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1 INTRODUCTION

1. This Non-Technical Summary (NTS) summarises the Environmental Statement (ES) prepared under The Environmental Impact Assessment (Electricity Works) (Scotland) Regulations 2008 (as amended) and The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) (collectively referred to as the EIA Regulations), which accompanies an application to Marine Scotland for consent under Section 36 of the Electricity Act 1989, and associated Marine Licences for the construction and operation of Beatrice Offshore Wind Farm (the Wind Farm) and Transmission Works (the OfTW), collectively these elements are referred to as "the Project".

2. BOWL are also applying for consent under Section 36A of the Electricity Act 1989 to extinguish public rights of navigation so far as they pass through those places within the Scottish Marine Area where structures (but not, for the avoidance of doubt, the areas of sea between those structures) forming part of the Wind Farm and OfTW are to be located. Beatrice Offshore Windfarm Ltd (BOWL), a joint venture partnership formed between SSE Renewables (75%), SSE's renewable energy development division, and Repsol Nuevas Energias UK (25%) (formerly SeaEnergy Renewables), is seeking consent from the Marine Scotland under Section 36 and 36A of the Electricity Act 1989, and associated Marine Licences for the construction and operation of the Beatrice Offshore Wind Farm (the Wind Farm) and Offshore Transmission Works (OfTW).

3. The Wind Farm site centre is located approximately 25 km south south-east of Wick, Caithness. The Wind Farm site boundary is, at its closest point, 13.5 km from the coastline, as illustrated in NTS 1 and NTS 2. The site is approximately 19 km in length and 9 km in width.

4. The total development area is approximately 131 km^2 and sits at the north western most point of the Smith Bank. The two existing Beatrice demonstrator turbines are located approximately 11 km to the south west of the Wind Farm. The existing unmanned Jacky oil platform is located adjacent to the south west of the site and the existing Beatrice B, A and C oil platforms are located approximately 5, 10 and 14 km south west of the site, respectively.

5. The Wind Farm will have a maximum installed capacity of up to 1000 megawatts (MW) and will comprise up to 277 three bladed horizontal axis wind turbines. The turbines will be secured to the seabed and a network of electricity cables, known as the inter-array cables, will be required to connect each of the turbines to one of, up to three, Offshore Substation Platforms (OSPs). Three meteorological masts will also be constructed and will be located on the edge of the Wind Farm site. Ancillary elements such as metocean buoys and Close Circuit Television (CCTV) will also be required.

6. The wind turbines will be designed to operate for a period of 25 years. After which the Wind Farm could be decommissioned, or continue operating and/or be upgraded. If the Project was to be decommissioned, towards the end of the Project

life a Decommissioning Plan will be prepared and submitted to Marine Scotland and DECC for approval.

7. The ES presents information on the identification and assessment of the likely environmental effects of the Project and has been undertaken in accordance with the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 ("the EIA Regulations"), as amended.

8. Environmental effects of the Project have been studied systematically through the EIA process and the results presented within the ES and summarised in this NTS. These documents inform readers of the nature of the Project, likely significant environmental effects and measures proposed to protect the environment, during construction, operation and decommissioning.

2 CLIMATE CHANGE AND MARINE PLANNING POLICY CONTEXT

9. This Section summarises the key climate change and marine planning policies relevant to the Project at an international, national and regional level. Climate change and the need to reduce carbon emissions underpin these policies and planning policy has been designed to support and deliver a move to low carbon energy production.

10. At an international level, obligatory targets were set by the United Nations to reduce greenhouse gases for those countries that committed to the Kyoto Protocol. Through this Protocol, the UK committed to reducing greenhouse gas emissions by 12.5% from 1990 by 2012. The 2009 Renewables Directive raised this target to 15% by 2020.

11. Various policies have been published at a national policy level in line with European policy objectives. The UK Renewables Obligation places a responsibility on licensed electricity suppliers to source an increasing proportion of electricity from renewable sources. The Renewables Obligation Scotland Order (ROS) was amended in April 2011 to reflect a new target of generating the equivalent of 100% of Scotland's gross annual electricity consumption by 2020 by renewable sources. The UK Renewable Roadmap 2011 advises that offshore wind has the potential to bring forward between 10 and 26 GW by 2020.

12. The Scottish Government has its own renewable energy targets. The Climate Change (Scotland) Act 2009 set an initial greenhouse gas emissions target and stated that this target should be reviewed annually. As at September 2011, the current Scottish targets are:

- At least 30% of all energy demand (heat and transport, as well as electricity) will be from renewables by 2020; and
- An output equivalent to 100% of Scotland's demand for electricity to be met from renewables.

13. New marine planning provisions were introduced through the Marine (Scotland) Act 2010 with the aim of ensuring better management of marine resources. A Sectoral Marine Plan for Offshore Wind was published in March 2011 which

identified the Beatrice Offshore Wind Farm as a site to be developed in the short term.

3 LEGISLATION AND CONSENTING REQUIREMENTS

14. In order to construct, operate and decommission the Wind Farm and the OfTW, a consent under Section 36 and 36A of the Electricity Act 1989 and Marine Licences under the Marine (Scotland) Act 2010 are required by BOWL:

- Section 36 Consent: a Section 36 Consent is required under Section 36 of the Electricity Act 1989 to operate all elements of the "generating station", including the wind turbines and inter-array cables elements of the Wind Farm
- Section 36A Consent: a Section 36A Consent is required to extinguish public rights of navigation so far as they pass through those places within the Scottish Marine Area where structures forming part of the Wind Farm and OfTW are to be located; and
- Marine Licence: a Marine Licence, under The Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009, is required to construct the Wind Farm and the OfTW.

4 ENVIRONMENTAL IMPACT ASSESSMENT PROCESS AND METHODOLOGY

15. This Section of the ES explains the concept of EIA and summarises the process undertaken for the Project.

16. The EIA Directive has been transposed into Scottish law through a number of different regulations. In relation to the Project, the EIA Directive is applied through the following regulations:

- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000, as amended by The Electricity Works (Environmental Impact Assessment) (Scotland) Amendment Regulations 2008 (where applicable); and
- The Marine Works (Environmental Impact Assessment) Regulations 2007, as amended by the Marine Works (Environmental Impact Assessment) Regulations 2011 (where applicable).

17. This EIA has been carried out in accordance with both of the above regulations, collectively referred to in this ES as the "EIA Regulations".

18. Environmental effects have been assessed to identify any effects that may be significant in the context of the EIA Regulations. Mitigation is proposed where possible to prevent significant effects.

19. In accordance with the EIA Regulations, the assessment has considered "cumulative effects". By definition these are effects that result from cumulative changes caused by past, present or reasonably foreseeable actions together with the Project.

5 THE WIND FARM AND OFFSHORE TRANSMISSION WORKS

20. The ES assesses the worst case likely significant effects of the Project through implementing what is called the "Rochdale Envelope"; this sets out a range of

parameters covering construction, operational and decommissioning options, within which the actual Project must fall. This method has allowed the likely significant effects arising from the worst case maximum/minimum parameters to be assessed.

21. Given that the Project will ultimately be constructed, operated and decommissioned within the maximum/minimum extent of these parameters, the ES has assessed the likely significant effects of the worst case Project.

5.1 CONSULTATION

22. This Section summarises the consultation that was undertaken throughout the EIA process. In support of the applications a stand-alone Consultation Report reports in detail the process and outcomes of the consultation on the Project.

23. EIA scoping was carried out for the Wind Farm as well as both the onshore and OfTW. The purpose of scoping is to outline the Project to key stakeholders so that their comments can be front-loaded into the EIA process.

24. In support of the Wind Farm, a number of public exhibitions took place that were designed to provide an opportunity for the public to ask questions, understand the project proposals and provide feedback. In support of the onshore transmission works (OnTW) and OfTW, a number of exhibitions were also undertaken. Full details of the exhibitions are detailed in Section 5: Consultation of the ES. A second round of exhibitions was undertaken to inform the public how the Project proposals had developed since the first exhibition.

25. Consultation will continue between BOWL, decision makers and stakeholders. BOWL is committed to ensuring stakeholders, including the public are kept informed of project progress before and during the construction phase, and on the commencement of operation.

5.2 SITE SELECTION AND CONSIDERATION OF ALTERNATIVES

26. This Section describes the approach taken to identify the preferred site for the Project including consideration of alternatives for the engineering solutions, the Wind Farm and the OfTW.

27. The site selection process for the Wind Farm included consideration of alternative sites and layouts, and the development of the Wind Farm Rochdale Envelope has included consideration of a range of available technologies and construction processes.

28. In response to the Crown Estate asking developers to come forward with proposals for offshore wind farm sites anywhere within Scottish Territorial Waters, BOWL identified the Wind Farm site for a number of reasons, including perceived low seascape, landscape and visual sensitivity, a favourable wind regime and an existing 1,000 MW Grid Connection Agreement held since 2006. The suitability of the site was affirmed by the Crown Estate, who awarded an Exclusivity Agreement to BOWL for this site, and further affirmed by Marine Scotland who included it in their Sectoral Marine Plan for Offshore Wind, as a short-term site.

29. Once the site was selected, the design went through an evolution process whereby the layout and design of the site was amended based on the technical requirements of the turbine layout and consultation with shipping and sailing stakeholders and the local fishing fleet. The detailed design of the site will not be finalised until after consent, however it will draw on this evolution process.

30. Detailed environmental and technical appraisals of the options available for the grid connection point and OnTW route, and the landfall and the OfTW route have also been undertaken.

6 PROJECT DESCRIPTION

31. The Project will comprise the following elements which will be installed in the Moray Firth:

- Up to a maximum of 277 offshore turbines;
- Up to a maximum of two AC and one DC Offshore Substation Platforms (OSPs);
- Up to a maximum of three meteorological masts;
- Up to 350 km of inter-array cabling linking turbines, OSPs and meteorological masts;
- Measures to protect installations from scour; and
- Ancillary elements such as metocean buoys and Close Circuit Television (CCTV).

32. The OfTW consists of the cabling that connects the Wind Farm to the landfall near Portgordon. The corridor within which the works will be located is approximately 65 km in length.

33. A brief explanation of the key components is provided below. The Wind Farm and OfTW locations are shown of NTS 1 and NTS 2.

6.1 OFFSHORE WIND TURBINES

34. The offshore wind turbines will be three bladed horizontal axis turbines. They will be mounted onto a substructure which will connect the turbine to a foundation which will secure the structure to the seabed.

35. At this stage of the development process it is not possible to determine the precise dimension and number of turbines that will be installed at the site. For the purposes of the EIA, a range of turbine types and layouts were identified. The smallest turbine likely to be installed at the site is a 3.6 MW turbine with maximum tip height of 140.6 m and the maximum number that could be installed on site is 277. The largest turbine likely to be installed at the site is a 7 MW turbine with a maximum tip height of 198.4 m and the maximum number that could be installed on site is 142. The precise turbine numbers, dimensions and locations will be provided to Marine Scotland prior to construction.

36. There are several different types of foundation that may be used in the construction of the turbines. These are:

- Gravity bases – a single concrete or steel structures filled with ballast that sit on the seabed;
- Pin piles – steel pegs driven into the seabed by a high blow force piling hammer. Several pin piles would be used for each foundation; and
- Suction Piles – an upturned bucked design forced to penetrate the seabed by vacuum pumps. Several suction piles would be used for each foundation.

37. In addition to the above it is possible that vibropiling could be used to install pin piles if conditions allow. This technique can be used in easily penetrable geological conditions and involves using a vibrodriver to install pin piles by high frequency vibration rather than hammering. It is not yet clear whether conditions at the Wind Farm site are suitable for this installation method and further work is being undertaken to assess the feasibility.

38. In addition to the foundation it will be necessary to install scour protection. Scour is the process where the seabed is eroded as a result of water movement and in the case of the Project, as a result of introducing new elements onto the seabed and changing water flows. Scour can occur around any structure placed on the seabed. Scour protection refers to the measures put in place to reduce or eliminate scour. There are two types of scour protection available for the Project:

- Static scour protection - the layer of fine grade rock or gravel is placed on the seabed prior to the installation of the foundation. An armour layer is then installed once the structure is in place. The armour layer will most likely comprise rock boulders however there are other options such as rock nets available; and
- Dynamic scour protection – the foundation is installed after scour protection installed at each location.

39. A substructure will be attached to the foundation. This structure serves as a transition piece between the foundation and the turbine and sits part below sea level and part above sea level in order that the whole turbine sits above sea level.

40. There are several different types of substructure that may be used on the construction of the turbines, these are:

- Tubular jacket – a lattice construction tubular steel, three or four legged structure; and
- Monotower - cylindrical steel or concrete tube.

41. The turbines, once in place will have navigation and aviation markings and lighting as required.

6.2 OFFSHORE SUBSTATION PLATFORMS

42. The OSPs are required to collect the electricity from the turbines and transmit the power to shore at the most efficient voltage level and with the minimum number of transmission cables. Up to three OSPs may be required; two Alternating Current (AC) and one Direct Current (DC) depending on the electrical system.

43. OSP locations will be determined once the size, type and number of turbines have been established and each potential location will be subject to a full geotechnical study prior to installation.

44. The OSPs will be mounted on to a substructure and foundation. The OSPs may use either gravity bases, pin piles or suction piles. They will use a tubular jacket substructure.

