation stakeholders, in general to accept the judgement of those stakeholders in assessing the significance of the effects. For example CAP 764 states: *"Where an ANSP determines that it is likely that a planned wind turbine development would result in any of the above effects on their CNS infrastructure, this may not, in itself, be sufficient reason to justify grounds for rejection of the planning application. The ANSP must determine whether the effect on the CNS infrastructure has a negative impact on the provision of the ATS. The developer should pay for an assessment of appropriate mitigating actions that could be taken by the ANSP and/or wind energy developer to deal with the negative impact. The position of an ANSP at inquiry would be significantly degraded if they had not considered all potentially appropriate mitigations."*



12. Therefore, taking the above into account, it is not considered to be appropriate for the Applicant to be making an assessment of significance of an effect in relation to aviation interests. It is also often the case that different Air Navigation Service Providers (ANSP) can take a different view to the same scenario and may disagree with the assessment findings leading to the need for further post submission consultation to confirm the findings of the assessment and/or agree to the need for and extent of mitigation.

Turbine Details

Turbine	Easting	Northing	Indicative Hub Height	Tip Height	Indicative Disc Dia
1	286968	186094	119m	200m	162m
2	286459	186354	119m	200m	162m
3	285774	186016	119m	200m	162m
4	285686	186503	119m	200m	162m
5	285732	186989	119m	200m	162m
6	284660	186283	119m	200m	162m

Table 1 Turbine Locations

Table Note: The proposed turbine locations are consistent with the locations proposed and consulted on during the Pre-Application Consultation period (between April 2025 and June 2025), with the exception of a small change to the location of T06. Any differences in the proposed coordinates of the other turbines is associated with rounding.

Airspace

13. The site is located as shown in Figures 1 to 3. Figures 2 and 3 show the location in an aviation context with Figure 2 showing the airspace up to 5000ft and Figure 3 up to 19500 ft. The site is located in Class G unregulated airspace and the turbines are between 26 and 28km to the north-west of Cardiff Airport and sit 12 km outside of the Cardiff Control Zone shown in Figure 2 with a light blue shading. It is also just over 5 km to the north-west of the westernmost boundary of the Cardiff Control Area (CTA). The only other aviation feature in the area is the small unlicensed airstrip at Old Park, just over 4 km to the south-west of the closest turbine.

