Appendix 18.1: Radar and Aviation Technical Assessment

18.1 Military and Civil Radar

18.1.1 Primary Surveillance Radar Systems

18.1.1.1 Air Traffic Control, Air Defence and Precision Approach Radar

1 The only military or civil radar; ATC, AD and PAR, systems with LoS to the wind farm are the RAF Leuchars Watchman ATC PSR and the RAF Leuchars PAR. None of the turbines from either layout A or B lies inside the PAR exclusion zone shown in Figure 18.1 within the chapter. Accordingly, the impact of the wind farm on PAR is likely to be negligible and is not considered any further.

2 The maximum operating range for the RAF Leuchars PSR is approximately 60 NM, similar to most MOD Watchman systems. For the purpose of the assessment the radar coverage will be assumed to extend out to 60 NM. The location of Neart na Gaoithe within the coverage area is shown in Figure 18.1. This does not take account of the likely coverage reductions in some directions on land due to terrain screening, which is not important to the assessment.

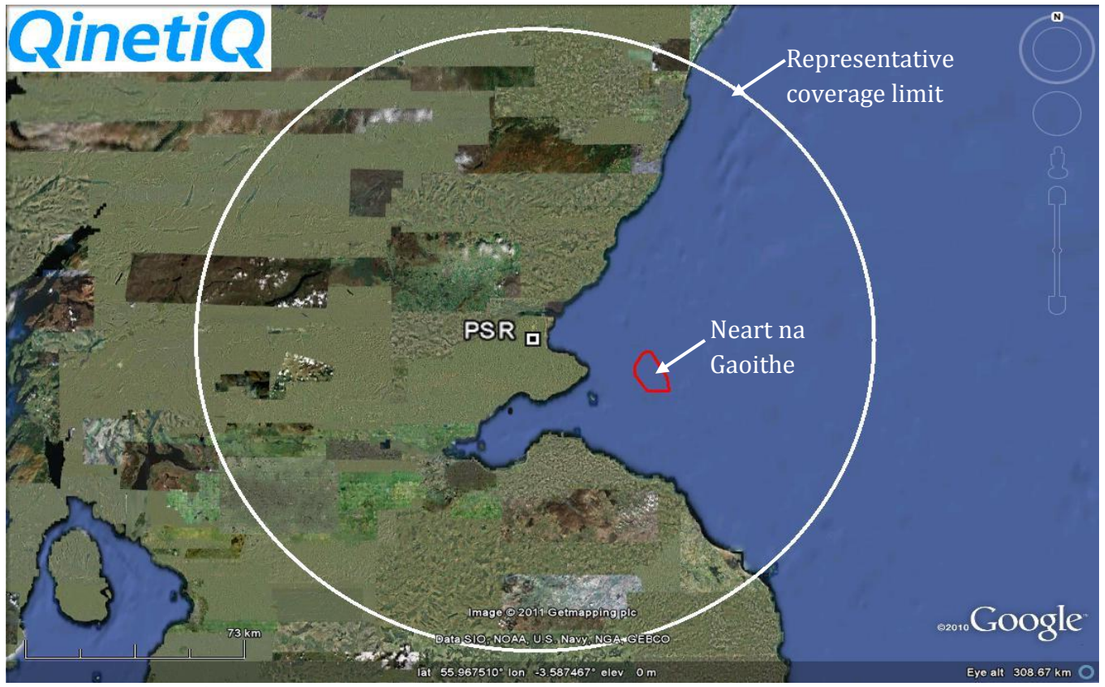

Figure 18.1: Representative 60 NM coverage zone for the RAF Leuchars PSR

3 The height to LoS for the RAF Leuchars ATC radar is shown in Figure 18.2. This indicates that the radar has visibility down to less than 40 m AMSL at all turbine locations, meaning that the majority of all turbines in layouts A and B will be visible.

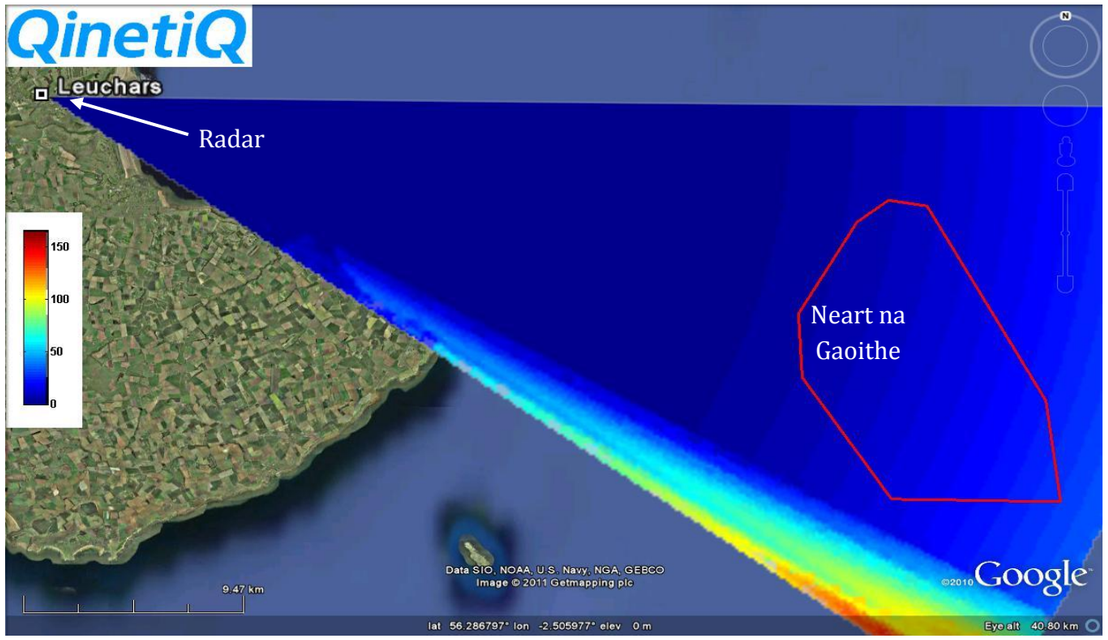

Figure 18.2: Height in metres to the RAF Leuchars ATC radar LoS in the vicinity of Neart na Gaoithe

4 The turbines are large reflective objects in LoS from the ATC radar, and are likely to be detected and appear as clutter on the radar display.

5 The Neart na Gaoithe turbines will also block some of the radar signal, i.e. shadow the radar signals, leading to a reduction in detectability of targets in the shadow regions. The alignment and severity of shadow losses will depend on the chosen layout and turbine tower dimensions but all options are likely to be qualitatively similar. The volume of the shadowed airspace will extend to the maximum operating range of the radar but will be limited in height because the radar can see 'over' the turbines.

6 The worst case volume of shadowed airspace is estimated in Figure 18.3 where the maximum range of 60 NM is assumed and the wind farm has been represented as a solid structure with a tip height of 197 m. The shadowed airspace extends to the maximum coverage range of 60 NM, is limited to the bearings of the wind farm and does not extend above 1000 m AMSL.

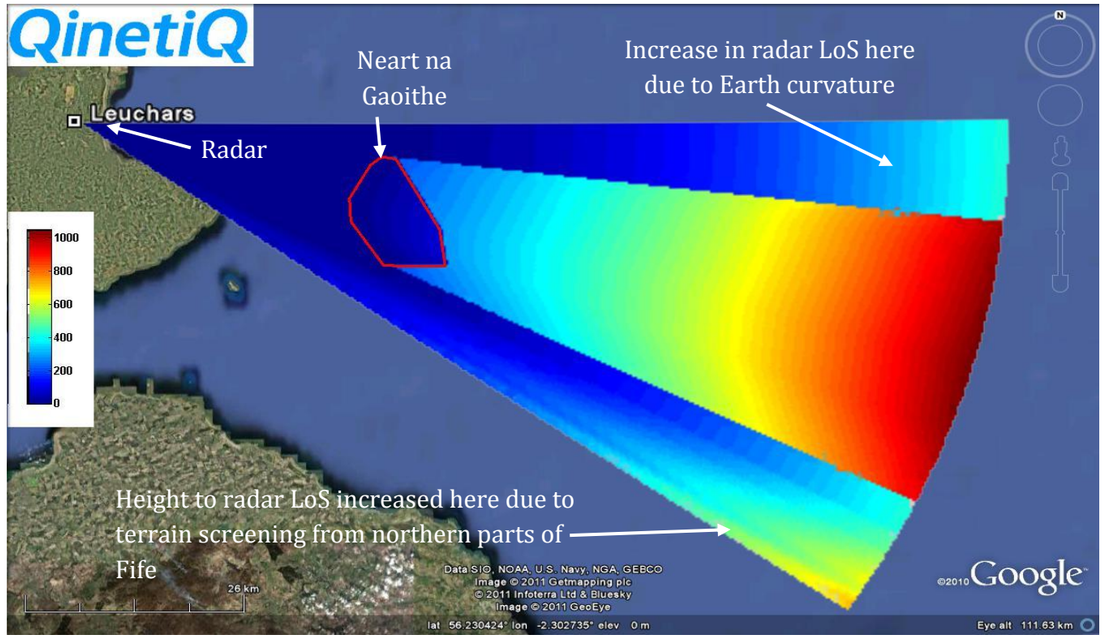

Figure 18.3: Estimate of the height of the shadowed airspace for the RAF Leuchars ATC radar, based on height to radar LoS