6.3 METEOROLOGICAL MASTS

45. Meteorological masts are required to monitor real time weather conditions within the Wind Farm. These details are then correlated and compared to the turbine performance to ensure that the most efficient and effective operation is being implemented. It is proposed that a maximum of up to three permanent meteorological masts will be installed at the site.

46. The masts will most likely be of a lattice structure and be equivalent to turbine hub height. Measuring instruments will be attached to the masts.

47. The masts will be secured to the sea bed by a foundation and attached by a substructure. In addition to the foundation and substructure options outlined for wind turbines there is a further foundation option for meteorological masts: monopile.

48. A monopile is a large cylindrical steel tube which is hammered into the seabed and can only be used with a monotower substructure. Based on the anticipated seabed and geological conditions, it is considered that the likely maximum steel monopile diameters will be approximately 5 m.

6.4 INTER-ARRAY CABLING

49. There will be up to 350 km of cabling linking the turbines, OSPs and meteorological masts. The size and voltage of cables along with the final layout and total length will be dependent on the final number and layout of turbines.

50. The inter-array cables will either be buried below the surface of the seabed or laid on the seabed surface and covered with cable protection (most likely a form of protection by rocks) where feasible.

6.5 OFTW

51. The OfTW will comprise up to three export cable trenches that will run parallel to each other, and be installed with a separation distance (between cables) of at approximately four times water depth.

52. The corridor within which the trenches will lie is approximately 65 km in length and will vary in width to reflect the spacing requirements associated with the varying water depths along the length of the corridor.

7 DESIGNATED SITES AND LEGISLATION

53. This Section provides summary information on sites that are protected under European Directives and/or UK Legislation and that are located near to, or that could possibly be affected by, the Project. No impact assessment is presented within this Section; these are contained within the relevant specialist topic Sections.

54. Figures NTS 3, 4 and 5 illustrate the location of all European designated sites within 100 km of the Moray Firth. The closest European designations to the Wind Farm are located at a distance of 16.5 km and 37 km respectively, and are the Caithness Cliffs Special Protection Area (SPA) and the Moray Firth Special Area of Conservation (SAC), which are designated for the conservation breeding bird interest, and for subtidal sandbanks and the bottlenose dolphin respectively. Nationally and locally important sites that may be potentially affected by the Wind Farm have also been taken into account in the assessments.

55. NTS 6 illustrates the location of all internationally and nationally designated sites within 20 km of the OfTW landfall. Sites identified at an international level were Ramsar, SAC and SPA. At a national level, Sites of Special Scientific Interest (SSSI), National Nature Reserves and Marine Nature Reserves have been identified within this distance. At a local level, Sites of Importance for Nature Conservation (SINC) and Local Nature Reserve (LNR) have been identified.

8 ENVIRONMENTAL EFFECTS

56. This Section provides a summary of the key findings regarding the likely significant effects on the environment across each of the technical assessment areas provided in the ES.

8.1 PHYSICAL PROCESSES AND GEOMORPHOLOGY

8.1.1 Introduction

57. The effects of the Wind Farm and OfTW on the physical environment (wave, tidal and sedimentary environments) have been conservatively assessed using a variety of methods. The issues tested were those identified by BOWL, stakeholders and consultees during the preceding stages of EIA scoping and consultation.

8.1.2 Wind Farm

58. During the Wind Farm construction phase, the installation of the turbine foundations may include dredging or drilling and the burial of inter-array cables will require some disturbance of the seabed. These activities may lead to the release or resuspension of loose sediment into the water, increasing the levels of turbidity. The same sediment will eventually settle back out onto the seabed, resulting in a thickness of accumulation. Using computer model simulations and with reference to previous guides and field studies, it was found that any increases in turbidity from these activities would be both localised and of a low magnitude in comparison to the much higher naturally occurring levels during (frequent) large storm events in the Moray Firth.

59. The installation vessels used for the Wind Farm construction might use either jack-up legs or a set of anchors to hold position during certain operations. It is likely that where legs or anchors have been pushed into the seabed and then removed, a depression or area of disturbed ground will be left. The rate of sediment movement through the Wind Farm suggests that such depressions will then be naturally in-filled by sand. This may take several months or years and will be most rapid during relatively more stormy periods.

60. During the Wind Farm operational phase, the presence of the turbine foundations has the potential to affect the passage of tides and waves through the Wind Farm. The effect on tides was tested using computer model simulations and it was found that none of the options being considered will measurably affect open water tidal currents or water levels, either within the Wind Farm or elsewhere within the Moray Firth. A narrow wake (an area of slightly reduced current speed) may become apparent immediately downstream of individual foundations but the effect will become not measurable within a small distance.

61. The effect on waves was also tested using computer model simulations. It was found that wave period and direction will not be measurably affected by any of the options being considered. Only the largest (gravity base) foundation type being considered will have a measurable effect on wave height. The pattern of effect is for wave height to be progressively reduced with distance of travel through the rows of turbines. The greatest reduction in wave height is found on the far side of the Wind Farm from the wave coming direction and so affects different areas at different times; the magnitude of the greatest difference is comparable to natural variability in the wave regime. Most of the site experiences a lower level of effect. The effects will extend outside of the site but recover towards unaffected values with distance. With the exception of the East Caithness cliffs (which are not susceptible to any such changes) the level of effect at adjacent coastlines has also been considered and was found to be not measureable at the identified designated areas (SPA, SAC, Ramsar, SSSI, etc.) and recreational surfing venues.

62. As no measurable effect on the wave and tidal regimes was assessed to occur, the study also finds that there can be no consequential effect on regional sediment transport patterns. Locally to each turbine foundation, sediment scouring may occur either due to the foundation itself, or to a lesser extent associated with scour protection materials if used. If and where inter-array cables become (unintentionally) exposed, a small amount of scour might also be expected, or again to a lesser extent associated with protection materials if used. In both cases, the area of seabed potentially affected is very small in comparison to the Wind Farm site area.

63. During the Wind Farm decommissioning phase, various operations may be used to remove the foundations and other Wind Farm infrastructure. In all cases, it is anticipated that these operations will disturb less sediment volume than the construction phase issues already described above. As the foundations are not considered to significantly affect wave, tidal or sedimentary processes whilst they are present, removing them will not produce any greater effect than introducing

them. Therefore, the effects of decommissioning are within the scope of the issues tested above; no other specific effects of decommissioning were tested.

8.1.3 OfTW

64. The effects of the construction, operation and decommissioning of the OfTW on physical process and geomorphological receptors were also assessed. Computer modelling indicated that there would be a temporary and localised change in the levels of suspended sediment concentrations, with associated localised accumulation of sediment in the order of mm to cm. Finer sediments were predicted to be more widely dispersed, although were not predicted to accumulate to a depth of greater than 0.001 m (likely to be immeasurable). These effects are considered to not be significant.

65. No measurable effect on the Spey Bay SSSI features are predicted, provided that construction is initiated further than 50 m landward of the back of the beach and the cable is suitably buried to avoid direct effects . In doing so, the cable will have no physical presence in the active part of the beach system during its operational lifetime.

8.1.4 Cumulative Effects

66. The potential for cumulative effects with other offshore wind farm and non-wind farm infrastructure was also assessed. The majority of other developments were scoped out of further assessment due to their small scale and/or distance from or position relative to the Wind Farm. The Moray Firth Round 3 Zone (being progressed by Moray Offshore Renewables Ltd (MORL) does however have the potential to result in some cumulative effects relating to sediment release and wave, tidal and sedimentary regimes.

67. Where sediment release is caused by installation operations, including foundation installation and cable burial, it is unlikely that multiple activities will occur at the same time in very close proximity for engineering and safety reasons. It is also unlikely that operations will be conducted in alignment with the tidal axis (a requirement for the two sources of effect to interact at all). Any effects on turbidity more than a few hundred metres from the source are of such a low magnitude that to combine the two values does not result in a significantly higher level of effect.

68. The cumulative effect of the two developments on tides and waves was tested using computer model simulations. The potential effects both within and outside the Wind Farm were not found to be significantly greater than found previously for the Wind Farm alone. Consequently, no additional effect on sediment transport was assessed to arise.

8.2 BENTHIC ECOLOGY

8.2.1 Introduction

69. An assessment of the effects of the Project on the benthic ecology has been undertaken. Separate assessments have been carried out for natural fish communities and for commercial fish and shellfish.

8.2.2 Wind Farm

70. The benthic communities of the Wind Farm site were characterised using an extensive site specific survey that used seabed grab samples for sediments and fauna, video and stills camera images, and 6 m scientific beam trawl sampling. Survey data from the Moray Firth Round 3 Zone (Eastern Development Area) survey were also used in order to produce a joint map of seabed communities covering both the Beatrice and Moray survey areas. Historical survey data were also used, and these were important in identifying likely communities in areas to the south west of the Wind Farm site where some sediment deposition from construction activities might be expected.

71. The seabed in the Wind Farm site is dominated by sands and gravels. The most extensive community occurred in medium sands with low gravel content, characterised by a mixture of bivalves and polychaetes with high densities of the bivalve *Tellina* (formerly *Moerella*) *pygmaea.* This community, referred to here as the MoeVen biotope, usually occurs in shallower inshore waters where it can be important as a feeding resource for small fish, and for this reason it appears on Scottish Natural Heritage's (SNH's) draft list of Priority Marine Features (PMFs). Although its importance as a feeding resource on the deeper waters of the Wind Farm site is less certain, it has conservatively been assessed here as an important feature. Finer sand areas, mainly in the northern and western parts of the area, were dominated by a characteristic community of polychaetes, small crustaceans, burrowing urchins, and bivalves. The coarsest sands and gravels were dominated by a richer community of polychaete worms with robust bivalves. Hard substrates were mainly limited to occasional small patches of cobble, mostly dominated by a scour tolerant fauna of barnacles and encrusting tubeworms.

72. Communities in the adjacent Moray Firth Round 3 Zone (Eastern Development Area) were very similar, although the bivalve *Tellina pygmaea* was much less abundant and so the potential PMF MoeVen biotope was not considered to be present.

73. To the south west the sediments gradually become muddier and the fauna changes accordingly; in some places large numbers of the large burrowing bivalve *Arctica islandica* have historically been recorded. This very long lived species is much reduced in abundance in many parts of the North Sea as a result of repeated fishing effects, and is also on the draft list of PMFs.

74. The main potential effects investigated were associated with construction of the Wind Farm (disturbance of the seabed; increase in suspended sediments; sediment deposition; noise during construction; release of chemicals); operation of the Wind Farm (loss of habitat; scour effects; changes to water movement; creation of new habitat; stepping stone effect for invasive species; operational noise; electromagnetic fields (EMF) effects; changes in fishing activity); and decommissioning effects (noise and vibration; disturbance of the seabed).

75. The most significant effects were associated with loss of up to around 2.9% of seabed habitat due to the presence of gravity based foundations with associated

scour protection, and protective rocks or mattressing on inter-array cables. These represent effects of moderate significance for the MoeVen biotope, minor to moderate significance for most other areas, and negligible significance for the cobble communities.

76. The new hard substrates introduced in the form of concrete and steel turbine supports, rock-based scour protection, and rock or concrete based cable protection, will allow the development of communities that will be different to those on the existing sediments, and with a higher biomass per unit area of seabed. This is considered to be a permanent positive effect of minor significance.

77. Disturbance to the seabed during installation of turbines and cables, and during decommissioning, will lead to temporary local effects on seabed communities that are mostly expected to recover over periods of months to a few years. These represent effects of minor to moderate significance for the MoeVen biotope, minor significance for most other areas, and negligible significance for the cobble communities.

78. All other effects were found to be of negligible, or occasionally minor significance.

8.2.3 OfTW

79. The main habitats and species of the seabed along the route of the OfTW have been characterised using existing resources and site-specific underwater camera surveys supported by grabs of the seabed to provide information on the sediment types.

80. Four main habitats associated with different sediment types were identified along the cable route. These were; inshore cobble area supporting encrusting marine life such as hydroids and algae; medium sands with varying amounts of shell fragments with some evidence of marine worms (the most dominant habitat in terms of area); and a mud habitat which showed evidence of animal tracks and mounds and burrows created by species such as polychaete worms and crustaceans e.g. the Dublin Bay Prawn which is a valuable commercial species. Sea pens, which are related to anemones and corals, were also recorded from this habitat during the site-specific camera survey.

81. The burrowed mud habitat is identified as being a PMF by Marine Scotland and SNH and 'burrowed mud with sea pens' is an OSPAR (Oslo-Paris convention for the protection of the marine environment of the North-East Atlantic) habitat and is also a Marine Protected Area search feature.

82. The primary potential effect identified during the construction phase is associated with the loss of habitat from either direct disturbance from the cable laying process and from increased suspended sediments in the water column caused by the construction work which may then settle out of suspension causing smothering of benthic communities. The assessment of these two effects was minor significance. Other effects which were assessed included effects of noise, potential for scour, heating effects from the operational cable and release of contaminants. These were all assessed as being of negligible significance.

8.2.4 Cumulative Impact Assessment

83. An assessment of potential cumulative effects on benthic ecology as a result of the Project in combination with other wind farm and non-wind farm developments in the Moray Firth was undertaken. No significant cumulative effects were identified for the benthic habitats and species of the Wind Farm or surrounding areas, or of the OfTW.