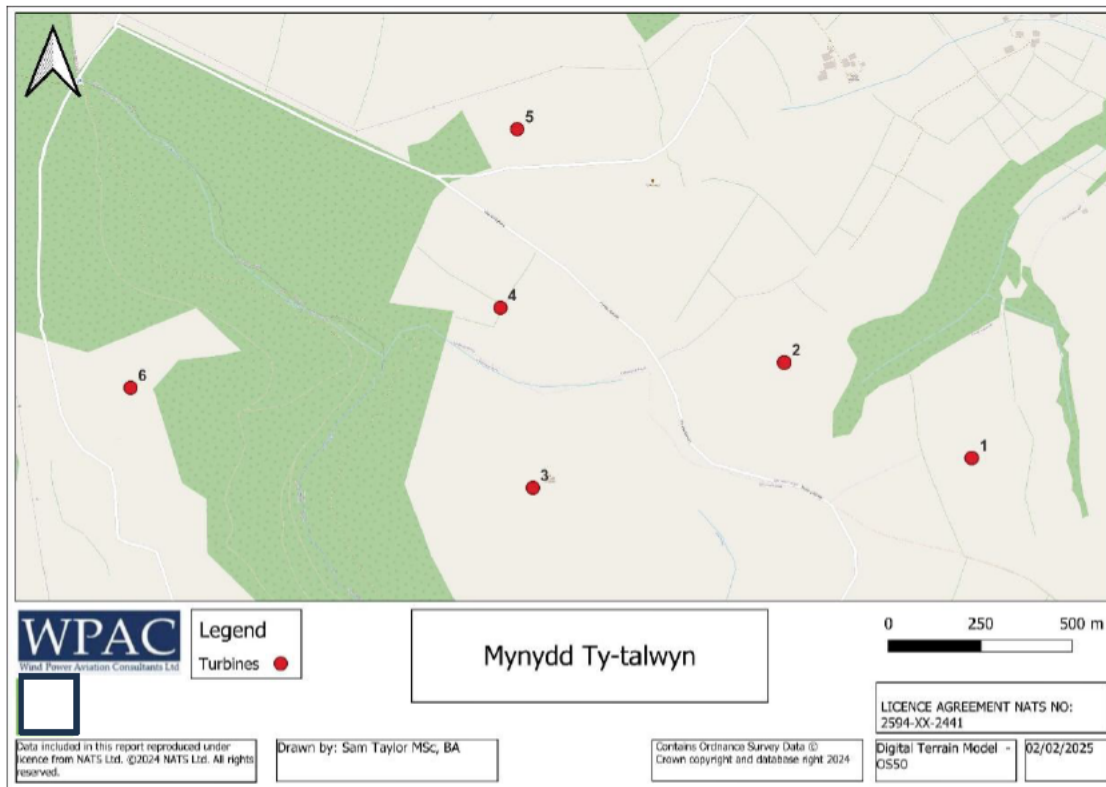


Figure 1

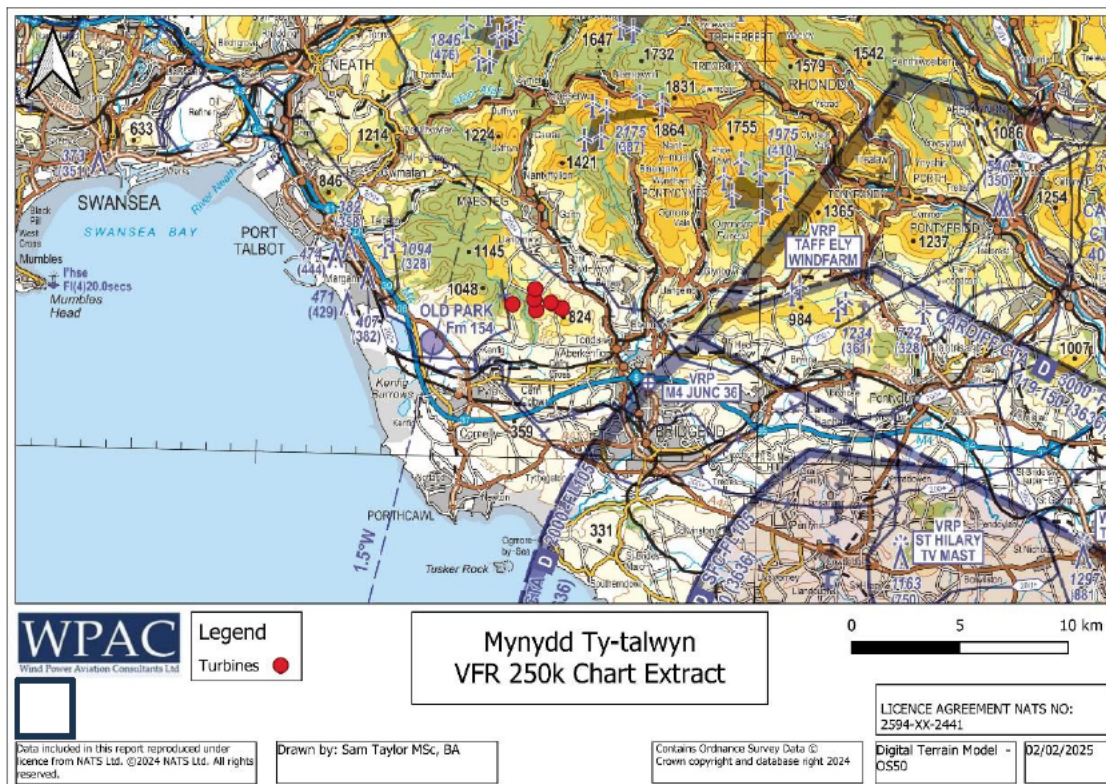


Figure 2

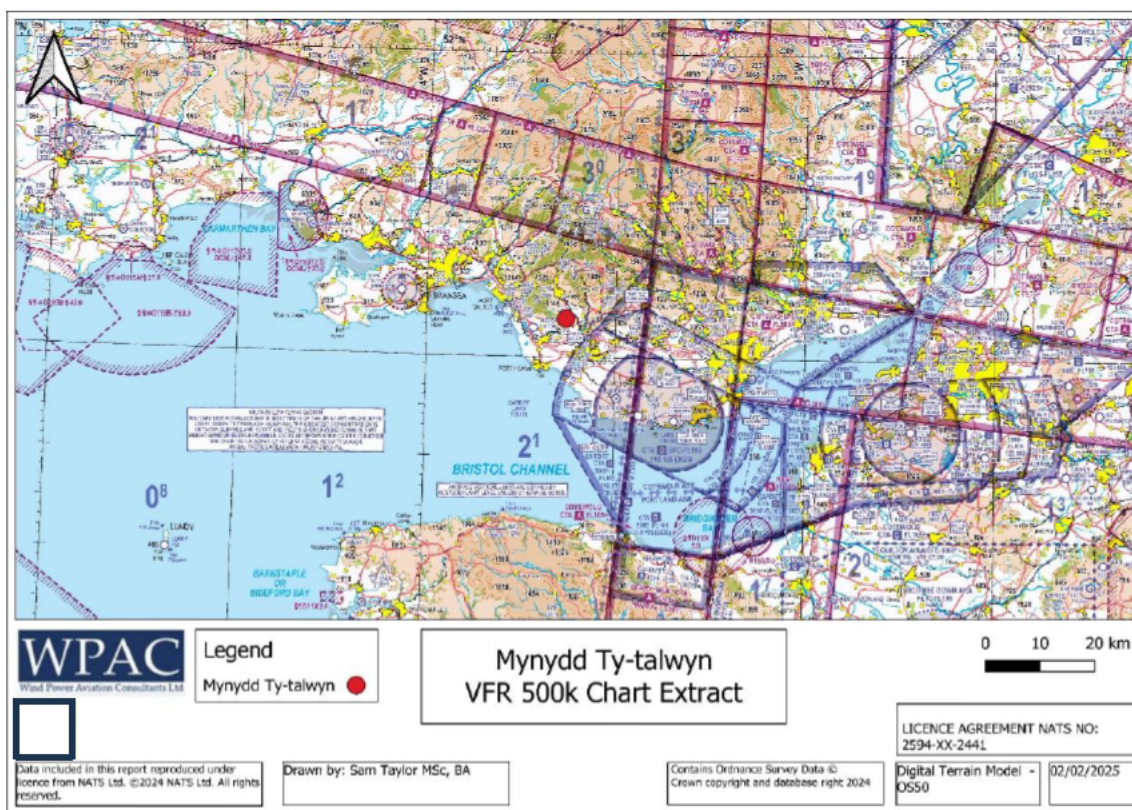


Figure 3

Military ATC Radars

14. The closest military airfield ATC radar is at RNAS Yeovilton and radar modelling shows that there are no affected military ATC radars. There is a military ATC radar located at Hartland Point in North Devon and radar modelling results in Table 2 below indicate that the turbines will be in view of the radar, however this radar is used primarily by the Royal Naval School of Fighter Control (RNSFC) at RNAS Yeovilton for use over Devon and Cornwall and is not used to provide radar services in the vicinity of the Proposed Development.

Turbine	Distance (Km)	Radar Line of Sight (m AGL)
1	86.106	19
2	85.91	18
3	85.255	7.8
4	85.45	0
5	85.819	32.9
6	84.5	8

Table 2 Hartland Point Radar Results

15. The only other military radars in the area are used for Range Safety at Manorbier Range and Aberporth Range. Neither radar is used in the location of the proposed development.

