

Monadhliath	35.8	8.9	19.0	14.1	35.9
The Arches	35.3	8.9	19.2	14.2	35.4
Bohanbeag Cottage	38.3	7.7	19.0	14.1	38.3
Knollywood Cottage	38.0	7.8	19.0	14.1	38.0
Grianach	37.1	7.7	19.3	14.4	37.2
Stroma	37.7	7.5	19.3	14.3	37.7
Blar Buidhe	35.4	4.8	20.4	16.1	35.5
Mains of Bunachton	36.8	2.6	18.7	13.5	36.9
Tom's Croft	36.1	2.5	18.4	13.1	36.2
Baile Na Creige	35.1	2.3	18.0	13.1	35.2

9.106 The cumulative assessment carried out indicates that there is a negligible cumulative effect for the receptors close to the Carr Ban proposed development. Predicted noise levels from the other schemes are 10dB below that predicted from the Carr Ban proposed development. Therefore the increase in noise due to all the above schemes is less than 1dB and no further cumulative assessment is required.

SUMMARY

9.107 An assessment has been made of the noise impact of the proposed development. The assessment is made according to ETSU-R-97 and the Institute of Acoustics' Good Practice Guide. These are the guidance documents recommended in Scottish Government online planning advice. In terms of operational noise, the proposed development can meet noise limits derived according to guidance document ETSU-R-97 and lower Highland Council night-time noise limits. The findings of the assessment are summarised in Table 9.18 below.

Table 9.18 Summary Assessment Table

Potential Effect	Mitigation	Residual Effect	Significance
Operational Effects			
Turbine noise at residential properties.	Embedded mitigation in the turbine selection and wind farm layout in order to meet approved noise limits. A low noise turbine is selected. The proposed scheme can meet ETSU-R-97 noise limits and the lower Highland Council noise limits.	Wind farm noise will be audible and above the background noise at the nearest properties. However the wind farm can meet noise limits designed to protect residential amenity.	Minor
Construction Effects			
Construction Noise	Best practical means as defined in BS 5228-1: 2009.	None for short-term noise	Negligible

Chapter ten

AVIATION AND TELECOMMUNICATIONS

INTRODUCTION

10.1 This chapter assesses the potential for the proposed wind turbines at the development site to affect communications links within the vicinity of the development site. A wind turbine is a structure that may affect electro-magnetic signals by reflecting them from the blades. The following communications links are considered within this chapter

- Electro-magnetic transmissions such as radio and microwaves which are used for a wide variety of communication purposes including radio, television and mobile phone links.

10.2 This chapter also assesses the potential for wind turbines to affect civil and military aviation operations and infrastructure in accordance with the guidance provided in Civil Aviation Authority (CAA) 'Policy and Guidelines on Wind Turbines' (CAA CAP764) and all other relevant documents. Turbines can affect radar transmissions used to detect and track moving objects such as aircraft which rely on reflected radio energy.

METHODOLOGY

10.3 Consultation as recommended by the Civil Aviation Authority and the Ministry of Defence (MOD) Defence Infrastructure Organisation (DIO) has taken place in respect of air traffic control and radar facilities.

10.4 Radar projections have been produced by WPAC Ltd using specialist propagation prediction software (Rview). 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) Landform Panorama digital terrain model, which has a post spacing of 50 metres and has a root mean square (RMS) error of 3 metres. The results are verified using the Shuttle Radar Topography Mission (SRTM) dataset, a separate smoothed digital terrain model with data spacing of 3 arc seconds. By using two separate and independently generated digital terrain models, anomalies are identified and consistent results assured.

Civil Aerodromes

10.5 Consultation with airports and aerodromes has taken place in accordance with the guidance contained in CAP764 which recommends the following consultation distances:

- Airfield with a surveillance radar – 30 kilometres (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.

10.6 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.