8.3 FISH AND SHELLFISH ECOLOGY

8.3.1 Introduction

84. The description of the fish and shellfish resources in the Wind Farm and the OfTW area was undertaken taking the following four main aspects into consideration:

- Commercial importance of the species;
- Presence of spawning/nursery grounds;
- Species of conservation importance (including diadromous migratory species); and
- Importance of the species in the food web.

8.3.2 Wind Farm

85. The following potential effects were considered for assessment of the effects of the construction/decommissioning and operational phases of the Wind Farm on fish and shellfish species:

- Increased suspended sediment concentrations and sediment re-deposition;
- Noise during construction;
- Loss of habitat;
- Introduction of new habitat;
- Operational noise;
- Electromagnetic fields; and
- Changes to fishing activity.

86. In general terms, the potential effects on fish and shellfish species have been predicted to be not significant.

87. An exception to this is the effect of construction noise (in particular that associated to pile driving activity) on herring, cod and European eel, for which significant effects have been assessed. Pile driving has potential to result in a number of effects on marine species, from lethal effects and hearing damage to behavioural responses. The assessment of construction noise was primarily based on the outputs of the noise modelling undertaken for fish species with different hearing abilities (herring, cod, dab and salmon) and on a literature review of available information.

88. In the case of cod the assessment takes a precautionary approach based on the lack of detailed information on the relative importance of the area of the Wind Farm and its vicinity as a nursery and a spawning ground. The cod population of the Moray Firth has been found to be genetically distinct from other North Sea cod populations and spawning has been low in this area in recent years. In the case of herring, the assessment takes into account the annual variability in the spatial

distribution of spawning and their substrate specificity as demersal spawners. In most years herring spawning tends to be primarily concentrated between the Orkneys and the Shetlands, however spawning has also been recorded in the vicinity of the Wind Farm, off the Caithness coast, in some years. For both cod and herring, the probability of a significant effect to occur has been assessed to be unlikely.

89. In the case of European eel, the assessment of construction noise is based on the outputs of the noise modelling undertaken for cod and takes account of the lack of detailed information on the migratory routes used by this species. The qualitative nature and likely conservative approach taken for assessment of noise related effects on this species should therefore be recognised.

8.3.3 OfTW

90. The following potential effects were considered for assessment on fish and shellfish species in relation to the construction/decommissioning and operational phases of the OfTW:

- Noise during construction;
- Increased suspended sediment concentrations and sediment re-deposition; and
- Electromagnetic fields.

91. Noise levels are predicted to be greatest during construction, although will be low enough as to not significantly affect fish or shellfish known to be present in the vicinity of the OfTW.

92. There are predicted increases in levels of suspended sediment concentrations and associated sediment re-deposition as a result of the trenching activities to install the OfTW cables. However, the measurable effects of these are predicted to be contained within tens of metres of the trenches, and are not predicted to exceed a time period of minutes. The effects of increased suspended sediments and associated sediment re-deposition are not large enough to result in a significant effect on fish or shellfish species.

93. Electromagnetic fields may affect sensitive species within very close proximity of the cables. However, the extent of the likely effects, and the sensitivity of species to these effects does not result in a likely significant adverse effect.

8.3.4 Cumulative Effects

94. In general terms, cumulative effects of the Wind Farm with other offshore developments/activities (including the OfTW) have been considered to result in no significant effects on fish and shellfish species.

95. As identified for the Wind Farm itself, however, a number of exceptions apply. The main cumulative effects predicted relate to construction noise, particularly those arising from simultaneous piling operations taking place in the Wind Farm and in the Moray Firth Round 3 Zone.

96. Taking the outputs of the noise modelling undertaken, cumulative effects were identified for the species mentioned above in relation to construction noise for the Wind Farm itself (herring, cod and European eel), and for salmon and sea trout.

97. A significant cumulative effect on herring and European eel was assessed as previously described for the Wind Farm itself. In the case of cod, a potential cumulative effect likely to exceed that assessed for the Wind Farm itself was identified.

98. In the case of salmon and sea trout, it has been considered that there is potential for construction noise to result in a significant cumulative effect. This takes into account the larger areas cumulatively being effected by noise (compared to the Wind Farm itself) but also the uncertainties in relation to the use that these species make of coastal areas around Scotland and of the potential for wind farm developments proposed in the Firth of Forth Area and the Aberdeen Bay to further add to any noise related effects at a later/earlier stage. Given these uncertainties, it is considered that this assessment presents a conservative worst case in relation to the potential for significant effects to occur.

99. In addition, a potential significant cumulative effect on sandeels associated to loss of habitat, has been identified. This takes a conservative approach, due to the lack of site specific information on the distribution and relative importance of the Wind Farm and the Moray Firth Round 3 Zone as a sandeel habitat, in the context of the wider Moray Firth.

8.4 MARINE MAMMALS

8.4.1 Introduction

100. The marine mammal resource has been characterised using boat-based and aerial surveys, passive acoustic monitoring (PAM) and telemetry studies. Survey data were collected as part of a site-specific survey programme of the Wind Farm site and surrounding area, and were supplemented with historical data from studies undertaken throughout the wider Moray Firth region to provide a long-term dataset for the area of potential effect (the study area) including the OfTW.

101. This information was used to characterise the distribution and density of key species within the study area, including their seasonality and year-to-year variability. In addition, the data was used to assess the likelihood of exchange between local SACs and the Project area.

102. The key marine mammal species identified in this study were bottlenose dolphin, harbour porpoise, minke whale, harbour (or common) seal and grey seal. Other features of importance include the presence of two internationally protected Special Areas of Conservation (SACs): the Moray Firth SAC, which is designated for bottlenose dolphin and the Dornoch Firth and Morrich More SAC, which is designated for harbour seal.

8.4.2 Wind Farm

103. Marine mammals were regularly sighted within the proposed Wind Farm site and surrounding region. Of the key marine mammal species identified, harbour porpoise, harbour seal, and grey seal were the most numerous and widespread across the Wind Farm site and occurred throughout the year. Minke whale was also recorded regularly within the Wind Farm site but in much lower abundance and only during the summer months. In contrast, distribution maps for bottlenose dolphin, a year-round resident, showed that individuals mainly occurred within the inner reaches of the Moray Firth and along the south coast. Seasonal peaks occurred for all these species, with a universal peak in the summer, coinciding with the breeding period.

104. Potential effects on marine mammals were identified for the construction, operation and decommissioning phases of the Project and consideration was given to the worst case scenario derived for the Project. The summary provided here gives the magnitude of the potential effects and identifies whether these are significant in terms of the EIA Regulations.

105. The primary potential effect identified during the construction phase is associated with construction related noise, primarily pile driving. Pile driving has the potential to result in lethal effects / physical injury and behavioural effects on species of marine mammal present at the proposed site and within the area of potential effect in the Moray Firth. Behavioural responses are highly variable, both between species and between individuals within a species. Effects may range from a mild, short-term avoidance reaction to a long-term displacement, which may then have consequences for the health of animals affected (e.g. if displacement reduces foraging opportunities or affects breeding). Effects were assessed over the short-term, in relation to the duration of the piling activity, and over the long-term, in relation to potential population-level affects.

106. With regard to lethal effects or physical injury (including long-term hearing impairment), soft start piling and other mitigation measures will act to reduce the magnitude of the effect, however, the residual effects will remain the same due to the sensitivity of marine mammals and the uncertainties associated with predicting these effects. Consideration of the results of a noise modelling study undertaken as part of this assessment suggests that, for the greatest proportion of the marine mammal populations, the effects are most likely to be behavioural. For bottlenose dolphin both the short-term and long-term potential effects were predicted to be small to medium magnitude, adverse, and significant. For harbour seal, it was considered likely that there would be a large magnitude, adverse significant effect in the short-term, but following cessation of the piling, the population would recover (demonstrated using population modelling) and the long-term effects would be negligible and not significant. Since bottlenose dolphin and harbour seal are primary reasons for designation of the Moray Firth and Dornoch Firth and Morrich More SACs respectively, the effects on these SACs were assessed as being the same as for the designated species. For all other species (minke whale, harbour

porpoise and grey seal) the effects from pile-driving noise were assessed as being of small to negligible magnitude and adverse, and not significant.

107. Other potential effects assessed during construction/decommissioning included short-term physical injury/mortality from vessels with ducted propellers and ship strike (primarily on seals); short-term suspended solids impairing foraging efficiency, and short-term indirect effects due to temporary loss of forging area or reduction in prey species. For all marine mammals these effects were assessed as being of small to negligible magnitude, adverse, and not significant. Although the effects from collision risk were not considered to be significant, due to the levels of uncertainty related to this effect, BOWL has proposed to work closely with the statutory authorities to further the understanding of potential effects. In the first instance, to mitigate for potential mortality, operators of construction vessels will be made aware of the risks.

108. Operational effects identified included: long-term disturbance due to operational noise from the turbines; long-term intermittent noise disturbance from maintenance vessels; long-term intermittent physical injury/mortality from vessels with ducted propellers and ship strike; long-term behavioural effects arising from EMF; and long-term indirect effects arising from changes in prey resources and tidal regimes due to the presence of turbine structures. For all marine mammal receptors the effects were assessed as being of small to negligible magnitude, adverse and not significant.

8.4.3 OfTW

109. Marine mammals were sighted in the vicinity of the proposed offshore cable route, with the majority found along the southern coast of the Moray Firth near the Portgordon landfall location in Spey Bay. The most abundant species found within this area were bottlenose dolphin, harbour porpoise, and minke whale. Spey Bay is one of the key feeding areas for bottlenose dolphin in the Moray Firth and minke whale are attracted to the southern coastline (mainly to the east of Spey Bay) during the summer months to exploit the rich sandeel resource in the area. Harbour seal and grey seal have also been recorded in the southern Moray Firth, but in lower numbers than in the northern and inner Moray Firth, and there are no haul-out sites in close proximity to the proposed cable route.

110. Potential effects on marine mammals were identified for the construction, operation and decommissioning phases of the Project and consideration was given to the worst case scenario (Rochdale Envelope) derived for the Project. The summary provided here gives the magnitude of the potential effects and identifies whether these are significant in terms of the EIA Regulations.

111. During construction there was predicted to be a short-term, localised noise disturbance during cable laying operations which could lead to temporary displacement of marine mammals from a very small proportion of their suitable habitat. The effects were considered to be negligible and not significant for all marine mammal species.

112. Collision risk was also identified as a potential effect, and seals in particular may be vulnerable to "corkscrew" injuries (resulting in mortality) from vessels that use ducted propellers, such as those that will be used during construction of the OfTW. This issue has been discussed throughout the EIA process with statutory consultees, and at present there is no scientific evidence to suggest this will be a significant risk to seals in the Moray Firth. Therefore, the effect was assessed as being of small magnitude, adverse and not significant. However, vessel operators will be made aware of the potential effects in order to minimise collision risk.

113. Other construction-related effects on marine mammals were identified as: the potential for suspended solids released during cable laying which could impair foraging ability; and the temporary loss of foraging habitat or loss of prey species which may indirectly affect marine mammal foraging. Neither of these were predicted to cause a significant effect in the short or long-term on any marine mammal species.

114. During operation there is potential for behavioural effects on marine mammals due to EMF. It is not thought that marine mammals are electro-sensitive, however, they may be sensitive to magnetic fields, produced by the current flow on the cable. Based on studies of other offshore wind farms it was determined that the most likely effects would arise from DC (rather than AC) cables. There was scant empirical evidence for the effects of EMF on marine mammals, but effects were considered to be most likely to occur in Spey Bay along the inshore section of the export cable route where dolphins are feeding and transiting in relatively shallow coastal waters. Potential effects include a temporary change in swimming direction or slight deviation from a swimming route. However, these effects from EMF will be very localised and whist this may cause a temporary adverse behavioural effect on marine mammal, it is not considered to be significant.

115. There were no significant cumulative effects of the OfTW with other existing or proposed developments predicted during construction or operation

8.4.4 Cumulative Impact Assessment

116. The cumulative assessment considered existing and proposed developments for which the construction and operation timescales overlapped or were in close succession to the Project. These included offshore wind farms (principally the Moray Firth Round 3 Zone, but also other proposed Scottish offshore renewable energy developments), offshore transmission cables (including those associated with renewable developments and the Shetland subsea transmission link) and offshore oil and gas installations.

117. The range of effects and methods employed for assessing the Wind Farm and OfTW were similarly applied with respect to potential cumulative effects. As before, the primary potential effects was associated with pile-driving noise primarily from simultaneous construction of the Moray Firth Round 3 Zone with the Project, but also with consideration of renewable energy developments further afield. The cumulative noise effect during piling was predicted to cause behavioural disturbance to marine mammals and therefore displacement over a greater extent of

the Moray Firth and potentially for a longer period (up to six years). In respect of marine mammals, the extent of the area of disturbance within the Moray Firth was not substantially greater since the noise contours overlapped to a large extent, however, additional displacement may occur during construction of the Firth of Forth OWF and the renewable energy developments in the Pentland Firth and Orkney waters. Consequently, in total, a greater area of the habitat range of marine mammals from the Moray Firth may be lost in the short to medium term.