18.1.1.2 Operational Impact on RAF Leuchars ATC Radar

7 The turbines are likely to appear on the RAF Leuchars radar display as clutter; filtering techniques are unlikely to remove the turbine clutter satisfactorily. The turbine clutter will potentially affect the ability of ATCOs to provide an ATS for both military and civil aircraft in the vicinity of the wind farm.

8 Operations at RAF Leuchars can take place in almost any direction but, due to the controlled airspace to the west, extensive operations can be expected in the Class-G airspace to the east. Class-G airspace is uncontrolled, and operations may be conducted under Visual Flight Rules (VFR) or Instrument Flight Rules (IFR). Examples of the types of operation which can be expected in the vicinity of Leuchars and that would be potentially affected by the development are:

- Departure and recovery: Aircraft departing or recovering to RAF Leuchars can fly in any direction. Aircraft from the south may be positioned onto final approach for Runway 27 under ATS and may overfly the proposed development site;
- Transit: Military aircraft can overfly the site whilst receiving an ATS from RAF Leuchars. RAF Leuchars can control aircraft at up to 50 NM from the airfield and frequently do so due to the lack of overlapping radar cover from neighbouring units; and
- General handling: There is an informally designated GH area to the north of the proposed wind farm site. Aircraft manoeuvring to and from this area may fly over or close to the wind farm.

9 Scottish Military controllers are responsible for en-route traffic in Scottish airspace and are co-located with civil en-route controllers at Swanwick. Both the military and civil services use radar information from the NERL en-route radars. LoS checks show that there is no LoS from any NERL radar. This is supported by the NATS online coverage maps (NATS, 2011). Accordingly there is unlikely to be any impact on military operations.

10 In July 2011, the MOD made a decision to shut RAF Leuchars as an operational flying base. Although no detailed timetable has been issued, it is likely that fast-jet flying will cease at Leuchars in 2013. It should be stressed that the formal plans have not been published at the time of writing (January 2012), and the assessment that follows is heavily dependent on assumptions.

11 As well as the fast-jet squadron, there are other flying units at Leuchars, including:

- University Air Squadrons;
- Army Air Corps; and
- Volunteer Gliding Squadrons.

12 It is possible that, even after closure, operations by these aircraft would continue, maybe without ATC services. Consequently, the impact of the proposed site at Neart na Gaoithe depends not on the continued operation of aircraft at Leuchars but on the continued provision of ATC radar services in the area after closure.

No ATC Radar Services

13 When Leuchars closes, the MOD could decide that there is no need for the radars located there to continue in service. In this case there would be no issue with clutter from the proposed site on ATC radar. All radar services formerly provided by ATC at Leuchars would no longer be available to aircraft operating in that vicinity, who would consequently need to operate without the benefit of ATC cover, or seek services from other units using different surveillance equipment, where sufficient coverage exists.

14 For any aircraft that wished to operate in that area in receipt of a radar service, the lowest altitude at which they could operate would be significantly increased due to the location of radars that could provide a service. The proposed site is not in LoS from any radar that could provide services in that geographical area, and so there is unlikely to be any ATC objection, should the radar at Leuchars be shut down.

15 It is likely that, after the closure of Leuchars, military aircraft would still operate over or near the proposed site but the main potential impact would now be the obstruction to low-level flying. Since the area is outside any areas of concern published on the chart made available by the MOD on the Renewable Energy Statistics (RESTATS) web site, it is unlikely that an objection would be made on those grounds alone.

Radar Services Continue

16 One option for the MOD following the closure of Leuchars is for the radar(s) at Leuchars to continue to operate, even if ATC itself at Leuchars were closed down. Although, at present, data from the Leuchars radars are not shared with any other ATC agency, it is technically possible for this to be implemented. There are several operational reasons for this to be done:

- There is a gap in surveillance coverage from the north of England until the coverage from Lossiemouth in the north. Given the volume of military traffic that covers that area, it may be deemed operationally unacceptable to have no radar coverage;
- Aircraft climb out of, and descend into, the LFA to the east of Leuchars. Loss of the Leuchars radar may make it harder for military aircraft to achieve their training aims; and
- ATC services are provided to civil aircraft, both as a Lower Airspace Radar Service (LARS) and through a Letter of Agreement with Dundee Airport. Loss of the Leuchars radar would render provision of these services impossible.

17 Should the Leuchars radar remain operational, even with controllers based remotely at other locations, the impact of the Neart na Gaoithe site would depend on the nature of the services provided. It is possible, therefore, for Leuchars airfield to close but for the impact of the proposed site to be just as severe on ATC operations as when Leuchars was fully operational.

18 In the case where the full range of radar services continued to be available, it is likely that the existing objection from the MOD would be upheld.

18.1.1.3 Technical Mitigation of Effects on RAF Leuchars

New radar

19 Replacing the existing RAF Leuchars Watchman ATC radar with a system that is more robust to wind farm clutter could mitigate the impact of clutter from Neart na Gaoithe. Given the likely extent of the clutter, especially when

considered cumulatively with the other proposed Firth of Forth wind farms, a wind farm resilient radar may not provide complete mitigation.

Infill Radar

20 Any regions of a radar's coverage that are impacted by the presence of strong clutter can be mitigated through the use of an additional radar to supplement the radar coverage. This *infill* radar should be located in an area where the wind farm is out of radar coverage, either over the horizon or terrain shielded but still able to detect aircraft flying above the turbines. A simplistic representation, showing the basic premise of the infill approach, is shown in Figure 18.4.

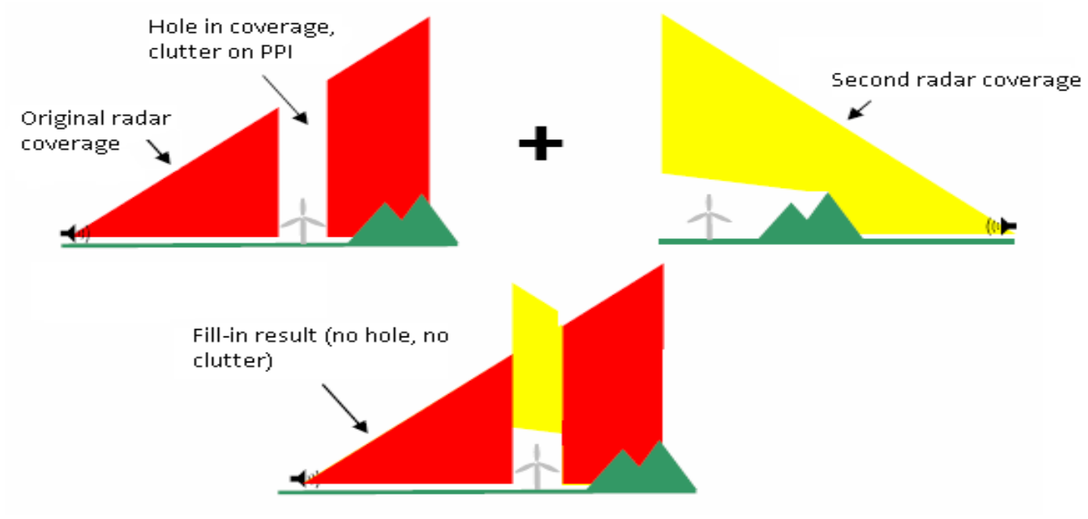

Figure 18.4: Simplified side on representation of infill radar

21 An infill radar system could either take the form of a new onshore system, if a suitable location can be found, or a system local to the wind farm. Any infill system would need to meet the MOD seamless integration policy, where seamless integration is defined as:

"The insertion of data into an air traffic control radar video display to provide a radar picture over a wind turbine development within a specific designated area that appears to have smooth boundaries with no visible seams or obvious joins to an MoD Air Traffic Controller. The infill patch must not display any form of boundary corruption for transponding or non-transponding aircraft which could lead to an MoD Air Traffic Controller being unable to provide safe air traffic control services" (MOD, 2010c).