10.7 As well as 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.

Ministry of Defence

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

- MOD Airfields, both radar and non-radar equipped;
- Ministry of Defence Air Defence Radars;
- Ministry of Defence Meteorological Radars; and
- Military Aviation Authority Manual of Aerodrome Design and Safeguarding.

National Air Traffic Services Facilities

10.9 It is necessary to take into account the possible effects of wind turbines upon the National Air Traffic Services (NATS) radar systems – a network of primary and secondary radars and navigation facilities around the country.

Television and communication links

10.10 Consultation was undertaken with Ofcom to determine if any fixed or scanning telemetry links are likely to be affected by the proposed development.

10.11 For fixed link systems operating above 1 GHz, Ofcom determines whether any part of a wind turbine proposal falls within 500 metres of a path between terminals, or the terminals themselves. Ofcom also forwards enquiries to Joint Radio Company (JRC) to check whether a wind turbine proposal has the potential to interfere with radio systems operated by utility companies (operating between 450 to 470 MHz).

EXISTING CONDITIONS & CONSULTATIONS

Television and communications links

10.12 TV transmission infrastructure within the vicinity of the development site comprises the Rosemarkie transmitting station, approximately 17 km to the north.

10.13 A summary of the responses received from the telecommunication providers

that have been consulted is shown below in Table 10.1

Table 10.1 Summary of telecommunication consultation responses

Consultee	Response
Ofcom (Spectrum Licensing fixed link report)	07/02/2014 - No objection
Atkins	10/02/2014 - No objection
Joint Radio Company	29/04/2014 - Objection based on 1km buffer 02/12/2014 - Co-ordination report received 03/12/2014 - Utility Company contacted, awaiting response.

Aviation facilities in the area

10.14 The development site is located 19km to the south-west of Inverness Airport. Close to the site there is a Visual Reference Point (VRP) at Dores. To the north-east at around 50km are the combined Military Aerodrome Traffic Zones (MATZ) for RAF Lossiemouth and Kinloss. Overall this is a fairly unconstrained section of airspace.

Radar Equipped Licensed Aerodromes

10.15 Inverness is a busy regional airport owned and operated by Highlands and Islands Airports Ltd (HIAL). The airport is well equipped and has a new Thales Star 2000 Primary Surveillance Radar (PSR) and a Secondary Surveillance Radar (SSR) system. The development site is approximately 18.5km from the runway and is therefore beyond the distance where physical safeguarding of the protected surfaces is an issue, but is within the distance for considering radar impacts. Currently the airspace is unregulated 'Class G' airspace, however, Inverness Airport is in the consultation phase of establishing controlled or regulated airspace (Class D) which will encompass the area around the proposed development.

Non Radar Equipped Licensed Aerodromes

10.16 There are no non-radar equipped licensed aerodromes within the consultation distance of the development site.

Unlicensed Aerodromes, Gliding, Hang Gliding and Parachuting Sites

10.17 There are no known unlicensed aerodromes, gliding, hang gliding or parachute sites within the applicable consultation distances or marked upon any aviation charts.

En Route Airspace and National Air Traffic Services Ltd (NATS) En Route (NERL) Radars

10.18 NERL operates a network of long range ATC radars, communication systems and radio navigation aids throughout the UK. The closest NATS radar that has coverage in this area is at Perwinnes near Aberdeen and following detailed modelling it has been determined that there is no possibility of the turbines being visible to this or any other NATS radar. The applicant commissioned a NATS Technical and Operational Report in July 2014 which confirmed that no impact is anticipated on any airport to which NATS provide a safeguarding service, any of NATS's radio communications infrastructure, radars or navigational aids.

Ministry of Defence Considerations

Meteorological Radars

10.19 There are no Met Office radars likely to be affected by the proposed development.

Military airfields

10.20 The closest radar equipped military airfield is at RAF Lossiemouth, 62km to the north-east of the proposed development. Radar projections undertaken by WPAC show that the turbines will all be screened by terrain. This has been confirmed by the MOD during pre-planning consultation in September 2014 and again in the MOD response to scoping (reference DIO/20414 dated 12 November 2014).