118. Due to the conservation importance of the bottlenose dolphin and harbour seal (and their associated SACs within the Moray Firth), the effects during the piling period were considered to be significant for both these species. As before, population modelling showed that harbour seal would recover in the long-term and therefore no significant effects were predicted for this species or for the Dornoch Firth and Morrich More SAC. Bottlenose dolphin was also likely to recover in the long-term, but subject to the uncertainties in this assessment (e.g. limited scientific understanding of the population-level effect of displacement), the effect on bottlenose dolphin and the Moray Firth SAC was predicted as significant. For all other species there were no significant effects predicted from cumulative pile-driving noise.

119. With respect to the other cumulative construction-related effects and to cumulative operational effects, there were no significant effects on marine mammals predicted.

8.5 ORNITHOLOGY

8.5.1 Introduction

120. The ornithological resource has been characterised using site specific boat and aerial surveys carried out at the Wind Farm Site, studies of wildfowl migration across the Moray Firth and a tracking study of foraging seabirds from the nearby breeding colonies along the East Caithness coast. In addition, existing data collected during bird surveys conducted within the region have been used to provide contextual information.

121. The seabird breeding colonies around the Moray Firth are host to internationally important populations of several species. Thirteen species of seabird and four species of wildfowl were identified from survey data as potential sensitive receptors for which detailed assessment was carried out.

8.5.2 Wind Farm

122. Potential effects on birds which may result from the installation and operation of an offshore wind farm are disturbance and displacement, collision mortality and as a barrier to movement. These effects have been assessed in relation to the construction, operation and decommissioning phases of the Wind Farm. The greatest risk for disturbance is during the construction phase, due to boat traffic and construction activities themselves. These effects will be fairly localised in nature and within the context of the region are consequently assessed for all species as no more than minor in magnitude and therefore not significant.

123. The risk of displacement is considered to be at its greatest during the operational phase, due to the birds potentially avoiding the turbines. The potential effects of displacement on breeding seabird populations were investigated using population models. The worst case scenario considered in this assessment was that each bird displaced by the introduction of the Wind Farm would be unable to find sufficient food elsewhere to permit successful reproduction. For the most numerous species present during the breeding season (fulmar, kittiwake, guillemot and razorbill), the effect on the local breeding populations of the peak abundance recorded on the Wind Farm Site failing to breed was found to be no greater than minor in magnitude and therefore not significant.

124. Collision risk modelling, which uses conservative assumptions and presents a worst case scenario, was conducted for seabirds and wildfowl (on migration) using recognised best practice methods. For great black-backed gull and herring gull the predicted effects of collision mortality were minor in magnitude, while for all other species the predicted effects were of negligible magnitude. Therefore, for all bird species the effects of collision mortality were not significant.

125. Wind farms may act as barriers to birds, either whilst on seasonal migration or on a more regular basis if the wind farm is sited between areas used on a regular basis (e.g. breeding and foraging sites). On the basis of observed patterns of wildfowl migration and using existing knowledge of migratory routes, population level effects for seasonally migrating species were considered to be negligible in magnitude and therefore not significant.

126. For seabird species which breed at nearby colonies and have foraging ranges which could encompass the Wind Farm site, the turbines have the potential to act as a barrier. Assessment for seabird species considered to be at risk of such effects, taking into account possible increases in energy expenditure due to extended travel distances, revealed no evidence for effects of greater than minor magnitude, which are therefore not significant.

127. Indirect effects, mediated though effects on seabird prey species from all aspects of the development of the Wind Farm, were assessed with reference to the relevant sections of this ES (e.g. benthic ecology, fish and shellfish ecology). No effects of greater than minor magnitude were identified and these were therefore not significant.

8.5.3 OfTW

128. A desk based assessment was conducted of the potential effects of cable installation on birds, drawing on information contained within other relevant sections of the ES. The same seabird species identified for assessment of wind farm effects are assessed in relation to the potential direct and indirect effects of the worst case cable laying scenario. Direct disturbance and displacement due to the presence and activity of the cable laying vessel are considered likely to cause no more than negligible magnitude effects and are therefore not significant. Indirect effects on seabirds resulting from habitat loss for fish and benthic species were assessed as of no more than minor magnitude and therefore not significant. Noise from vessels

during construction and maintenance may affect seabirds both directly and indirectly, however both were assessed to be of no more than minor magnitude and not significant. The effects of EMFs and thermal radiation were assessed as being extremely localised for fish and shellfish. These are expected to give rise to negligible magnitude effects on seabirds and are not significant. Overall, the OfTW are therefore not considered likely to give rise to any significant effects on birds.

8.5.4 Cumulative Impact Assessment

129. The same range of effects and assessment methods were applied with respect to potential cumulative effects resulting from the Beatrice Wind Farm in conjunction with existing and proposed developments within the Wind Farm's zone of influence. These included offshore wind farms (principally the Moray Firth Round 3 Zone, but also included other proposed Scottish Offshore Wind Farms), wave and tidal renewable projects (in the Pentland Firth and around Orkney), offshore transmission cables associated with renewable developments and offshore oil and gas installations. No cumulative effects of greater than minor magnitude were identified, therefore no significant cumulative effects are considered likely to occur.

8.6 SEASCAPE LANDSCAPE AND VISUAL (WIND FARM ONLY)

8.6.1 Introduction

130. The Wind Farm site centre is located approximately 25 km south south-east of Wick, Caithness. The seascape, landscape and visual environment has been identified and defined within an agreed 40 km radius around the outermost limits of the Wind Farm, this being identified as the area most vulnerable to effects arising from the presence of the Wind Farm within the seascape. The study area includes large tracts of the Outer Moray Firth and areas of landscape within East Caithness and Sutherland. The assessment has also identified the range of visual receptors, both land-based and marine-based, that can reasonably be anticipated to be affected by the introduction of the Wind Farm into the existing seascape. The OfTW was scoped out of the assessment as there will be no significant effects on seascape, landscape or visual receptors.

8.6.2 Wind Farm

131. The seascape assessment has identified that the greatest effects upon the seascape and coastal environment will occur between the Wind Farm and the coast within the area between Berriedale and Noss Head. Effects upon the character of the regional seascape units and seascape character types out-with this area will be noticeably lower reflecting their increased distance from the Wind Farm.

132. The assessment has also revealed that there will be no significant effects upon the various landscape character types included within the study area. Whilst there will be generally low to negligible effects upon these landscape character types the effects will be limited to visual effects upon their character only with no other effects upon their defining characteristics. The assessment has also considered areas of local landscape designation and found that there will be only Minor effects upon

the character of the Areas of Great Landscape Value (AGLV) and the Search Areas for Wild Land (SAWL), neither of which are considered to be significant effects.

133. Through consultation with Highland Council, SNH and Marine Scotland a total of 16 representative viewpoints were agreed to enable the assessment of potential effects upon visual receptors (people). The distribution of the agreed viewpoints was informed by a "zone of theoretical visibility" study which indicated that the potential visual effects would largely, but not wholly, be confined to a relatively narrow coastal strip between Duncansby Head and Helmsdale with a more fragmented landward area of visibility inland to the Northwest of Wick. The viewpoint assessment found that significant effects upon visual receptors would be focused upon the coastline between Wick and Dunbeath. The effects upon visual receptors to the North and South of this coastal strip and further inland were found to be noticeably reduced. In these areas, whilst the Wind Farm, under conditions of reasonably good visibility, would still be visible on the distant horizon line, the effects were not found to be so high as to constitute a significant effect.

134. The assessment has also considered the potential effects that might arise upon a range of different visual receptors including residents; motorists; rail travellers; users of footpaths and cycle routes; visitors to the area; workers; and, those engaged in offshore activities, be they recreational sailors, fishermen or oil and gas platform workers. Of these the most sensitive receptors are residents and, for those along the stretch of coastline between Wick and Dunbeath, and where they enjoy views out across the sea towards the Wind Farm, they will experience significant effects when visibility is good. However, the historic settlements do tend to occupy more sheltered locations along the coast and the older dwellings are not always orientated out to sea.

135. The assessment has also investigated the potential effects upon road users. Effects upon those travelling the A882 and the A9 between Latheron and Thurso were found to be negligible. Similarly, for those travelling the A9 south of Latheron the effects were found to be generally limited and not significant, the greatest effects being upon those travelling the A99 between Latheron and John O' Groats. From some stretches of the A99 Motorists will experience significant effects but these will generally be confined to those areas where the alignment of the road and available panorama tend to directly focus onto the Wind Farm. Effects upon other visual receptors will generally vary according to their location in relation to the Wind Farm and the availability or absence of seaward views towards the site.

8.6.3 Cumulative Impact Assessment

136. The assessment also considers the cumulative effects that will occur as a result of the addition of the Wind Farm in the context of the existing onshore wind farms distributed throughout the area. The cumulative effects upon seascape character are generally found to not be significant except for the area of seascape between Noss Head and Berriedale.

137. The cumulative assessment with onshore wind farms has also established that there will only be generally limited cumulative effects upon all landscape character types

within the study area, this being largely a reflection of the presence of existing wind farms within the landscape and the distant, offshore environment within which the Wind Farm will be located.

138. Those visual receptors identified as most likely to experience cumulative visual effects arising from the Wind Farm in conjunction with the existing onshore wind farms includes users of the public paths, especially within the coastal and hinterland area between Noss Head and Berriedale; the local residents at Dunbeath and motorists along the A99.

139. A cumulative viewpoint assessment was also undertaken and this identified that the greatest cumulative effects arising from the addition of the Wind Farm to the existing onshore wind farms would be experienced by visitors to Hill O'Many Stanes and the residents of Dunbeath.

140. The cumulative impact assessment also considered the cumulative effects arising from the Wind Farm in conjunction with the proposed Moray Firth Round 3 Zone development. For this it was found that the effects upon the various regional seascape units and seascape character types would generally not be significant except for, again, the Noss Head to Berridale area. The cumulative effects upon the landscape character types will not be significant given the additional distance between the landscape character types and the Moray Firth Round 3 Zone development.

141. The greatest cumulative effects arising from the Wind Farm and Moray Firth Round 3 Zone will be in relation to cumulative visual effects upon visual receptors and these were generally found to be significant from the coastal and more elevated viewpoints between Noss Head and Berriedale.

8.7 MARINE ARCHAEOLOGY AND CULTURAL HERITAGE

8.7.1 Introduction

142. The marine archaeology and cultural heritage resource has been characterised using existing sources, site specific survey data, and site visits to key onshore cultural heritage assets associated with visual effects. Potential physical effects upon the archaeology and cultural heritage resource includes direct and secondary physical effects on recorded sites, features and deposits on, in and under the seabed; and the indirect physical effects of changes in tidal currents, sediment movement and chemical imbalances in the water. Potential direct effects also include those associated with the visual effect on the setting of onshore assets.

8.7.2 Wind Farm

143. The assessment established that there were no recorded wrecks or features within the Wind Farm site. Following the assessment of marine geophysical data a number of potential targets of cultural heritage interest were identified and included within the impact assessment. In addition, coastal and onshore cultural heritage assets were also identified in relation to the visual effects of the development on their setting, a number of which were also included for assessment.

144. The primary effects identified, related to the Wind Farm, during the construction phase are associated with the direct physical effects on potential features of cultural heritage interest identified in the marine geophysical survey. In addition, indirect and secondary physical effects on recorded wreck sites in the vicinity of the proposed application boundary are also considered. All identified sites and features of cultural heritage interest will be avoided through appropriate scheme design and the implementation of temporary exclusion zones; and in the case of any unexpected archaeological discoveries, through the implementation of protocols and procedures for the reporting of such discoveries. Following the proposed mitigation measures the effects assessed for these sites and features are considered to be of negligible significance.

145. Potential operational physical effects of the Wind Farm on features of cultural heritage interest have been assessed and no significant operational effects are predicted. Operational setting effects have also been assessed and it has been concluded that effects will not be significant.

8.7.3 OfTW

146. The assessment identified several recorded wreck locations within the proposed OfTW corridor. In addition, a number of potential targets of cultural heritage interest were identified through the assessment of marine geophysical data. These sites were subsequently considered for inclusion in the impact assessment.

147. The primary potential effects identified, related to the OfTW corridor, during the construction phase are the direct physical effects of the proposed transmission cable trench on the recorded wrecks and marine geophysical survey targets identified in the assessment. In addition, indirect and secondary physical effects on recorded wreck sites and marine geophysical targets in the vicinity of the proposed transmission cable route have been considered. Similar to the Wind Farm, all identified sites and features of cultural heritage interest will be avoided through cable re-routing and the implementation of appropriate temporary exclusion zones; and in the case of any unexpected archaeological discoveries, through the implementation of protocols and procedures for reporting such discoveries. Following the proposed mitigation measures the effects assessed for these sites and features are considered to be of negligible significance.

148. Potential operational effects of the proposed offshore transmission cable corridor were considered as part of the assessment and it was concluded that there would be no significant effects on the cultural heritage resource.

8.7.4 Cumulative Impact Assessment

149. In terms of cumulative effects, the Wind Farm was considered in relation to other developments within the region; including the Moray Firth Round 3 Zone located along the eastern boundary. The assessment considered the physical effects on cultural heritage assets and the effects of the developments on the setting of key coastal and onshore sites. As a result, the assessment concluded that there would be no significant effects on the cultural heritage resource.