22 It is desirable that any infill solution would form part of a regional solution, to mitigate the other proposed Firth of Forth wind farm developments. Given the likely extent of the cumulative area of clutter, it is unlikely that any one new onshore radar will fully mitigate the effect. Local infill solutions could, in principle, fulfil this requirement. Current local infill solutions include:

- Cambridge Solutions *Aveillant*, based on holographic radar methods, whereby the airspace around the wind farm is continually scanned using a three dimensional radar that can discriminate between turbines are aircraft;
- C Speed *Lightwave*, a solid state PSR that uses a high pulse repetition frequency to differentiate between wind farm clutter and real aircraft;
- QinetiQ *VERIFEYE*, a novel solution using multiple navigation radars as a low cost, high redundancy solution that is readily integrated with existing radar set ups.

23 In addition to mitigating the impacts of clutter, infill radar solutions can potentially mitigate the impact of shadowing on the RAF Leuchars PSR, should this be considered necessary.

18.1.1.4 Operational Mitigation of Effects on the RAF Leuchars PSR

Airspace Change

24 The proposed site is currently located in Class-G airspace, which means that mostly any class of airspace user can fly there with a minimum level of equipage, maybe not even a radio. There is currently no requirement for aircraft to be equipped with an SSR transponder, when operating at lower levels. This has three main consequences:

- The activity levels around Neart na Gaoithe are unpredictable;
- ATC authorities cannot deny access to the airspace above Neart na Gaoithe to any airspace user; and
- ATC agencies controlling traffic near the proposed site cannot guarantee that the probability of detection of conflicting traffic will be improved through the use of SSR.

25 It would be possible to increase the level of predictability over the site by means of an airspace change process (ACP). For example, the area could be designated a TMZ, which would require aircraft to be equipped with transponders. Without a TMZ, SSR cannot be considered an effective mitigation. The implementation of a TMZ is a proposed mitigation for the impact of offshore wind farms in The Greater Wash, as part of the Greater Wash Regional Solution (GWRS).

26 There are other more constrictive types of airspace that could also be considered, however, it should be recognised that the authority for classifying airspace in the UK, the DAP within the CAA, has a remit to ensure access to airspace equitably to all airspace users, and it would be unlikely to sanction proscriptive airspace classification simply to permit the development of a wind farm. Moreover, the ACP process is lengthy and expensive, requiring consultation with all affected stakeholders.

Procedure Change

27 Where formal IFR procedures exist, it is sometimes possible to explore the modification of these procedures to ensure that aircraft can be safely separated from wind-turbine clutter. However, in this case, all the activities that directly affect the proposed site take place in Class-G airspace without prescribed routes and altitudes. Consequently there are no formal procedures to assess.

28 The radar patterns associated with RAF Leuchars, while not formally published IFR procedures, take place to the south of the extended centreline of Leuchars main runway, which is approximately east-west. These patterns cannot be moved to the north of the airfield due to noise-abatement and terrain issues, as well as the need to avoid a formal Site of Specific Scientific Interest (SSSI). Consequently, these radar patterns cannot be significantly altered to clear the site. Of course, with the cessation of flying activities at Leuchars, this issue will diminish in importance, or disappear.

Tactical Intervention

29 When controlling aircraft, controllers can always seek to re-route aircraft away from potentially hazardous areas. In this case, however, options for doing this are limited for the following reasons:

- Aircraft performing GH generally do so under VFR and are, therefore, not always willing or able to accept re-routes;
- In Class-G airspace, controllers cannot mandate a re-route;
- Other wind farm sites and proximate controlled airspace limit the options for re-route;
- Controller workload. Offering a re-route may not be high on a busy controller's priority list; and
- Other traffic. In Class-G airspace, other traffic could be anywhere, and a proposed re-route may take an aircraft under control into the path of other aircraft.

30 Against these limitations, however, it must be borne in mind that any such aerial activities where the pilot refuses to accept a re-route would only normally occur when the aircraft is operating VFR, or IFR in Visual Meteorological

Conditions (VMC). When operating under a full IFR service, in VMC or Instrument Meteorological Conditions (IMC), the pilot would normally accept the instructions of the controller or risk being in breach of the terms of the service.

31 However, it is not possible to guarantee that a controller will be able to ensure an aircraft can re-route around the proposed site and this cannot be considered a reliable mitigation.

18.1.1.5 En-route Radars

32 None of the NERL radars shown in Figure 18.2 within the chapter has LoS to the proposed wind farm. This is supported by the NERL online self-assessment coverage maps (NATS, 2011). The radar coverage map (a cumulative picture for all systems) for turbines with a maximum blade tip height of 200 m is shown in the vicinity of the wind farm in Figure 18.5. A 200 metre blade tip height was chosen for this illustration because it is the closest match to the maximum proposed Neart na Gaoithe blade tip height of 197 m. Because there is no LoS to any NERL radar, there is unlikely to be any significant impact.

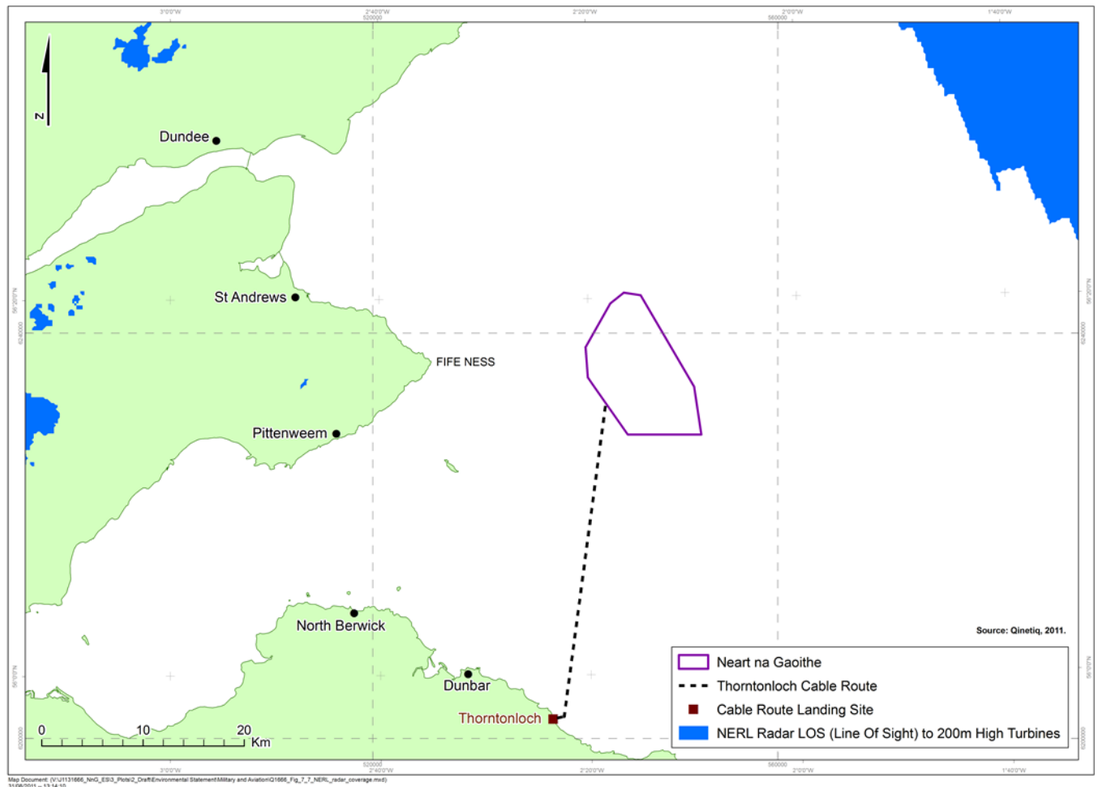

Figure 18.5: NERL radar coverage map for wind turbines with a 200 metre maximum blade tip height, also showing the location of the proposed wind farm boundary

18.1.1.6 Vessel Traffic Services Radars

33 The MCA has confirmed that none of their VTS radars operate in the vicinity of Neart na Gaoithe (MCA, 2011).

18.1.1.7 Offshore Oil and Gas Platform Radars

34 No offshore oil and gas platform radars have been identified in the vicinity of Neart na Gaoithe. Accordingly, the impacts on these systems are likely to be negligible.