Military Air Defence Radars

16. The closest military air defence radar is located at Portreath in Cornwall. Radar modelling shows that there is no possibility of the radar being affected by the Proposed Development.

Military Low Flying

17. The proposed development is within MOD Low Flying Area (LFA) 7. At night this area converts to Night Allocated Region (NRR) 7S an area primarily reserved for low flying helicopters in the hours of darkness. It is located in an area where military fast jet and tactical transport aircraft are limited by flow-control measures that limit both their routing and altitude. This restricts the utility of this airspace and therefore the presence of such fixed-wing aircraft.

18. Conversely, the hilly and built-up nature of the Welsh Valleys dictates that this is an active helicopter operating region. Emergency Helicopters operating in the area most nights will include: Police, Ambulance, Coast Guard, HEMS and various Military formations down to 30ft (9m) on occasion. Due to the density of MOD and Civilian helicopters operating in the airspace, it will require a comprehensive obstruction lighting arrangement that includes both visible and infra-red obstruction lights.

Restats Safeguarding Maps

19. To provide a strategic overview, MOD Low Flying Operations Squadron (LFOS) has published a Low Flying vs Wind Farm Map to aid wind energy developers in their planning. The map is colour coded Red, Amber, Blue and Green in descending order of low flying priority. The published map is quite crude (see extract below); the map held by the MOD is in fine detail and confirms that all Mynydd Ty-talwyn wind turbines are in a Green area, defined as *'an area with no military low flying concerns.'*

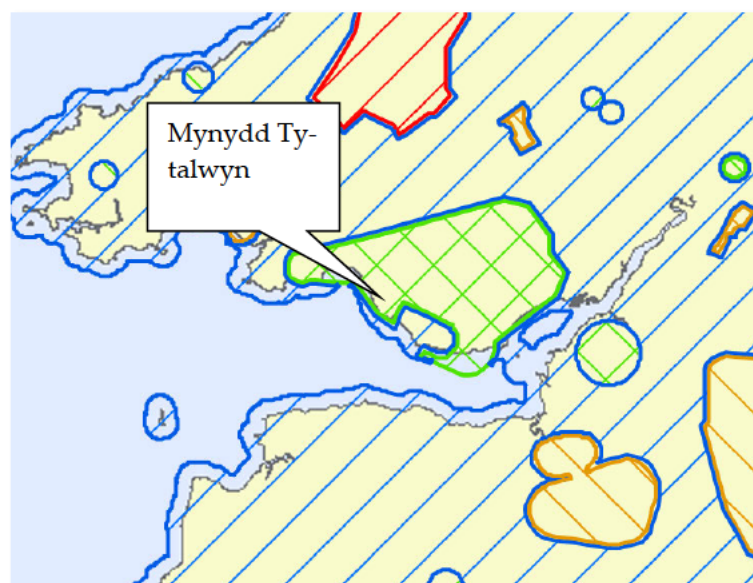


Figure 4 Low Flying Vs Windfarm Airspace Map

MOD Infra-Red Lighting Requirements

20. There will be a requirement for MOD approved IR lights. This issue is addressed in the separate Aviation Lighting technical appendix.

MOD Consultation

21. The MOD were consulted about the proposed development in 2021 and again at scoping in 2023. Their response (DIO 10061476 dated 27 Feb 2024) addressed to WPAC Ltd confirmed that the only issue of concern is in relation to aviation lighting; this is addressed in the separate Aviation Lighting technical appendix to the Environmental Statement. The MOD response will be confirmed once they are consulted formally when the full planning application is submitted as per the standard MOD process.

UK Met Office Radars

22. The Met Office safeguards its network of rainfall radars out to a distance of 20km. In this case the closest radar is at Crug-y-Gorilwyn, over 70km to the north-west. There will be no effect on the Met Office radar network.