8.8 COMMERCIAL FISHERIES

8.8.1 Introduction

150. Commercial fishing activities (with the exception of salmon and sea trout fisheries) in the vicinity of the Wind Farm and OfTW have been characterised using a number of data and information sources, including national fisheries statistics, satellite monitoring data, fisheries surveillance sightings, Marine Scotland charts and information gathered through consultation. The approach has been to describe fishing activities in the local (smallest spatial unit used for the collation of fisheries statistics) and regional (Moray Firth) areas, as well as to briefly describe activities in the national context.

151. Salmon and sea trout fisheries are principally in-river, and to a lesser extent coastal, in the Moray Firth. The fisheries have significant socio-economic importance on a local, regional and national level and it is recognised that indirect effects to the fishery may occur if the species' ecology is affected in the marine environment. Potential effects upon commercial and recreational fish and shellfish species, including salmon and sea trout, are outlined in Section 1.5.3 of this NTS.

152. Potential effects of the Wind Farm and OfTW, including cumulative effects, upon commercial fisheries may include loss or restricted access to fishing grounds, displacement of fishing vessels into other areas, safety issues for fishing vessels and the potential for navigational conflict (interference to fishing activities).

8.8.2 Wind Farm

153. The principal fishing activity occurring within the Wind Farm is boat dredging for scallops. The large majority of activity is recorded by the over 15 m fleet. Scallop dredging is recorded throughout the Moray Firth, including the Smith Bank and in inshore areas along the Caithness and Moray coasts. There is limited activity recorded within the Wind Farm site. The majority of large category scallop vessels are nomadic and able to target scallop grounds around the UK in addition to the Moray Firth, including offshore of the Aberdeenshire coast, the English Channel and Irish Sea. Time spent in the Moray Firth will vary, depending upon productivity of grounds. As a result of the limited level of scallop dredging activity recorded within the Wind Farm site relative to available grounds in the Moray Firth and grounds elsewhere in the UK, the sensitivity of the scallop fishery is considered to be low.

154. There is additionally whitefish and squid fishing activity in the vicinity of the Wind Farm, although the majority of activity by vessels targeting these fisheries occurs out with the Wind Farm site. The sensitivity of these receptors is therefore considered to be low.

155. During the construction/decommissioning and operational phases of the Wind Farm, the effects upon commercial fisheries were generally considered to be minor.

156. Safety zones will be applied for during the construction/decommissioning and operation phases. In addition, BOWL will develop an approach in consultation with the fishing industry to ensure that the safety risks posed to fishing vessels outside

of these zones are within an acceptable and reasonable standard determined in consultation with the fishing industry, and remain within acceptable limits, throughout the construction/decommissioning and operation phases of the development.

8.8.3 OfTW

157. The OfTW transects: nephrops grounds in the southern Moray Firth; scallop grounds in the offshore section of the OfTW, and to a lesser extent in an inshore area; seasonal squid grounds and, to a lesser extent, creel grounds for lobster and crab in the inshore section of the route.

158. The principal effects of the OfTW upon commercial fishing activities will occur during the construction phase. The seasonality of the fisheries during this period relative to construction activities will render them more sensitive. The effect of loss of fishing grounds and displacement of vessels into other areas has been assessed to be moderate during the construction phase.

159. Safety zones will be applied around construction and decommissioning works. Post construction surveys will be undertaken to assess the seabed status in the immediate vicinity of construction and installation activities to ensure that the seabed is at an appropriate and reasonable standard determined in consultation with the fishing industry for fishing activities to be safely resumed.

160. As a result of the suggested mitigation, there is not considered to be a significant effect upon commercial fishing activities during the operational phase of the OfTW.

8.8.4 Cumulative Impact Assessment

161. An assessment of the cumulative effects has principally focussed on developments in the Moray Firth. In the case of the nomadic scallop fishery, however, it is recognised that developments in addition to those in the Moray Firth may also contribute to a cumulative effect.

162. Cumulative effects arising from offshore development in the Moray Firth have identified moderate significant effects. This relates to complete loss or restricted access to fishing grounds during the construction phases of the Wind Farm and Moray Firth Round 3 Zone developments and displacement of fishing vessels as a result of this. In addition, an assessment of the cumulative effect of the installation of the Moray Firth Round 3 Zone export cable and Beatrice OfTW in addition to the Wind Farm and Moray Firth Round 3 Zone developments have also identified moderate significant effects during construction should the timescales of construction overlap. The proposed SHETL cable may also contribute to a cumulative effect in relation to commercial fishing activities, although given the current uncertainties regarding the location, installation methodology and timescales associated with this, it is not clear whether this is likely to be significant at this time.

8.9 AIRBORNE NOISE (WIND FARM ONLY)

8.9.1 Introduction

163. The effect of airborne noise arising from the Wind Farm has been assessed. The OfTW was scoped out of the assessment as most noise will be produced underwater. The effect of underwater noise has been assessed in the relevant technical assessments of the ES, e.g. marine mammals, fish and shellfish ecology etc.

164. Calculations of airborne noise arising from the Wind Farm have been undertaken using a noise model. The calculations focus on the key noise generating activities anticipated during construction and operation of the Wind Farm. These are: construction noise associated with piling activities; and operational noise associated with the turbines.

8.9.2 Wind Farm

165. The relevant British Standard provides daytime, evening and night time criteria that define what would be considered a significant noise effect during construction. The night time criteria is the most stringent.

166. The calculations undertaken conclude that, during construction, noise levels at the nearest noise sensitive receptor onshore will be less than the level set by the relevant British Standard. This confirms that there will therefore be no significant effects during the day or the night time during construction.

167. An assessment of noise effects from the operational wind turbines was undertaken following relevant guidance. The guidance recommends a methodology for measuring existing background noise at noise sensitive properties close to a proposed wind farm site and for defining operational noise thresholds which can then be used to identify significant effects.

168. The guidance further recommends an assessment method where, if the noise from a wind farm development can achieve a particular noise limit (which is defined in the guidance as 35 dB LA90, 10-min at wind speeds up to 10 m/s (at 10 m height) at the nearest noise sensitive property, this would demonstrate there will be sufficient protection of amenity and no significant effects would occur. In this case it is not necessary to measure background noise levels at noise sensitive properties.

169. Given the calculation results it is predicted that noise effects from the operating turbines will not exceed the defined limit (i.e. 35 dB LA90, 10-min (at 10 m height)) at the nearest noise sensitive receptors and therefore there will be no significant effect during operation.

8.10 SHIPPING AND NAVIGATION

8.10.1 Introduction

170. The vessel traffic surveys of the Wind Farm and OfTW carried out recorded a range of vessel types passing through the area. In general, commercial vessels were recorded on Automatic Identification System (AIS) and non-AIS vessels (including sailing and small fishing vessels) were recorded on radar.

8.10.2 Wind Farm

171. The Wind Farm is located in an area of low commercial ship density, with the main ship route passing 5 nautical miles (NM) north by north east of the Wind Farm boundary on the route used by ships heading to and from the Pentland Firth. Vessels should be able to safely increase their passing distance from the Wind Farm as there is a low level of shipping adjacent to the site and available sea room to the north, east and west of the Wind Farm. Overall, the effect of the Wind Farm on navigation is of minor significance.

172. The effects on recreational and fishing vessels passing the Wind Farm can be considered similar to other passing vessels in the area. There is limited fishing and recreational vessel activity in the Wind Farm, and smaller vessels should be able to pass through the area (subject to safety zones, sea state and weather conditions), resulting in an effect of minor significance. For other offshore developments in the area, including offshore activity at Beatrice/Jacky Fields and the SHETL hub and cable, there is a low commercial, fishing and recreational shipping density within the Wind Farm area and OfTW; therefore it is considered that any effect will be of minor significance.

173. Overall, with industry standard mitigation measures put in place for the proposed Wind Farm, including lighting/marking and publication on admiralty charts, the development will have a residual effect on navigation of minor significance.

8.10.3 OfTW

174. The main effects on shipping and navigation from the OfTW relate to vessels re-routeing around cable laying vessels (temporary effect) and the risk of anchor interaction with the OfTW. The OfTW is located in area of low commercial ship density with the main shipping route crossing the OfTW, approximately 3.5 NM north of the Moray coast (associated with Inverness and Cromarty Firth). Given the low level of shipping and the available sea room in the Moray Firth, vessels should be able to increase their passing distance from cable laying vessels, therefore resulting in an effect of minor significance.

175. Vessels anchor in the Moray Firth during adverse sea and weather conditions. In terms of the OfTW it is considered that there could be a higher risk of anchor interaction in Spey Bay. To minimise the effect on current anchoring practices in Spey Bay, cable protection should be explored to reduce the risk of anchor dragging or snagging the export cables. There are a number of alternative anchorages in the area and with standard mitigation (including burial and protection) the risk of dragging anchor onto the operational cable is considered to be of minor significance.

176. Scoping comments from Royal Yacht Association (RYA) on the OfTW indicated that it is unlikely that there would be any significant effect on recreational sailing, either in the construction or operational phases.

177. The surveys recorded fishing vessels approximately 10 NM north of the OfTW cable land fall options, with vessels also travelling to nearby fishing ports (Portgordon, Buckie, Banff and Macduff). In the same way as for commercial

vessels, fishing vessels should be able to deviate around cable laying vessels as they will be made aware of these temporary works through Notices to Mariners (NtMs) and fisheries liaison. Day marks and lights will also be used by the cable laying vessels to warn passing vessels of restrictions in manoeuvrability.

178. Overall, with industry standard mitigation measures, including cable burial/protection and information circulation on marine activities, the OfTW will have a residual effect on shipping and navigation of minor significance.

8.10.4 Cumulative Impact Assessment

179. There is the potential for cumulative effects on shipping and navigation, as vessels may deviate around the Moray Firth Round 3 Zone developments. However, as the shipping density in the area is low and there is available sea room out-with major shipping routes (i.e. the Pentland Firth bound traffic); the cumulative effect is considered to be of minor significance.

180. In addition, the expected export cable works from the Moray Firth Round 3 Zone are likely to run clear of the Beatrice Offshore Wind Farm and associated export cables. Given, the temporary nature of cable laying works and the low commercial, fishing and recreational shipping density in the area, the cumulative effect is considered to be of minor significance.

8.11 AVIATION AND MOD (WIND FARM ONLY)

8.11.1 Introduction

181. The effect of the Wind Farm on Aviation and MOD activities has been assessed. The OfTW were scoped out of the assessment as there will be no effect on Aviation or Defence activities.

8.11.2 Wind Farm

8.11.2.1 HIAL Wick Airport arrival and departure procedures

182. A potential effect was identified for arrival and departure procedures at HIAL Wick Airport. This is due to the fact that the instrument approach procedure for category C and D aircraft will routinely cause aircraft to pass within 5 NM of the north west of the Wind Farm. This would mean the minimum altitude above the area of the Wind Farm would have to be raised, leading to an alteration to the approach procedure which was found to be unacceptable.

183. On consultation, HIAL Wick Airport have rationalised their approach procedures. Due to the low number of Category C and D aircraft using the Airport, this approach procedure was removed. As a result there will be no residual effects on HIAL Wick Airport.

8.11.2.2 Primary Surveillance Radar Systems at RAF Lossiemouth and NERL Allanshill

184. A potential effect was identified on Primary Surveillance Radar Systems (PSR). This is due to the fact that a large proportion of the turbines are theoretically visible to both RAF Lossiemouth and NERL Allanshill. The theoretical visibility of turbines will cause unwanted radar returns to be presented on the PSRs and will

likely hamper an air traffic controller's ability to distinguish aircraft returns from those created by the Wind Farm turbines, known as "clutter".

185. There are a number of potential PSR mitigations which are being considered, some of which are emerging technologies. Solutions include in-fill radar, holographic radar, Raytheon Solution, Transponder Mandatory Zones (TMZ) and a new PSR.

186. Consultation is ongoing regarding agreement of a mitigation strategy and appropriate consent conditions with NERL, the MOD and Marine Scotland.

187. Following the adoption of a suitable mitigation solution, there will be a negligible residual effect on the RAF Lossiemouth and NERL Allanshill PSRs.

8.11.2.3 Minimum Safe Altitude

188. The current minimum safe altitude (MSA) for aircraft operations in poor weather, in the Moray Firth region is 1,500 ft (457 m). This allows for 1,000 ft (305 m) clearance from en-route obstacles. The realistic worst case turbine blade tip heights at the Wind Farm are 198.4 m (approximately 650 ft) LAT, therefore the existing MSA would be infringed by approximately 200 ft (61 m).

189. The MSA will therefore be raised to 1,700 ft (518 m) to allow 1,000ft (305 m) clearance from the Wind Farm. Aviation charts and any other relevant documentation would be updated where necessary to reflect this change.

8.11.2.4 Helicopter operations on Helicopter Main Routes (HMR X-RAY)

190. Potential effects on HMRs were identified. Consultation with helicopter operators found that Aircraft routinely fly along the HMR at between 2,000 ft and 3,000 ft, depending on prevailing meteorological conditions. This is sufficient altitude to prevent helicopters from coming into direct physical conflict with turbines under normal operating conditions.

191. In icing conditions helicopter pilots of aircraft not equipped with an anti-icing capability may elect to transit at lower altitudes, below the HMR, to avoid the 0° isotherm. The presence of turbines which may infringe the MSA has the potential to limit the transit options available to these pilots.