18.1.1.8 Meteorological Radars

35 As shown in Figure 18.6 the Neart na Gaoithe development lies outside the safeguarded areas associated with any meteorological radars. Accordingly, the impacts on these systems are likely to be negligible.

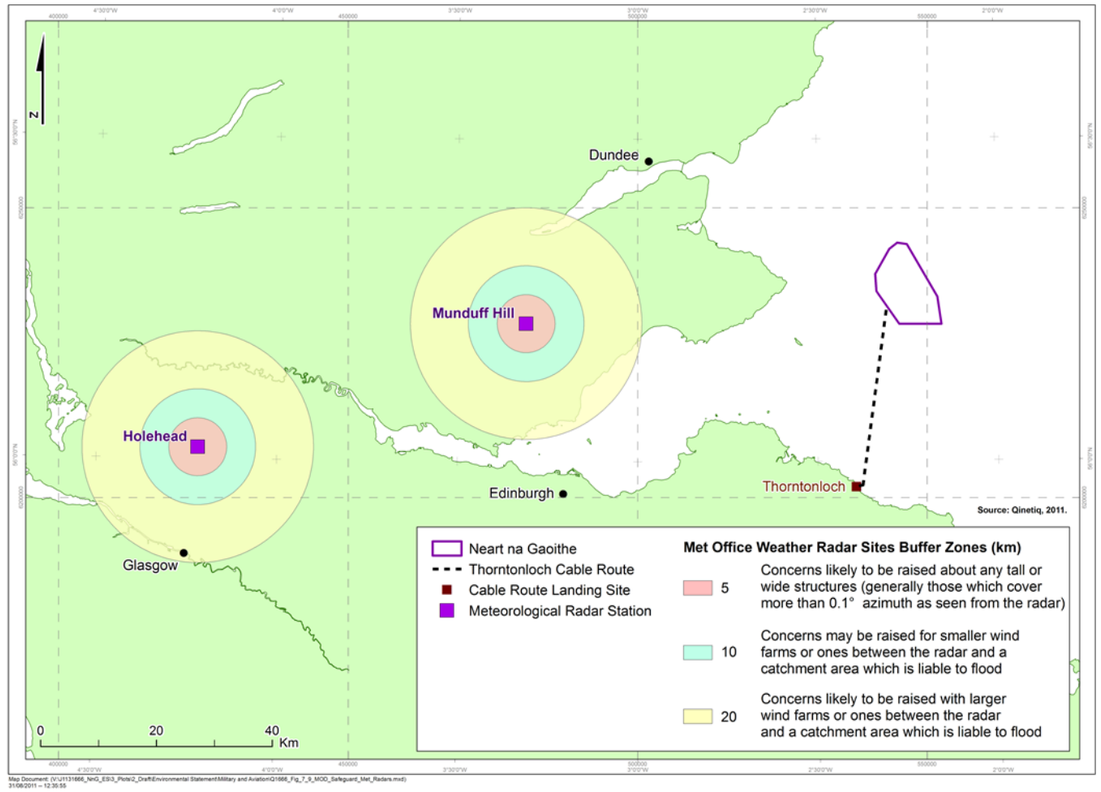

Figure 18.6: MOD safeguarding map for meteorological radars, also showing the location of the proposed wind farm boundary

18.1.1.9 Secondary Surveillance Radar

36 There are no SSRs identified within the CAA recommended consultation distance of 24 km (approximately 13 NM) of the proposed wind farm. Accordingly, the impacts of the Neart na Gaoithe on SSR are likely to be negligible.

18.2 Telecommunications

18.2.1 Marine Navigation Aids

18.2.1.1 Racons

37 Previous studies suggest racons may be triggered due to reflections from a typical offshore wind turbine when the racon is within 1 km (0.54 NM) of a turbine (QinetiQ and MCA, 2004). The potential for reflections triggering racons has been noted in experimental trials (MCA, 2005) but no instances were identified in the sources listed in Section 18.3 – Data Sources, where this has been observed.

38 No racons have been identified in the vicinity of Neart na Gaoithe. The MCA has confirmed that it does not operate any racons within 10 NM of the development. Accordingly, the impact on racons is judged to be negligible.

18.2.1.2 VHF Radio Communications and Automatic Identification System

39 VHF radio communications are likely to be used by a number of maritime users in the vicinity of the proposed wind farm. Onshore VTS operators will be in communication with offshore vessels. Vessel to vessel communications will be made alongside and possibly across the development. SAR operators, e.g. lifeboats and helicopters may need to use VHF communications in and around the wind farm.

40 The locations of the VHF communication base stations operated by the MCA in the vicinity of Neart na Gaoithe are shown in Figure 18.7 (MCA, 2011).

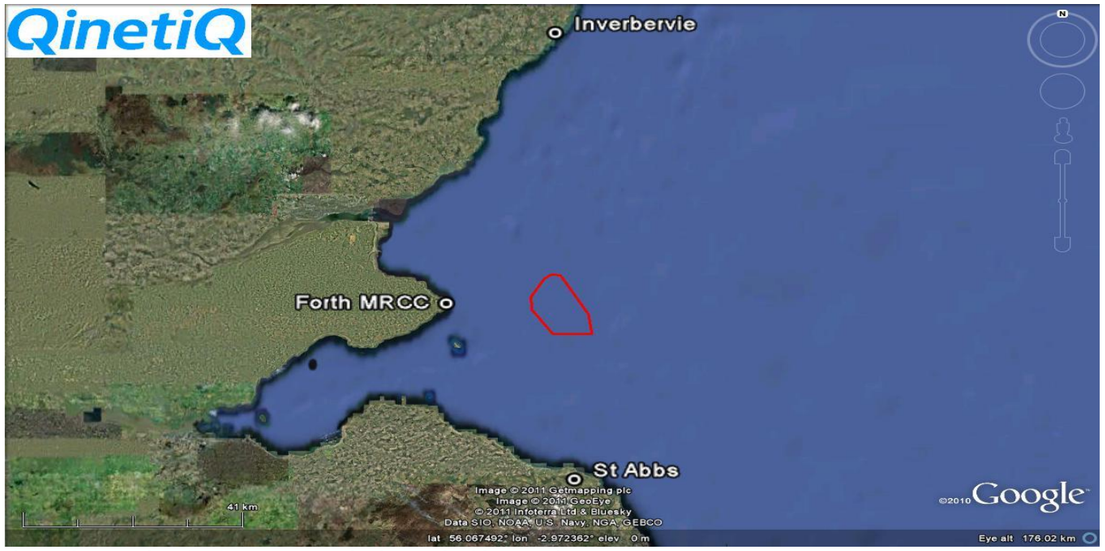

Figure 18.7: Location of MCA VHF communications and AIS base stations

41 An illustration of the composite VHF communication coverage from the three MCA base stations identified in Figure 18.7 (MCA, 2011). Red and yellow areas show where base stations are likely to have coverage. Green and blue areas indicate where coverage is unlikely. All three base stations are likely to offer coverage at Neart na Gaoithe, although the strongest coverage will be from the Forth Maritime Rescue Co-ordination Centre MRCC.