CAA Licensed Radar Equipped Airports

Cardiff Airport

23. Cardiff Airport is 26 km to the south-east. Radar modelling has been undertaken with the following results:

Turbine	Distance (Km)	Radar Line of Sight (m AGL)
1	27.0	45.9
2	27.5	36.4
3	27.8	4.2
4	28.2	18.5
5	28.5	50.1
6	28.79	0

Table 3 Cardiff Airport Radar Line of Sight Results

24. These results unambiguously demonstrate that all the turbines will be visible to the radar and have the potential to create radar clutter and obscuration of real aircraft in the vicinity of the Proposed Development. The Applicant has engaged with Cardiff Airport on this issue, initially in 2021 and again in 2023 and 2024. Additional consultation was initiated in January 2025 and NATS, the Cardiff Airport Air Navigation Service Provider (ANSP) responded on 13/02/25 stating: *'Looking at the locations and, without having NSL check whether the turbines are line of sight, I think our position will remain unchanged and that radar mitigation would be a requirement.'* Discussions about mitigation are on-going with other developers and Cardiff Airport currently.' The Applicant is a member of the developer group engaged with the airport to overcome this issue for a number of wind farm proposals in South Wales including the

permitted Upper Ogmre and Twyn Hywel wind farms. It is clear that a mitigation scheme will become available within the lifetime of any planning consent, either to install a Terma Scanter 4002 wind farm resistant infill radar (as is already installed at six UK airports) or to upgrade the existing Thales Star 2000 radar at the airport to the Star 2000NG variant which has an inbuilt Wind Farm Filter (WFF) capability. Discussions are ongoing with the airport on the specifics of which mitigation option will be employed. It is therefore appropriate to impose a planning condition to provide a Radar Mitigation Scheme in order to overcome this issue. It is anticipated that Cardiff Airport will agree to a condition consistent with that imposed for the above mentioned schemes and the Applicant will continue to engage to ensure a condition can be agreed.

CAA Licensed Non-Radar Equipped Airports

25. There are no non-radar equipped aerodromes within or even close to the CAA approved consultation distance of 17km. The closest is at Swansea, over 30km to the west. The proposed development will not affect Swansea and consultation is not required.

Unlicensed Aerodromes and Airstrips

26. There are no unlicensed aerodromes or airstrips within the 3km consultation distance recommended in CAP 764 for unlicensed airstrips with a runway of less than 800m. The closest is at Old Park Farm, a private airstrip located just over 4km to the south-west of the nearest turbine location. It is an active site used mainly by microlights and ultralight aircraft due to the extremely short runway which is approximately 300m in length. Examination of the orientation of the two mown strips show they are orientated north/south and north-west/south-east and the Proposed Development will therefore have no effect on their operations and consultation is not required. Operations at Old Park Farm airstrip are already constrained by adjacent power lines and a single wind turbine only 700m from the eastern end of the mown strip as well as high ground rising to almost 1000ft above the runway elevation to the north of the airstrip.

NATS En Route Ltd (NERL)

27. The closest NERL radars are at Clee Hill in Shropshire and Burrington in Devon. Radar modelling has been undertaken which shows that there is no possibility of either radar being affected. This was confirmed by NERL in their response to the scoping application SG36584 dated 09 Jan 2024 in which they stated: ...*'NATS has no safeguarding objection to the proposal'*

Conclusion

28. The Proposed Development has been examined using the guidelines provided in CAP 764 and best practice developed over the past ten years or more. The report finds that the Proposed Development turbines will be located between 24-26km to the north of Cardiff International Airport who, with NATS, their ATC service provider, have identified a radar effect that will need to be resolved. The Applicant has been engaging with NATS and the airport to ensure their concerns are addressed subject to a suitably worded planning condition to secure the most appropriate mitigation. Technical mitigation is feasible and the radar mitigation scheme will be secured by a planning condition.

29. Following the implementation of this mitigation there are no significant residual effects on other civil or military aviation interests which will require mitigation.