Air Defence Radars

10.21 The UK maintains a network of radars around the country to provide a policing and security service for the airspace for which it is responsible under international agreements and for national security. The nearest Air Defence radar is located at Buchan, near Peterhead, over 140km to the east. Initial radar projections show that there is excellent terrain screening, and the proposed turbines will not affect the radar. This was also confirmed by the MOD in pre-planning consultation.

Ministry of Defence Low Flying Areas

10.22 The development site is in MOD Low Flying Area (LFA) 14, one of the largest LFA's in the UK and includes mainland Scotland north of Glasgow/Edinburgh, the Western Isles, Orkney and Shetland. Within this area are several major military flying units, the air weapons range at Tain and the Highlands Restricted Area (HRA). Due to the relatively unrestricted nature of the airspace, both in and above LFA 14, the area has the highest number of fixed wing low level training flights of any LFA. However, due to its size, the low flying intensity is amongst the lowest in the UK.

10.23 The development site is in one of the busier parts of LFA 14. Twenty nautical miles to the NNE is the Tain Weapons Range which is in regular use by fast jet aircraft. Twenty miles NE is the Lossiemouth/Kinloss complex which includes the Search and Rescue (SAR) helicopter night training area (SAR 1). Twenty miles south-east, is SAR 2, a second dedicated night helicopter area. However, the development site is not on any of the routes used to access these facilities by either local (Lossiemouth) units or aircraft/helicopters from further afield.

10.24 The development site is in an MOD windfarm low flying consultation blue area as shown on the DECC Renewable Energy Statistics Planning Database (RESTATS), defined as 'an area with low priority low flying less likely to raise concerns', and part of LFA 14 which is a normal training area. At 126.5m to tip (415ft), the turbines are above the height flown by military fast jets (250ft) and helicopters (100ft and lower). Low Flying Operations Squadron (LFOS), through DIO, will request vertical obstruction lighting. The normal LFOS request will be for Infra Red (IR) lighting (to the MOD specification) fitted to every other perimeter turbine including corner/cardinal turbines. In the case of the proposed development, this will most likely require lighting on turbines T1, T2, T5 & T7. This IR lighting is invisible to the naked eye. Due to the proximity of night SAR training areas, LFOS might request 'combo' lighting. This is a single light containing both IR and low intensity Red elements and caters for aircrew operating at low level at night and training without Night Vision Devices. It should be noted that MOD are re-drafting their lighting requirements and this may change in future.

10.25 At pre-planning the impact on low flying was discussed with the MOD who after

initially expressing a 'concern', stated on 12 September 2014 (DIO ODC-SG2a) that '*I am happy to advise that we would not have any objections to the above development with regard to low flying ops should it be submitted as a planning application. We would require 25cd or IR lighting*'. The name change from Dinichean Wind Farm to Carr Ban Wind Farm resulted in the MOD issuing a further 'concerns' letter (reference DIO/20414 dated 12 November 2014), as they did not realise that it was the same proposed development, however, this issue should be resolved shortly.

IMPACT ASSESSMENT

Terrestrial television

10.26 It is possible for the wind turbines to affect TV reception in the vicinity of the development site.

Communications links

10.27 As detailed in Table 10.1, the Joint Radio Company (JRC) has raised an objection based on a 1km buffer. Discussion with the JRC and the Utility Company they represent is ongoing to clarify mitigation solutions.

Civil aviation/radar

10.28 The proposed scheme will be visible to the primary surveillance radar (PSR) at Inverness Airport and is likely to generate an area of 'clutter' or unwanted radar returns on the ATC displays at the airport.

10.29 None of the turbines will affect any of the communications, navigation and surveillance systems used by NERL as confirmed in their TOPA dated July 2014.