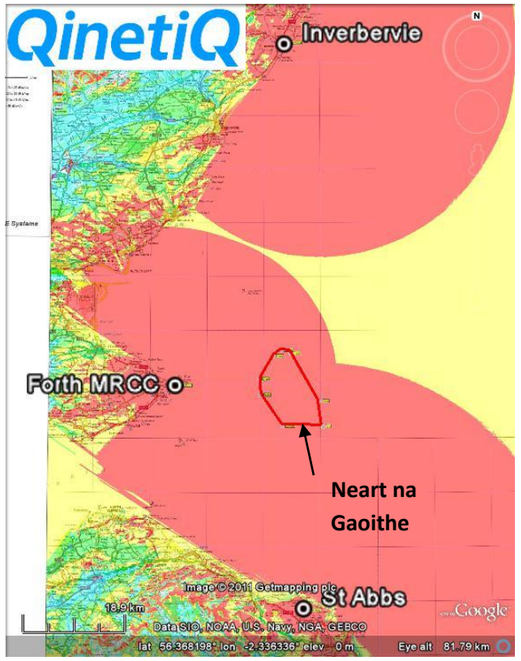

Figure 18.8: Indication of MCA VHF communication base station coverage in the vicinity of Neart na Gaoithe (MCA, 2011). Colour indicates the received signal strength (blue = 10 to 20 dBµV/m, green = 20 to 30 dBµV/m, yellow = 30 to 40 dBµV/m, red = greater than 40 dBµV/m)

42 Similarly, an illustration of the composite AIS coverage from the same base stations is shown in Figure 18.8. Red and yellow areas show where base station coverage is likely. Green and blue areas show where coverage is unlikely. The coverage of all three base stations is approximately 60 km (MCA, 2011). Forth MRCC and St Abbs are likely to provide coverage at Neart na Gaoithe; coverage from Inverbervie is unlikely.

43 Interference due to reflections from wind turbines has the potential to affect the operation of VHF communications and AIS transmissions. The severity of the impact will depend on the size of the reflections from the turbines. Different choices of turbine foundation may have different impacts on the severity of impact. For example, Figure 18.9 shows the scattering from an illustrative turbine on a gravity foundation of the type being considered for Neart na Gaoithe (Mainstream, 2011). The modelling was carried out at a representative VHF frequency, typical of VHF communications and AIS transmissions. The tapered turbine scatters energy mostly above the sea surface and the vertical section of the gravity base scatters signals mostly back in the direction of the transmitter.

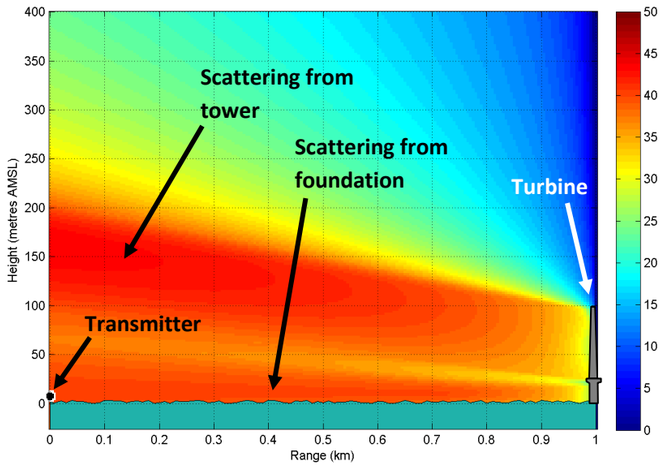

Figure 18.9: Indicative illustration of scattering from turbine tower and gravity base foundation option. The colour indicates the bistatic Radar Cross Section (RCS) in units of dBsm

44 The corresponding scenario, with a jacket foundation of the type being considered for Neart na Gaoithe, is shown in Figure 18.10. In this case, both the tapered tower and tapered jacket legs reflect signals predominantly above the sea surface. In this case, the strength of interfering signals due to reflections from the turbine for vessels on the sea surface is smaller than the case for a gravity base.

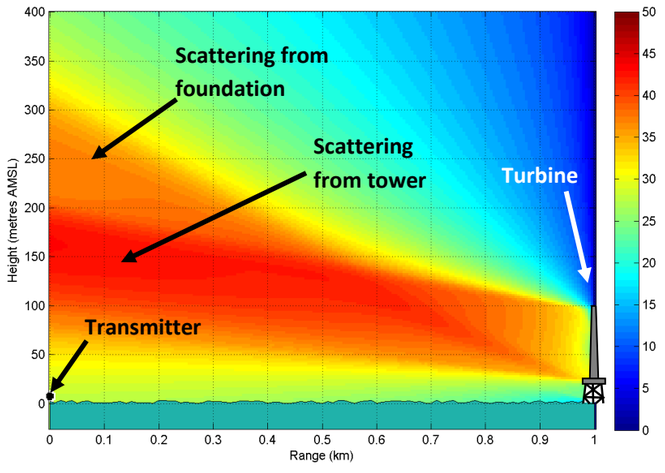

Figure 18.10: Indicative illustration of scattering from turbine tower and jacket foundation option. The colour indicates the bistatic RCS in units of dBsm

45 The exact scattering behaviour is complex, depending on the turbine type, the exact foundation configuration and the signal frequency, as well as the locations of the transmitting and receiving vessels and the antenna heights. As an illustrative worst case, the interference zones using the worst case gravity base foundations are shown in Figure 18.11. The red zones show where a receiving or transmitting vessel could potentially be impacted due to reflections from turbines. Layout A has been assumed for the illustration. The zones are approximated by circles with a radius of approximately 200 m centred on each turbine. The size of zones for communications between two offshore vessels is likely to be qualitatively similar to that shown in Figure 18.11 in most circumstances.

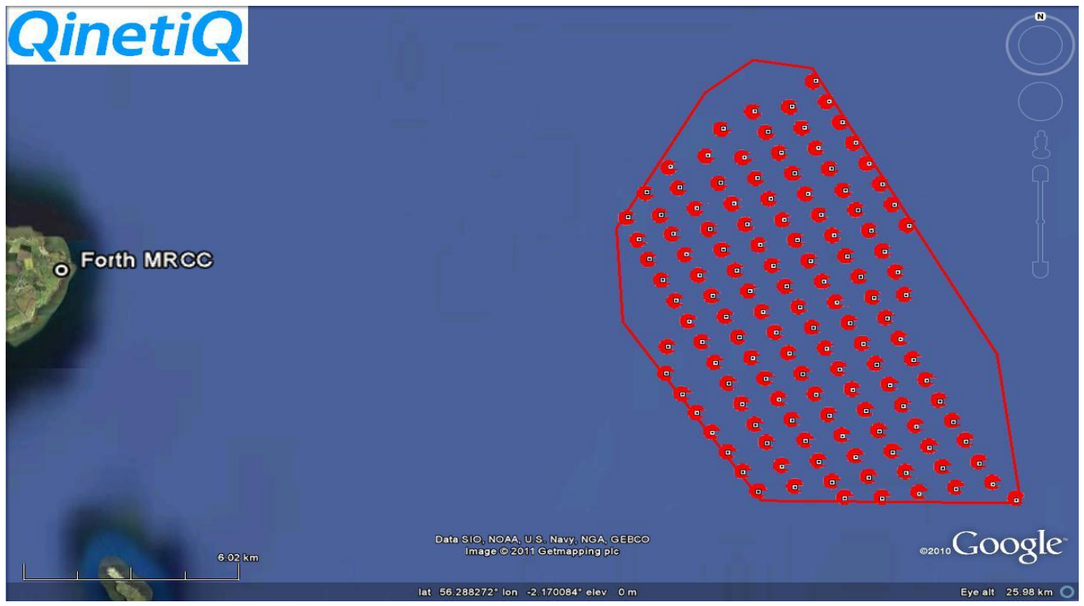

Figure 18.11: Reflection zones at VHF frequency for turbines with gravity base foundation

46 The Neart na Gaoithe turbines will also physically block some signal, casting a shadow behind each turbine. The impacts of shadowing on onshore performance are partially mitigated because both AIS and VHF communications have coverage from at least two different base stations. Shadowing could have a noticeable impact on communications between two offshore vessels, when a turbine lies directly on their LoS and one of the vessels is close to the turbine. In emergency situations for stricken vessels, if shadowing blocks communication with one vessel, it is likely that vessels in other directions will still be in radio contact in this busy marine environment. The impact on the operation of AIS is likely to be negligible as the system will continue to operate with the latest received information.

47 Based on the observation that the jacket foundation option presents less of a physical obstruction than the gravity base foundation at sea level, it is likely that the impact of shadowing will be less severe for the jacket option.