192. Discussions between BOWL and the offshore helicopter operators concluded that there will therefore be no effect of the Wind Farm on helicopter operations on HMR X-RAY as the MSA would be raised to 1,700 ft (518 m) (below the lowest altitude at which the HMR is flown).

193. It was established that not all of the helicopters operating to the Moray Firth platforms are equipped with anti-icing capability. However, those that lacked it would not fly along or below HMR X-RAY in forecast icing conditions as an overland option is available. Therefore, there will be no residual effect on HMR X-RAY as a result of the Wind Farm.

8.11.2.5 Offshore Oil and Gas Platform Helicopter Operations

194. A potential effect was identified for helicopter operations to offshore oil and gas platforms in the Moray Firth. This is due to the effects on both visual and

instrument approaches to the platforms, decreasing the ability of helicopters to reach the platforms for both evacuation and personnel transfer purposes.

195. In the absence of mitigation, anticipated numbers of flights likely to be prevented from reaching the platforms has been calculated to be no more than 1 flight per year for any of the platforms assessed. Consultation is ongoing with the helicopter operators to determine the acceptability of this potential effect, also taking into account the cumulative assessment.

196. A number of mitigation options have been proposed, owing to the complexity of the aviation issues in the Beatrice field and the requirement to propose a mitigation which considers cumulative effects, the mitigation measures are still under discussion.

197. Moray Firth helicopter operators have agreed these mitigation solutions are acceptable from an operational perspective. The mitigation options will be presented to the platform operators for discussion and an acceptable mitigation solution will be agreed.

8.11.3 Cumulative Impact Assessment

198. The cumulative impact assessment for Aviation and MOD considers the Moray Firth Round 3 Zone. The Beatrice demonstrator turbines and Beatrice and Jacky oil platforms were considered for BOWL in isolation as they are integral to the procedures currently in place for helicopter approaches.

199. All the activities/receptors considered in *Section 8.11.1 Introduction* are relevant for the cumulative impact assessment, with the exception of HIAL Wick Airport which only has the potential to be affected by the Beatrice Offshore Wind Farm.

200. Due to the proximity of the Moray Firth Round 3 Zone and the nature the Aviation and MOD effects identified, potential effects, mitigation and residual effects are as described in Section 8.11.2 Wind Farm, above; with the exception of Offshore Oil and Gas Platform Helicopter Operations which are discussed below.

8.11.3.1 Offshore Oil and Gas Platform Helicopter Operations

201. In the absence of mitigation, anticipated numbers of flights likely to be prevented from reaching the platforms has been calculated to be no more than four flights per year for any of the platforms assessed.

202. Through consultation, given the proximity of both Wind Farm site boundaries to the three Beatrice platforms and the Jacky platform, the cumulative effect of the Wind Farm and the Moray Firth Round 3 Zone on helicopter approach procedures in the region has been identified as being unlikely to be acceptable to the helicopter operators, and therefore mitigation is required.

8.12 SOCIO-ECONOMICS, RECREATION AND TOURISM

8.12.1 Introduction

203. The study area is defined as covering the Local Authority areas that border the proposed site; Moray, Highlands, Aberdeenshire. Aberdeen City is also included

because of its number of energy-related businesses and proximity to the site. The potential employment and Gross Value Added (GVA) that the Wind Farm and OfTW expenditure supports is also considered for Scotland, and the UK. The effect on tourism is predominantly defined by the findings of other assessments, such as the Seascape, Landscape and Visual Assessment, which uses a study area of 40 km from the Wind Farm site.

204. The scope of the economic element of the assessment is to estimate the significance of the employment and GVA that would be associated with the expenditure made in relation to the construction, operation and decommissioning of the Wind Farm and OfTW. It is not within the scope of this work to assess any changes in electricity generation activity elsewhere which may occur as a result of the Wind Farm.

205. Given that important design and procurement decisions have not been made to date there is a wide range of potential effects that depend upon who the successful contractors might be or where they might be based. The assessment is based on BOWL's estimates of how much expenditure would be made where under low and high scenarios. The low case considers the total value of contracts that have been delivered, or are expected to be delivered, from within each geography, assuming the current supply chain. The high case estimates the total value of contracts that could be secured by firms based in Scotland (and the study area) with a stronger supply chain. This assumes that some Scottish-based firms that are not currently in a position to tender for work (but there is good reason to expect them to be in the future) could secure contracts.

206. To estimate the employment and income that this expenditure would support, the assessment uses typical ratios for the appropriate industries taken from the Scottish Government's Input-Output Tables. These also provide ratios for calculating the indirect effects (the additional income and employment that would be supported throughout the supply chain and through the re-spending of salaries and wages in the local economy and Scotland).

8.12.2 Wind Farm

207. Using these inputs, within the study area, the Wind Farm would support between a low case of 3,600 and a high case of 7,800 "job years" across the whole lifetime of the Project. For Scotland as a whole this is between approximately 11,900 and 20,300 ''job years''.

208. In the study area during the construction phase, the Wind Farm would support between 220 and 740 jobs in the peak year and, during the operations phase, this would fall to between 110 and 210 jobs, including the indirect employment.

209. In Scotland, during the construction phase, the Wind Farm would support between 1,710 and 3,100 jobs in the peak year and, during the operations phase, this would fall to between 190 and 340 jobs, including the indirect employment.

210. The tourism assessment is based on literature, the visual assessment and estimates of the number of visitors to the area. The most detailed study available for Scotland

was produced by Glasgow Caledonian University (2008)[1]. This concludes that while a significant minority of tourists prefer landscapes without wind farms, only a very small group changed their intentions about revisiting an area or Scotland. Under the worst case scenario visitors, on average, indicated that they would be 2.5% less likely to return in the presence of a wind farm. These survey findings were supported by a literature review that concluded that overall there is no evidence to suggest a serious negative economic effect of wind farms on tourists.

211. Coupled with the number of tourists that stay within sight of the Wind Farm, the visual effects on tourism are considered to be minor. A second source of effect is the sensitivity of visitors attracted to watch the marine wildlife. This group will be sensitive to changes that alter the opportunities to do this and any effect depends on the findings of the Marine Mammals assessment (outlined in Section 1.5.4 of this NTS). The effects on other recreation are also considered to be minor.

8.12.3 OfTW

212. The socio-economic effect of the OfTW is limited to the employment and GVA associated with the expenditure on the supply and installation of the export cables, and any recreation effect. Because there is considered to be no visual effect, there is not considered to be any significant effect on tourism.

213. For the study area, the total number of direct "job years" is anticipated to range between eight and 17. For Scotland as a whole the number of "job years" is estimated at between 60 and 150 related to the supply and installation of the OfTW. This employment is spread over the three years of OfTW from 2015 through to 2016

214. The effect on sea-based recreation (surfing and kayaking) is considered to be negligible given the limited effect, relatively small number of users and temporary nature of the work.

8.12.4 Cumulative Impact Assessment

215. The cumulative impact assessment considers other activities that may affect the conclusions. For the economic element this depends on the extent to which the supply chain has the capacity to meet demand from a number of projects. In this sense, the cumulative effects may not be limited to wind farms, but also to other major projects over the same time frame, including oil and gas investment and decommissioning.

216. In relation to tourism and recreation, cumulative effects are interpreted as the combined effects of the proposal with other existing and proposed wind farms within 60 km of the site. This is related to the cumulative visual effect and the conclusions linked to the Seascape, Landscape and Visual Assessment.

217. The main cumulative effect would be with the proposed Moray Firth Round 3 Zone. While the visual effect of these together will be greater than one on its own,

[1] Glasgow Caledonian University et al, 2008. The economic effect of wind farms on Scottish tourism

it is likely to be a marginal increase. In practice, the cumulative effect has a greater visual effect, although the effect remains minor.

8.13 OTHER ISSUES

8.13.1 Introduction

218. Other considerations associated with the Project include:

- Military exercise areas;
- Telecommunications;
- Pipelines and marine cables;
- Ports and harbours; and
- Oil and gas activities.

8.13.2 Wind Farm

8.13.2.1 Military Exercise Areas

219. The operation of the Wind Farm will introduce a permanent physical obstruction to the operation of vessels and it is considered that this will result in the need for the military to adjust passage plans for military vessels and training exercises to ensure that they avoid the area. However, as the Wind Farm is not located within a military Practice and Exercise Area, this is not a significant effect.

8.13.2.2 Telecommunications

220. Wind turbines can have an effect on telecommunications links through disruption of the signal when the turbines are operational. Consultation was undertaken with numerous telecommunications organisations to identify what microwave links were present in the area. One microwave link was identified, however this was found to be at sufficient distance from the Wind Farm to not be effected.

8.13.2.3 Pipelines and Marine Cables

221. There is potential for the Wind Farm to generate sediment deposits during the preparation of the seabed for the wind turbine structures. The sediment will be deposited mainly in the local area, although finer materials may be transported over larger distances leading to the potential for an accumulation of fine sediment in areas outside the Wind Farm Site.

222. On the basis that the fine materials may be transported up to 25 km from the Wind Farm site and transport of sediment is likely to occur in a mainly south by south west direction, there is potential for some accumulation on the seabed in areas where cables and pipelines are present. However, it is likely that this material will be evenly graded and dispersed across a wider area, reducing the likelihood of discrete accumulations in this location. Material is also expected to be subject to continual erosion and dispersal from storm events during the construction period.

223. Temporary changes of this thickness of accumulation on the seabed are unlikely to affect the integrity of the existing seabed or buried cables and pipelines, and the effect on cables and pipelines is not significant.

8.13.2.4 Ports and Harbours

224. Effects on commercial, recreation and fishing vessel movements within the Wind Farm and surrounding area may be subject to disruption and navigation risk. No significant effects are predicted on the nearest port, Wick Harbour, due to the distance between it and the Wind Farm. No significant effects are predicted on access to or from other ports and harbours in the Moray Firth and surrounding area due to the construction of the Wind Farm.

225. There may be opportunities for some ports and harbours within the Moray Firth or the surrounding area to be developed to support the longer term operations and maintenance of the offshore wind sector.

8.13.2.5 Air Quality and Carbon Savings

226. The Project aims to generate electricity from a renewable source of energy, i.e., the wind, and therefore once operational, will offset the need for power generation from the combustion of fossil fuels. This will result in the electricity produced creating a saving in emissions of CO_2, with associated environmental benefits.

227. Throughout its operational lifespan, the Project has the potential to displace electricity generated from fossil fuels, and subsequently prevent CO_2 from being released. In order to calculate the exact amount of CO_2 released through electricity generation in the UK, it is necessary to know the electricity generation rate of machinery at any given time. This mix changes on a daily basis, and will change in the future as UK generating plant is replaced and its efficiency improved, and as a consequence it is not possible to predict the exact amount of how much CO_2 the Project will prevent over its life time.

228. The Department of Energy and Climate Change (DECC) produces an annual document, the Digest of UK Energy Statistics 2011 (DUKES), which highlights that in 2010, 364 tonnes of CO_2 was released per gigawatt hour (GWh) when generating electricity from gas and 872 tonnes per GWh from coal. The average CO_2 release from all fossil fuel mix, including oil, was 434 tonnes per GWh.

229. Based on the above figures, the Project, with an estimated energy yield of approximately 24 GWh per year (based on 900 MW installed capacity with a capacity factor of 26.9% of offshore wind farms in 2010 could displace a minimum of 920,514 tonnes of CO_2 from the average CO_2 release of all fossil fuel mix each year from entering the atmosphere.

230. The operational phase of the Project has the potential to also displace gases other than CO_2, such as those associated with acid rain (Sulphur Dioxide (SO_2) and oxides of nitrogen (NO_x)).

231. The Project will act as a major contributor for reducing the amount of CO_2 released in the atmosphere and hence meet targets forming part of Scotland's commitments on climate change action to reduce greenhouse gases.

232. The energy generated from the Project compared to the generation of that energy from fossil fuel sources presents a positive difference in terms of the generation of CO_2.

8.13.2.6 Oil and Gas Activities

233. The risk of collision to oil infrastructure is considered to be extremely low and interference with oil and gas industries operational activities is considered to be low.

234. BOWL will liaise with the oil platform operators to ensure the facilities are managed in a safe manner and no significant effects arise.

8.13.3 OfTW

8.13.3.1 Military Exercise Areas

235. A portion of the OfTW corridor is located within the military zone; however, due to the short term activity involved with its installation, military activity will only be excluded from the area on a temporary basis. Effects will be further minimised through liaising with the relevant military operatives to ensure the construction of the cable is undertaken in a safe manner.

8.13.3.2 Telecommunications

236. The OfTW submarine cables will have no effect on airborne telecommunication links during construction, operation or decommissioning and this is not considered further in this assessment.

8.13.3.3 Pipelines and Marine Cables

237. Three pipelines and cables have been identified that have the potential to be affected; these are illustrated on NTS 7.

238. No crossings are proposed with any existing or consented pipelines or cables, therefore no interference with other cables and pipelines due to cable crossings are predicted.

239. Any material released during cable installation will be re-deposited locally and is expected to be contained within the cable corridor rather than being dispersed elsewhere. Due to the localised and temporary nature of these accumulations, the effect on other existing and consented cables and pipelines will be acceptable and therefore not significant.