Ministry of Defence

Air Traffic Control Radar

10.30 The proposed turbines will be screened by terrain from all military ATC radars and there will be no effects.

Low Flying

10.31 The proposed development should have only a minimal impact on low flying operations as confirmed by the MOD.

MITIGATION

Terrestrial television

10.32 In the event that there is considered to be interference, this will be investigated and monitored to establish the cause. If reception is degraded as a result of the wind turbines, this may be resolved by repositioning the television aerials. This can be controlled by means of a planning condition relating to TV and radio signals.

Communications links

10.33 Consultation is ongoing with JRC and the Utility Company they represent. Based upon experiences of similar projects elsewhere and ongoing discussions with the relevant consultees, it is expected that issues identified can be resolved through ongoing discussions, consultations and where necessary, the identification of further specific mitigation measures.

Civil aviation/radar

10.34 Discussions have commenced between the applicant and Highlands and Islands Airports Ltd (HIAL) in relation to Inverness Airport. The turbines will be visible to the radar and may generate 'clutter' or unwanted radar returns. It is possible that the impact can be mitigated through the establishment of controlled airspace already being planned, however, technical mitigation will be considered should it be necessary; the interests of the airport will be protected through suitable planning conditions.

Ministry Of Defence

Air Traffic Control Radar

10.35 There are no radar impacts that will require mitigation.

Low Flying

10.36 MOD accredited aviation lighting may be required at the highest practicable point on the wind turbines. Suitable mitigation could be to illuminate with 25 candela red lights, or more probably infra-red (IR) lights flashing at 60 cycles per second but invisible to the naked eye. This can be controlled by means of a planning condition if required.

RESIDUAL EFFECTS

10.37 With mitigation measures in place, the proposed development would not result in any significant impacts on telecommunications or aviation infrastructure.

CUMULATIVE EFFECTS

10.38 With mitigation in place there are no cumulative effects on telecommunications or aviation infrastructure.

Chapter eleven

SHADOW FLICKER AND SAFETY

11.1 This chapter provides an assessment of potential shadow flicker effects and safety issues relating to the installation and operation of wind turbines at the proposed development.

INTRODUCTION

11.2 Shadow flicker is the term given to an effect that can occur under certain conditions when the sun passes behind a wind turbine and casts a shadow through narrow window openings which flicks on and off within a neighbouring property.

11.3 The effect can occur within a building if a wind turbine is located within a distance of ten times the rotor diameter or less from the building in question. It will not happen where there is intervening topography, vegetation or other obstruction between the turbines and the house.

11.4 The likelihood and duration of the effect depends upon several factors including:

- the orientation of the property's windows relative to the turbines, in the UK, only properties within 130 degrees either side of north, relative to the turbines, can be affected, as turbines do not cast long shadows on their southern side;
- the distance from the turbines. The further the receptor is from the turbine, the less pronounced the effect would be;
- turbine height and rotor diameter;
- time of year and day; and
- weather conditions (cloudy days reduce likelihood).

11.5 Shadow flicker is one of the potential constraints that have been considered in the selection of the development site and the choice of location of the turbines.

LEGISLATION AND GUIDANCE

11.6 The Scottish Government's Online Renewables Planning Advice in respect of onshore wind turbines¹ defines shadow flicker as:

'Under certain combinations of geographical position, time of day and time of year, the sun may pass behind the rotor and cast a shadow over neighbouring properties. When the blades rotate, the shadow flicks on and off; the effect is known as 'shadow flicker'. It occurs only within buildings where the flicker appears through a narrow window opening. The seasonal duration of this effect can be calculated from the geometry of the machine and latitude of the potential site. Where this could be a problem, developers should provide calculations to quantify the effect. In most cases however, where a separation is provided between wind turbines and nearby dwellings (as a general rule, 10 rotor diameters), 'shadow flicker' should not be a problem. However, there is scope to vary layout/reduce the height of turbines in extreme cases.'

¹ Scottish Government, Online Renewables Planning Advice, Onshore Wind Turbines last updated 28 May 2014