48 The effects of interference and shadowing are likely to be short lived due to vessel motion. It is also noted that systems such as VHF communications and AIS are designed to operate in complex environments, where reflections from large vessels and harbours are common. In anecdotal evidence from offshore trials, no significant operational impacts have been observed in the operation of VHF communications or AIS (QinetiQ and MCA, 2004; Marico Marine, 2007). Construction or maintenance vessel operators, who are most likely to be close to turbines, will also be well informed of any potential impacts.

18.2.2 Global Navigation Systems

18.2.2.1 Loran

49 In trials where the operation of LORAN-C was assessed within the North Hoyle wind farm, signals were received without apparent degradation (QinetiQ and MCA, 2004). A vessel position was not obtained using LORAN-C but this was probably due to other operational problems and not due to the turbines (Section 7.3.2 of QinetiQ and MCA, 2004).

18.2.2.2 GPS

50 The locations of the closest known UK DGPS transmitters are shown in Figure 18.12 (Trinity House, 2011). The closest DGPS transmitter is at Girdle Ness, approximately 47 NM to the north of the proposed Neart na Gaoithe

site. The DGPS system is designed to provide coverage out to at least 50 NM from the coast (Trinity House, 2011) and so there is likely to be coverage throughout the wind farm site.

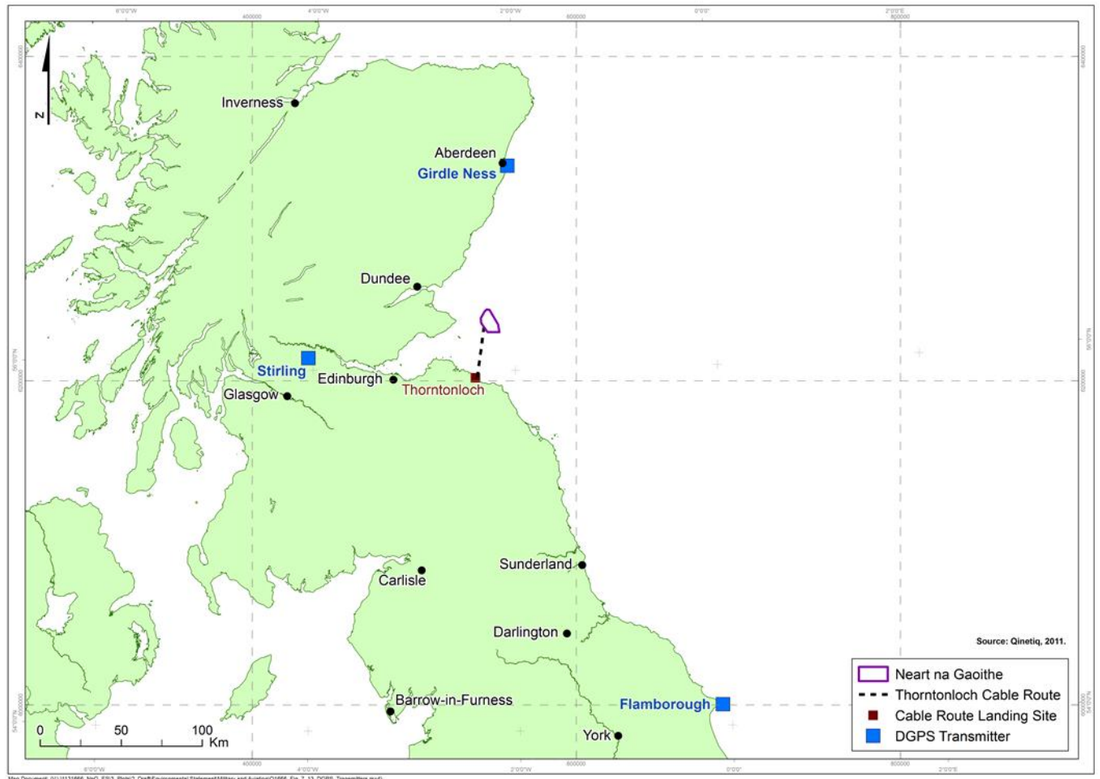

Figure 18.12: Locations of the closest UK DGPS transmitters in relation to the proposed wind farm boundary

51 Reflections of GPS signals from large objects such as harbours, other vessels or wind turbines can lead to errors in the calculated position. The GPS system is relatively robust to multipath signals and in trials around an offshore wind farm no impact on the operation of GPS was reported (QinetiQ and MCA, 2004).

52 Obscuration of GPS signals can be a problem in built up areas. In an offshore environment, wind turbines do not obscure a large percentage of the sky and so the likelihood of affecting GPS in this way is small. Figure 18.13 shows an estimate of the percentage of the sky obscured by Layout A. The figure is illustrative and based on obscuration from the tower only. Only within approximately 100 m of a turbine is 2% or more of the sky obscured. Based on the sources listed in Section 18.3 – Data Sources, wind turbines do not have a significant operational impact on GPS.

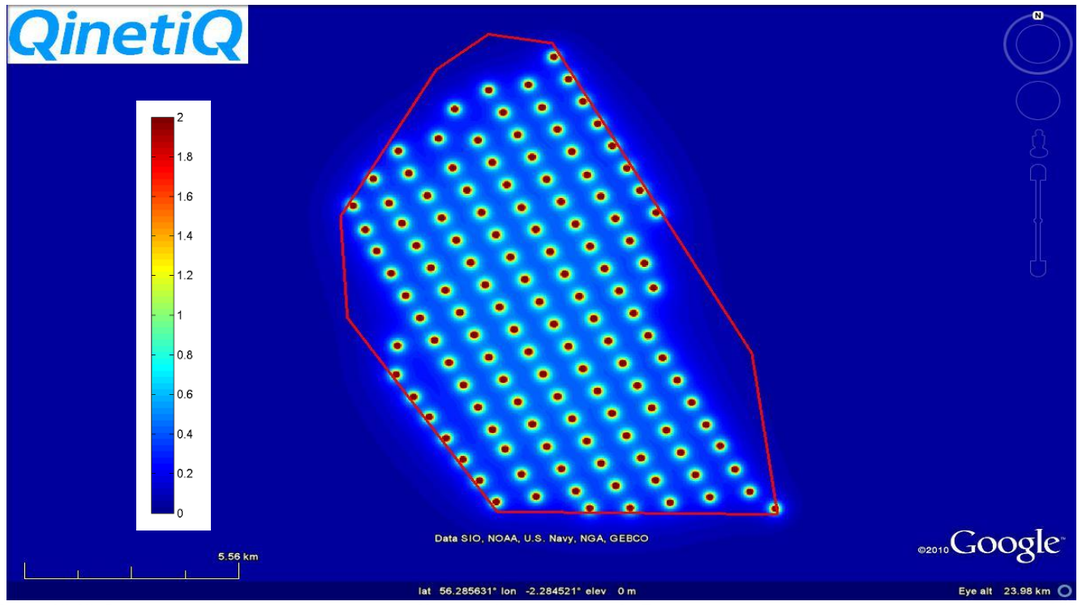

Figure 18.13: Percentage of the sky obscured by the Neart na Gaoithe layout A. The data have been capped at a maximum value of 2%

53 Due to the low frequency of operation, the impact of wind turbines on the operation of DGPS is likely to be negligible. No instances were identified in the sources listed in Section 18.3 where turbines have been found to have a significant operational impact on DGPS.

18.2.3 Global Maritime Distress System

18.2.3.1 SARTS

54 The main potential impact of wind turbines on SARTs is that the reduction in signal strength behind wind turbines can prevent them from being triggered. The impact will depend on the distances of the radar and the SART from the turbine, the radar set-up and the SART's detection sensitivity. Because SARTs operate at a relatively high frequency (9.4 Gigahertz), significant shadows can extend for some distance behind turbines. However, the amount of signal reduction is likely to fluctuate as the SAR vessel or aircraft moves relative to the SART. No instances were identified in the sources listed in Section 18.3 where turbines have been shown to degrade the performance of SARTs. The operational impact is judged to be small.

18.2.3.2 Distress Beacons

55 Significant impacts on distress beacons are unlikely, and will be limited to a few hundred metres from turbines. No instances were identified in the sources listed in Section 18.3 where turbines have been shown to degrade the performance of distress beacons.