Authors

Cdr John Taylor RN (Ret) – after a career in the Royal Navy specialising in Air Traffic Control (ATC), Airspace Management and Air Defence which culminated in leading both the ATC and Fighter Control Specialisations, John worked for Lockheed Martin UK for three years as a Principal Consultant and Business Area Manager responsible for Air Traffic Management Consultancy, including the provision of advice to wind farm developers. In 2008 he founded WPAC Ltd and since then he and his team have provided aviation advice in relation to over 2000 wind farm and wind turbine sites, given evidence at a number of planning inquiries and enabled many sites to overcome aviation objections where it was feasible to do so. He and his team have also provided advice to a number of Local Planning Authorities, Renewable UK and the Aviation Fund Management Board, including organising workshops and the provision of guidance documents. John also advises planners and developers in relation to physical and technical safeguarding of non-wind farm developments in the vicinity of aviation facilities.

Sqn Ldr Mike Hale RAF (Rtd) has over 45 years, piloting, instructing and examining experience on numerous military fast jet aircraft through to a range of civilian and military general aviation training aircraft and gliders. He has held many posts including Flying Instructor, Training Officer, Flight Commander, Squadron Commander and Principal Tornado AD Force Examiner. He has amassed over 10,000 flying hours of experience when operating at many locations around the world. In parallel to his flying duties, Mike held the post of Officer Commanding the MOD Low Flying Operations Squadron (OC LFOS). In this post he was both Low Level Airspace Manager for the MOD & Wind-Farm Subject Matter Expert for the Defence Infrastructure Organization (DIO). During that period, he assessed over 14,000 wind-farm pre-applications and 2000 full applications against low flying, weapons range, specialist airspace, local community and aerodrome safeguarding criteria. Mike also instigated two Qinetiq ground based Infra Red obstruction lighting trials. These were followed by instigating and managing the MOD Infra Red/Low Intensity (Henlow) flight trials and the CAA/MOD/Trinity-House/RUK off-shore IR/Morse (North Hoyle) flight trials. In conjunction, Mike organised numerous and various supporting trials including night vision equipment compatibility and detailed lighting beam overspill analysis (where light is emitted outside the required specification envelope). In 2012, he was awarded an MBE for generating a proactive and mutually successful working relationship between the Wind Power Industry and the MOD Air Staff.



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Appendix A – Abbreviations and Definitions

ADSB.....	Automatic Dependent Surveillance Broadcast
AGL.....	Above Ground Level (Height)
ANO.....	Air Navigation Order
ANSP.....	Air Navigation Service Provider
AMSL.....	Above Mean Sea Level (Elevation)
ASG.....	Aviation Steering Group
CAA.....	Civil Aviation Authority
CAP.....	Civil Aviation Publication (Referrers to Specific Documents)
cd.....	Candela, a measure of light intensity
DIO.....	Defence Infrastructure Organisation
HNTA.....	Helicopter Night Training Area
In Flight Visibility.....	The distance a pilot can see ahead to fly & navigate the aircraft
IR.....	Infra-Red
Kts.....	Knots: a measure of airspeed (10 kts = 12mph = 19 kph)
LED.....	Light Emitting Diode
LFOS.....	Low Flying Operations Squadron RAF
MOD.....	Ministry of Defence
mW/sr.....	milliWatts per steradian: electromagnetic energy output related to solid angle
Nm.....	Nautical Mile
NVD	Night Vision Devices - Aircraft Mounted
NVG.....	Night Vision Goggles - Operator Worn
Radar Altimeter.....	An altimeter that uses radar to accurately measure height above ground
QFE	Setting on Altimeter that gives Height above Airfield
RoAR.....	Rules of the Air Regulations
Rule 5.....	The Low Flying Rule – part of RoAR
Rule 28.....	VFR Rules Outside Controlled Airspace – part of the RoAR
ReUK.....	Renewables UK – The UK Wind Industry Body
SAR Box.....	Night Training Area for Search and Rescue Helicopter Units
SSA.....	Sector Safety Altitude
SSR.....	Secondary Surveillance Radar
UKAB.....	United Kingdom Air Prox Board – Investigates Aircraft Near Misses
VFR.....	Visual Flight Rules (Flight without ATC on a see-and-be-seen basis)
VMC.....	Visual Meteorological Conditions (Weather suitable for VFR flight)