8.13.3.4 Ports and Harbours

240. There may be disruption to vessels during the installation of the OfTW, particularly along the southern coast of the Moray Firth. However, where disruption occurs, this will largely be localised and short term during the temporary construction phase. BOWL will liaise with the relevant authorities to ensure that information about the construction activities is provided to minimise disturbance. The likely effect on ports and harbours in terms of restricted access due to the construction of the OfTW will short term and acceptable.

8.13.3.5 Oil and Gas Activities

241. Once operational, the OfTW's are not anticipated to affect oil activities and no operational effects are anticipated. During decommissioning of the platforms jack-up vessels will be restricted to use away from the BOWL cables to ensure no safety

issues arise. This will be managed in coordination with the platform operators to ensure no unacceptable and therefore significant effects arise.

8.13.4 Cumulative Effects

242. There is the potential for cumulative effects on military activities, pipelines and marine cables, ports and harbours and oil activities during the construction of the Wind Farm, the Moray Firth Round 3 Zone and the installation of associated OfTWs. Communication will be maintained with the relevant operators and authorities to ensure these effects are acceptable and therefore not significant.

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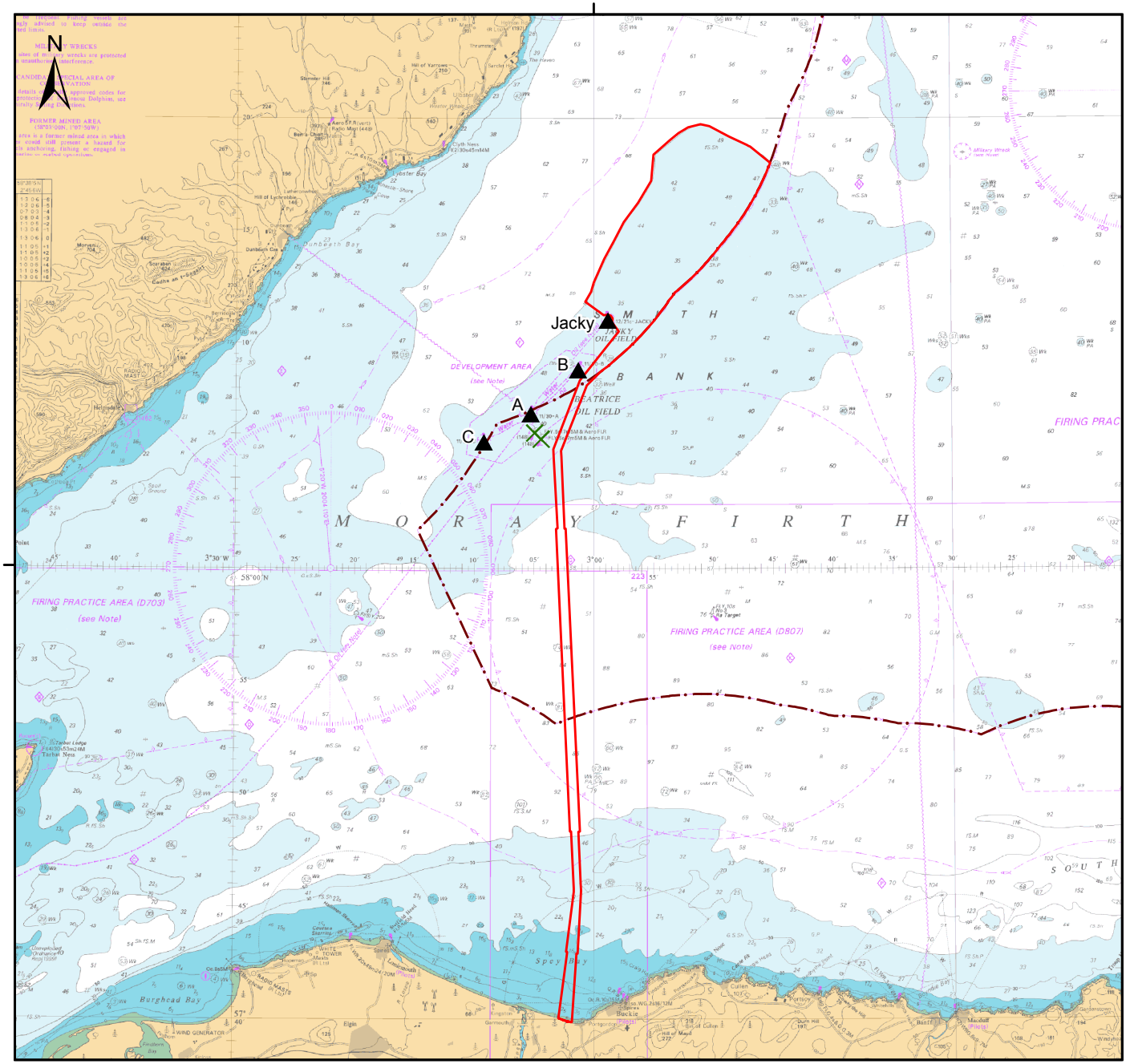

Legend

- Project Boundary
- Fixed Platform/Structure
- Existing Demonstrator Turbine
- Scottish Territorial Waters Boundary

0 3 6 12 km 0 1.5 3 6 Nm

UK Offshore Development

NTS 1

Project Context

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Date: 09/02/2012	Scale: 1:500,000 @ A4		
Drawing Number: BEA-MAP-EWF-BOWL-148		Revision: 05	
Datum: WGS84	Projection: UTM30N		

Beatrice Offshore Windfarm Ltd

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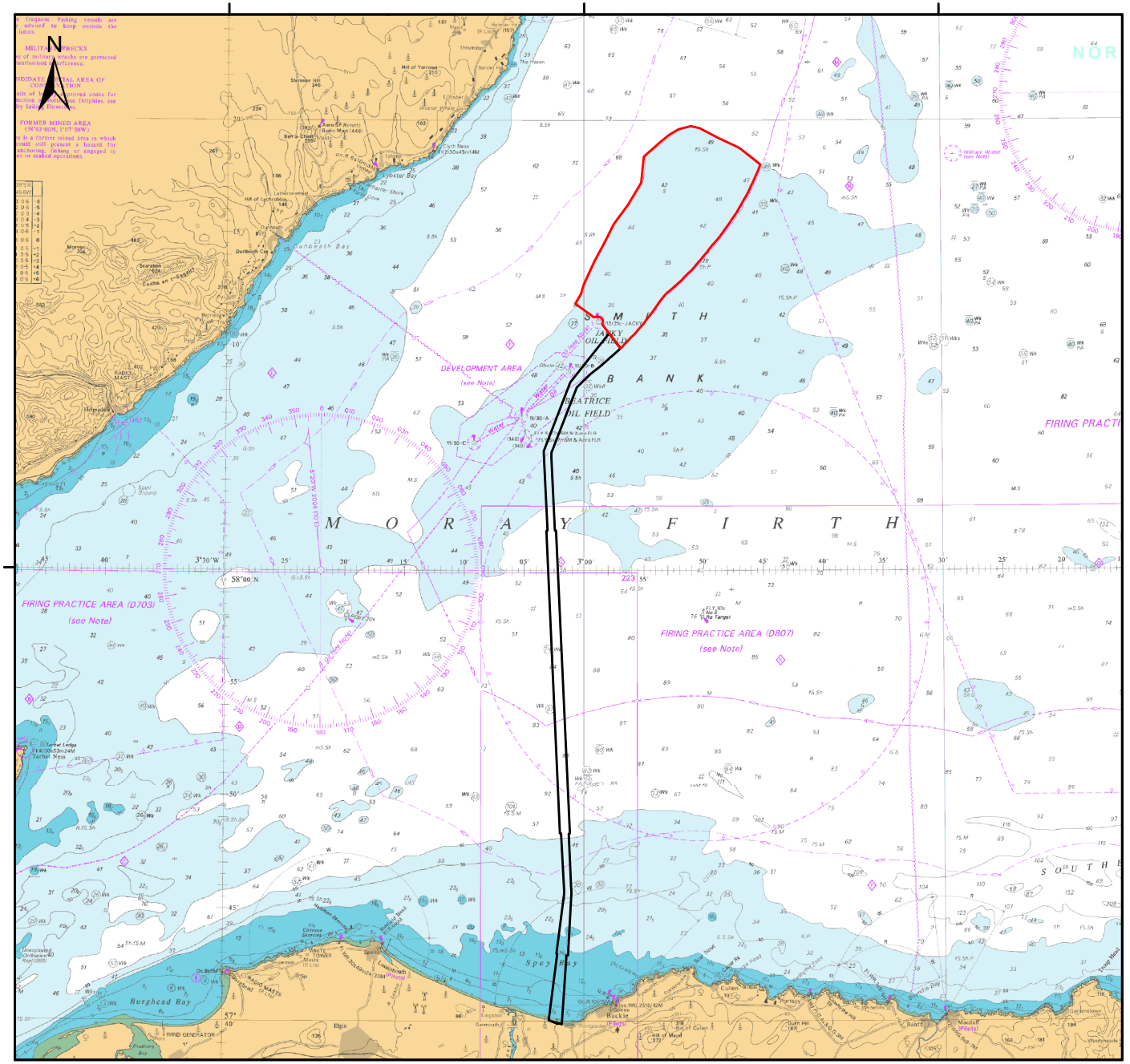

Legend

- Beatrice Offshore Wind Farm Site
- Beatrice Offshore Transmission Works Corridor

0 3 6 12 km 0 1.5 3 6 Nm

UK Offshore Development

NTS 2

Project Boundary

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Date: 09/12/2011	Scale: 1:500,000 @ A4		
Drawing Number: BEA-MAP-EWF-BOWL-149		Revision: 05	
Datum: WGS84	Projection: UTM30N		

Beatrice Offshore Windfarm Ltd

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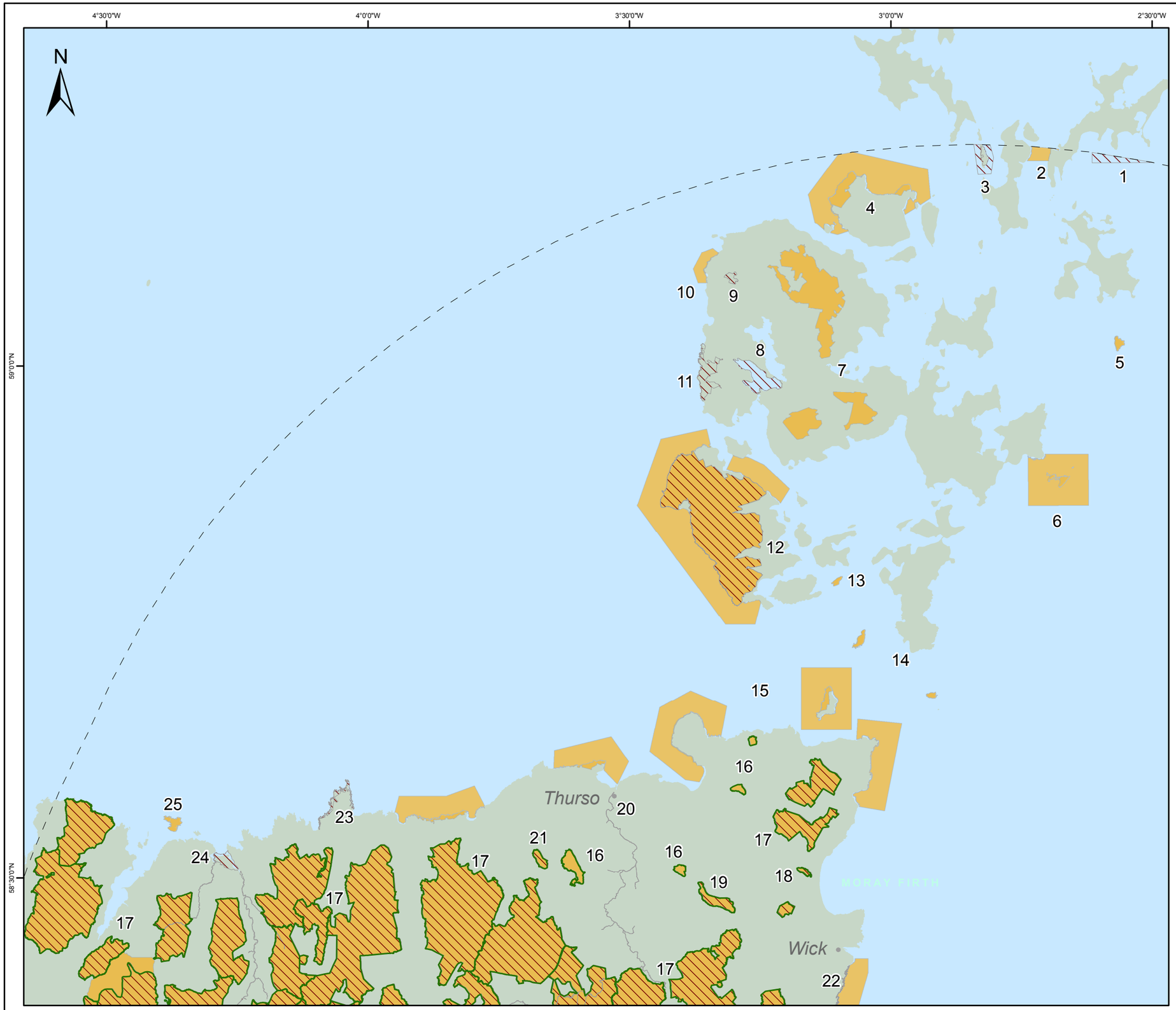