18.2.3.3 Direction Finding

56 In previous trials the operation of DF equipment on SAR vessels was not significantly affected by the presence of offshore wind turbines (MCA, 2005; QinetiQ and MCA, 2004). In one trial, DF equipment was adversely affected when operating within 50 m of turbines but this was reported not to be operationally significant (QinetiQ and MCA, 2004). SAR operators using DF will be well informed of the potential impacts.

18.2.4 Telephony

18.2.4.1 Mobile Telephones

57 Mobile phone usage in the vicinity of the wind farm is possible in principle but very unlikely. Because the usage in the vicinity of the development site is likely to be low and mobile telephone systems are robust to multipath interference, the impact is assessed to be insignificant.

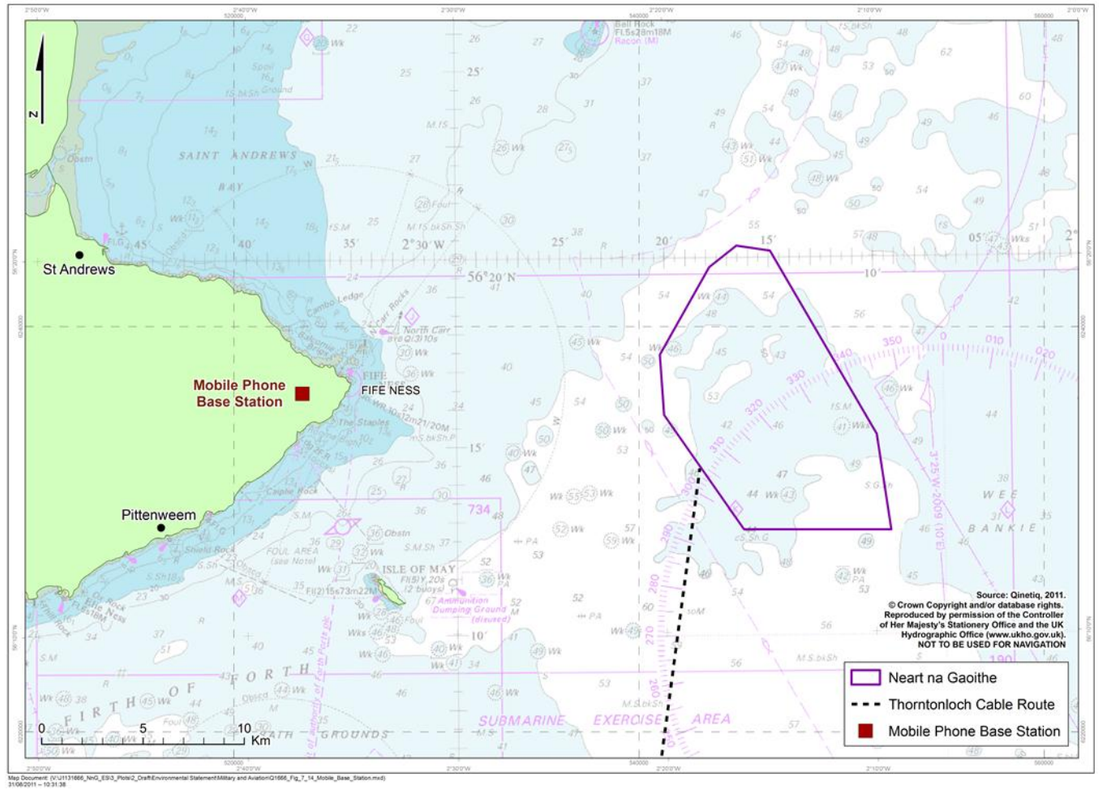

Figure 18.14: Location of the proposed wind farm and the nearest mobile phone base station

18.2.4.2 Satellite Telephones

58 Satellite telephone systems are commonly used in areas where mobile telephone coverage is limited or unavailable, such as offshore wind farm sites further than 19 NM from shore. The impacts will be slightly different depending on whether geostationary (always above the same point on the earth's surface) or orbiting (moves relative to the earth's surface) satellites are used. In both cases, however, potential effects such as shadowing and interference, are likely to be limited to within hundreds of metres of a wind turbine. The likelihood of obscuration of satellite signals is similar to the GPS discussion, where a 2% or greater change of obscuring a satellite only occurs within approximately 100 m of a turbine, as illustrated in Figure 18.13. No instances were identified in the sources listed in Section 18.3 where wind turbines have been shown to degrade the operation of a satellite telephone.

18.2.5 Television and Public Radio Broadcasts

59 The closest main onshore TV transmitters, as identified in Figure 18.15, are approximately 32.4 NM from the centre of the proposed development site. Potential interference issues are likely to be limited to televisions within hundreds of metres of a wind turbine. Signal reduction due to turbines obscuring the signal is possible behind turbines (as viewed from each transmitter). The significance of the shadowing will depend on a number of factors but unacceptable signal losses up to several kilometres behind turbines are common. No offshore structures, e.g., oil and gas platforms, have been identified that could be potentially affected by signal loss, and so the impact is assessed to be low. Shadowing and interference effects could have an impact on television reception on vessels operating near the wind farm, although effects are unlikely to be persistent due to vessel motion.

Television

60 The closest main onshore television transmitters are Angus and Craigkelly (BBC, 2011a), as illustrated in Figure 18.15. Television coverage at Crail (the closest onshore location from the Neart na Gaoithe site) is likely to be from the Craigkelly transmitter (DigitalUK, 2011). Both the Angus and Craigkelly transmitters are approximately 60 km from the centre of the proposed development site. Usage in the vicinity of the Neart na Gaoithe site will be limited to reception on maritime vessels.

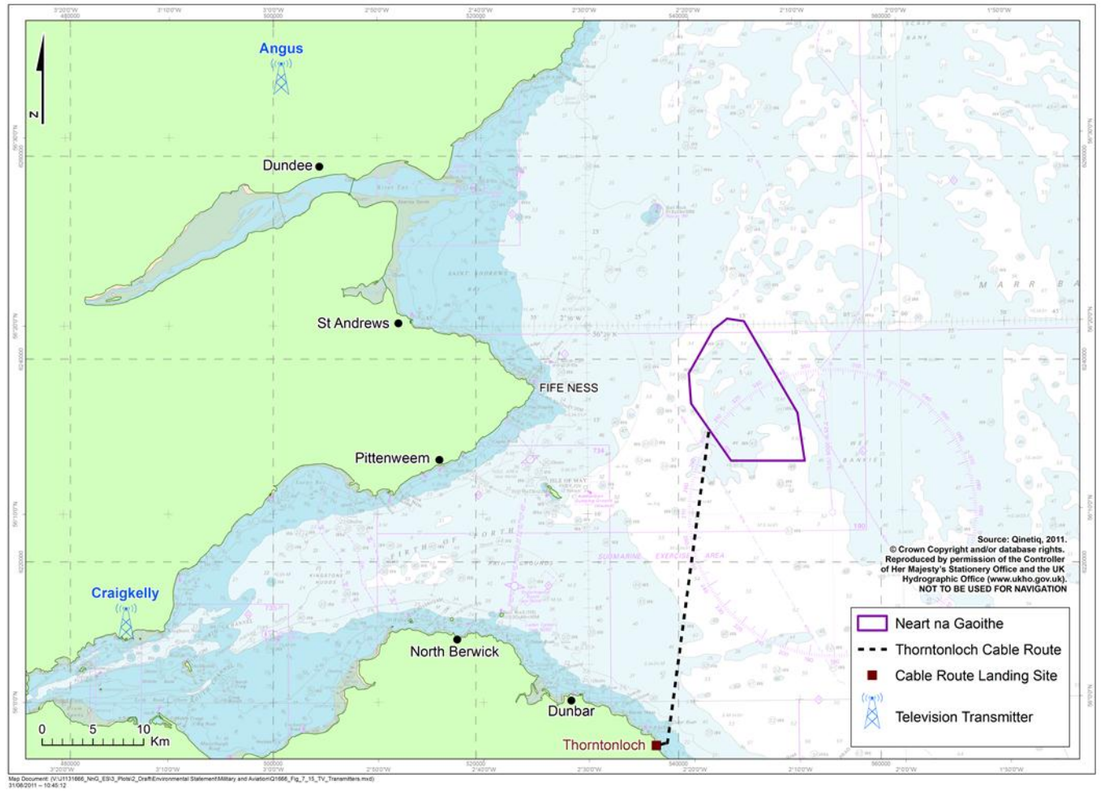

Figure 18.15: Location of Angus and Craigkelly transmitters and the proposed wind farm boundary

Public Broadcast Radio

61 There are a variety of onshore public broadcast radio transmitters in the vicinity of the proposed wind farm. The main transmitter sites are shown in Figure 18.16. National DAB transmitters are shown as white squares (DAB Digital Radio, 2011); BBC analogue FM transmitters are shown as blue squares (BBC, 2011a); BBC analogue amplitude modulation or medium wave transmitters are shown as red squares (BBC, 2011a). It is not known which transmitters offer coverage within the development area. Based on the typical maximum coverage ranges of analogue and digital radio broadcasts of many tens of kilometres (MB21, 2011) it is likely that radio reception is available at the Neart na Gaoithe site.

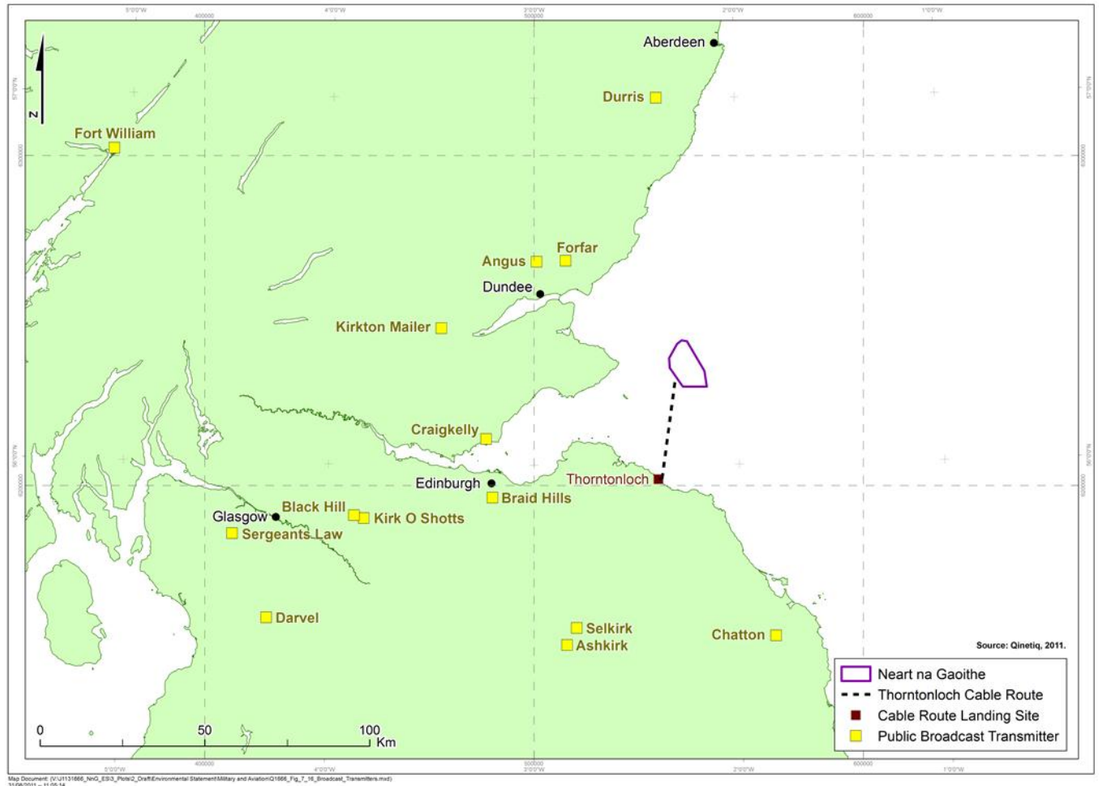

Figure 18.16: Public broadcast radio transmitters

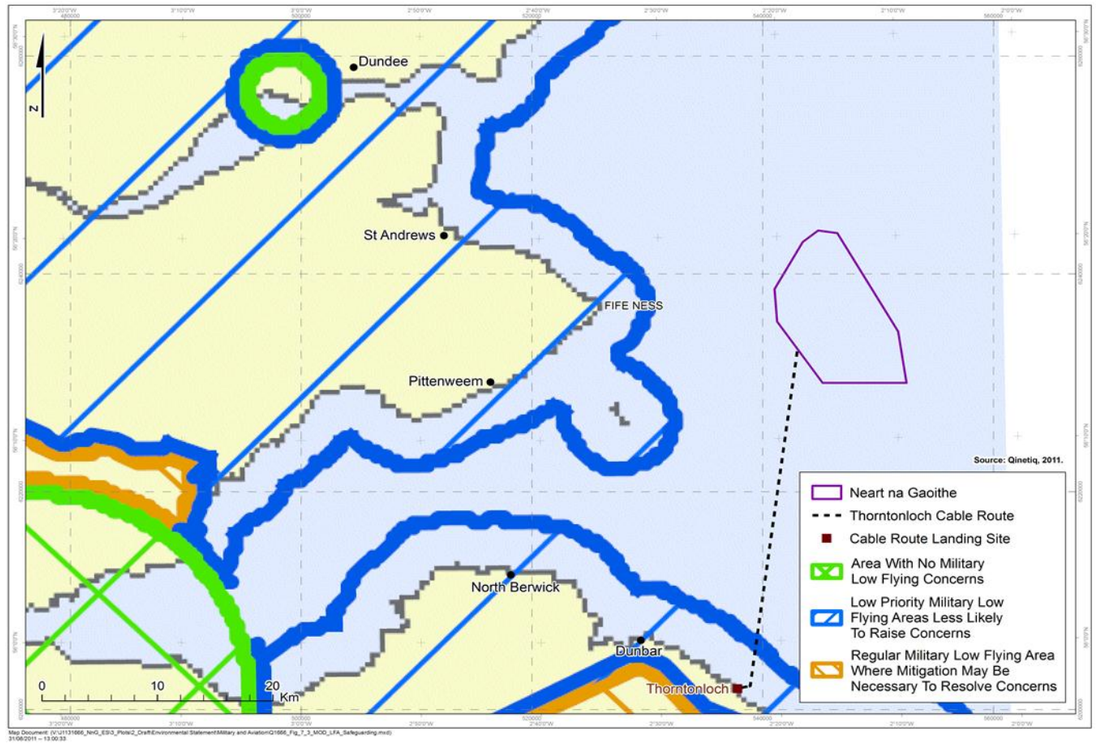

Figure 18.17: MOD LFA safeguarding map showing the location of the proposed wind farm boundary

18.2.6 Line of Sight Links

62 The consultation response from Ofcom indicates that no LoS links in their database will be affected by Neart na Gaoithe. Further, none of the links in the 64-66GHz, 71-76GHz and 81-86GHz online self-consultation databases will be affected (Ofcom, 2011b). Consultation with Atkins Global and JRC showed that they would have no objection to Neart na Gaoithe.

18.3 Physical Obstruction to Aviation

63 The proposed wind farm does not lie within any of the low-flying consultation zones published by the MOD (MOD, 2011b) (see Figure 18.17). Accordingly, there is not likely to be an objection from the MOD as a result of impact on LFA manoeuvres within these consultation zones. In February 2010, the MOD indicated that the impact on low-flying would be manageable (EMU, 2010c). The MOD was informed of the increase in maximum blade height to 197 m in September 2011 and confirmed in December 2011 that they have no objections on the grounds of impact on low-flying (MOD, 2011e).

64 None of the proposed turbines lies within the lateral extent of any OLS associated with any civil or military aerodrome. Accordingly, the impact as a physical obstruction to aircraft movements around aerodromes is judged to be negligible.

18.4 Military Practice Areas

65 The proposed Neart na Gaoithe development site lies close to a number of MOD PEXA (Mainstream, 2009b; DTI, 2004). The Neart na Gaoithe scoping report states that a firing range to the east is no longer used and MOD has indicated they would not object on the grounds of impacts to operations in the submarine exercise area (Mainstream, 2009b). At a meeting in February 2010, the MOD indicated there would be no direct impact on Navy operations (EMU, 2010c). At a meeting in June 2010, the MOD indicated there would be no impact on PEXA (EMU, 2010a). The MOD has confirmed by email that they have no concerns over the impact on the increased 197m tip height project on PEXA (MOD, 2011e).

18.5 References

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