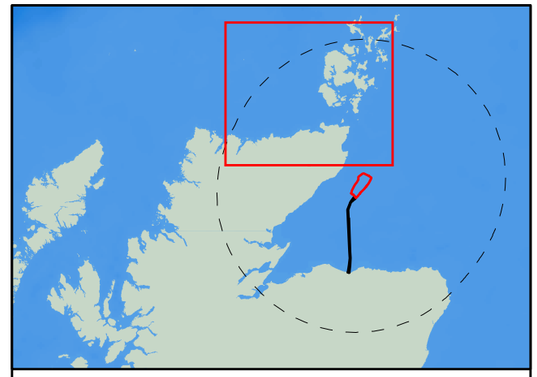

Legend

- Beatrice Offshore Wind Farm Site
- Beatrice Offshore Transmission Works Corridor
- Wind Farm Site 100km Buffer

Designations

- RAMSAR
- SAC
- SPA

0 3.5 7 14 km

0 1.5 3 6 Nm

UK Offshore Development

NTS 3

International & European Designations within 100 km of the Wind Farm Site - Orkney and the Far North

Drawn: MM	**Checked:** VR	**Approved:** VR	
Date: 19/01/2012	**Scale:** 1:425,000 @ A3		
Drawing Number: BEA-MAP-EWF-BOWL-180		**Revision:** 01	
Datum: WGS84	**Projection:** UTM30N		

Beatrice Offshore Windfarm Ltd

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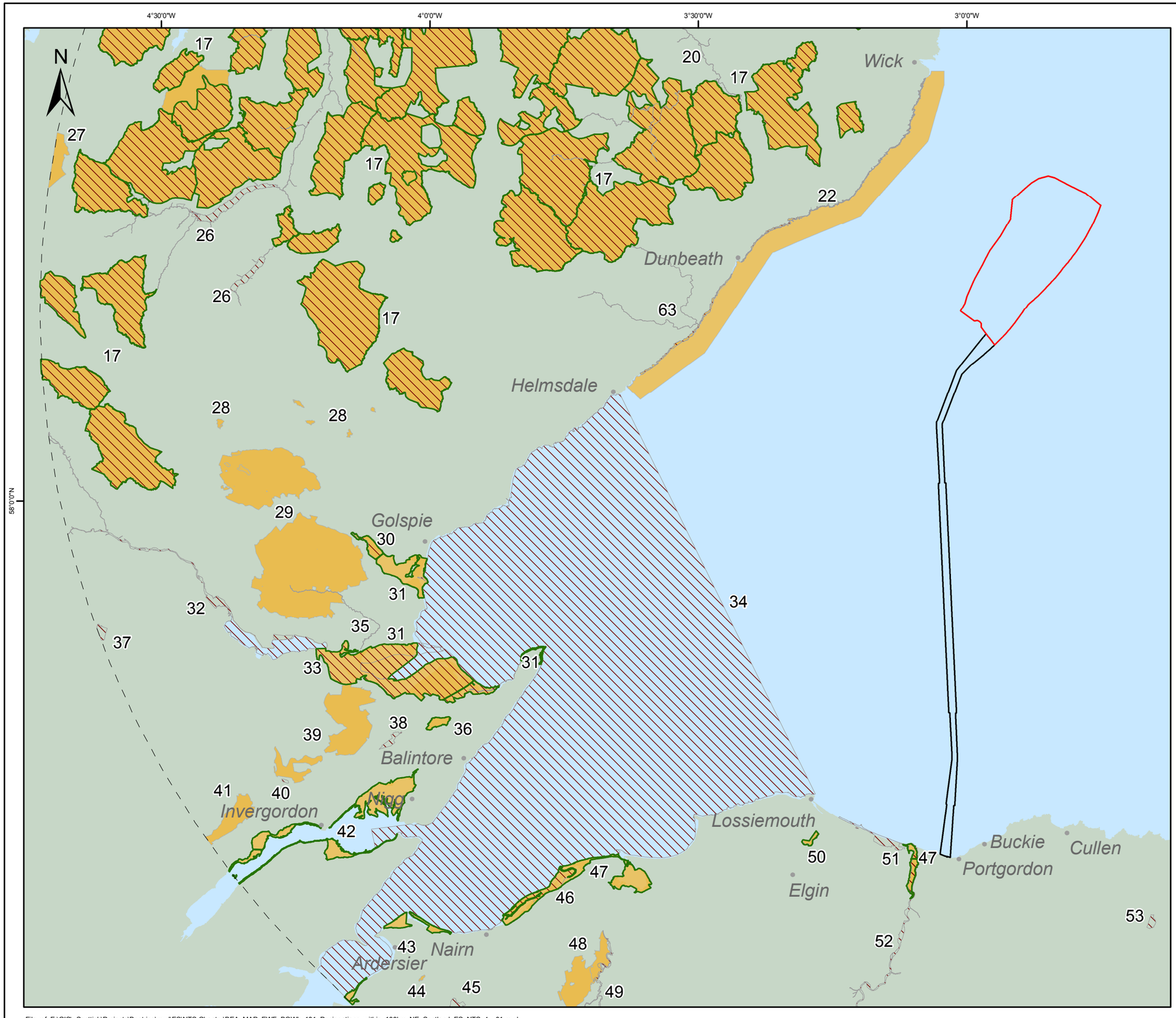

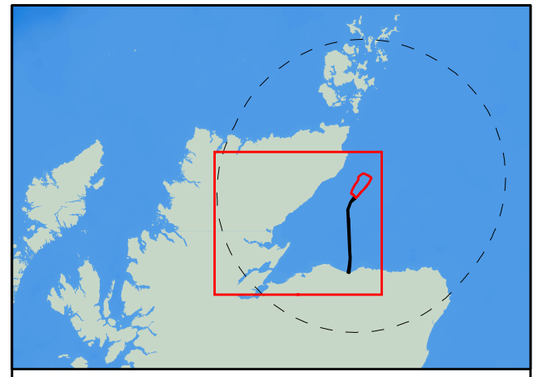

Legend

- Beatrice Offshore Wind Farm Site
- Beatrice Offshore Transmission Works Corridor
- Wind Farm Site 100km Buffer

Designations

- RAMSAR
- SAC
- SPA

0 3.5 7 14 km

0 1.5 3 6 Nm

UK Offshore Development

NTS 4

International & European Designations within 100 km of the Wind Farm Site - North East Scotland

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Date: 19/01/2012	Scale: 1:425,000 @ A3	
Drawing Number: BEA-MAP-EWF-BOWL-181		Revision: 01
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Beatrice Offshore Windfarm Ltd

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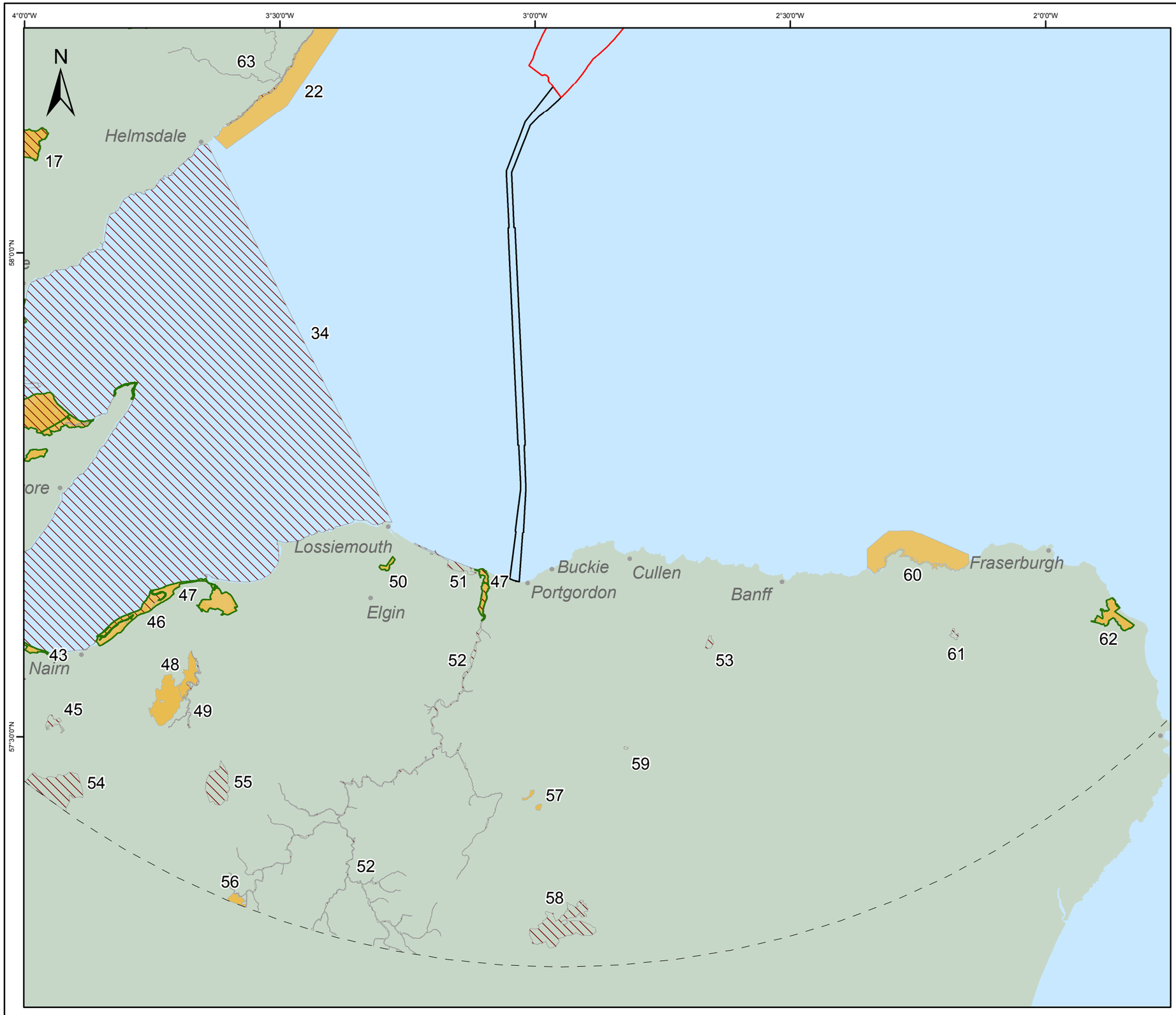

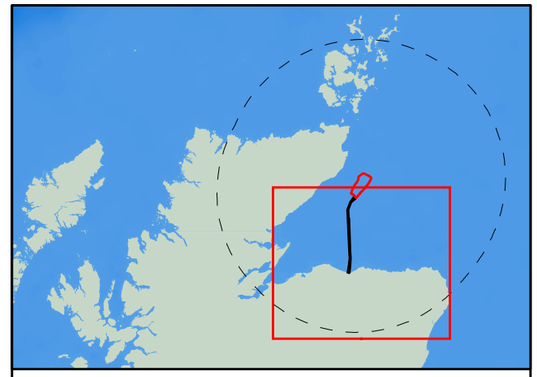

Legend

- Beatrice Offshore Wind Farm Site
- Beatrice Offshore Transmission Works Corridor
- Wind Farm Site 100km Buffer

Designations

- RAMSAR
- SAC
- SPA

0 3.5 7 14 km 0 2 4 8 Nm

UK Offshore Development

NTS 5

International & European Designations within 100 km of the Wind Farm Site - Moray Firth

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Date: 20/01/2012	Scale: 1:450,000 @ A3	
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Datum: WGS84	Projection: UTM30N	

Beatrice Offshore Windfarm Ltd

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3°0'0"W

57°30'0"N

N

Lossiemouth

Buckie

Portgordon

Cullen

Banff

Elgin

34
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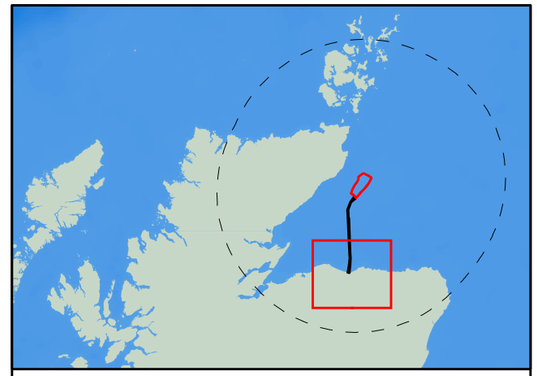

Legend

- Beatrice Offshore Wind Farm Site
- Beatrice Offshore Transmission Works Corridor
- Offshore Transmission Works Corridor Landfall 20km Buffer

Designations

- RAMSAR
- SAC
- SPA
- SSSI

0 2 4 8 km

0 0.5 1 2 Nm

UK Offshore Development

NTS 6

National and International Designations within 20 km of the Offshore Transmission Works Corridor Landfall

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Date: 20/01/2012	Scale: 1:200,000 @ A3	
Drawing Number: BEA-MAP-EWF-BOWL-183		Revision: 01
Datum: WGS84	Projection: UTM30N	

Beatrice Offshore Windfarm Ltd

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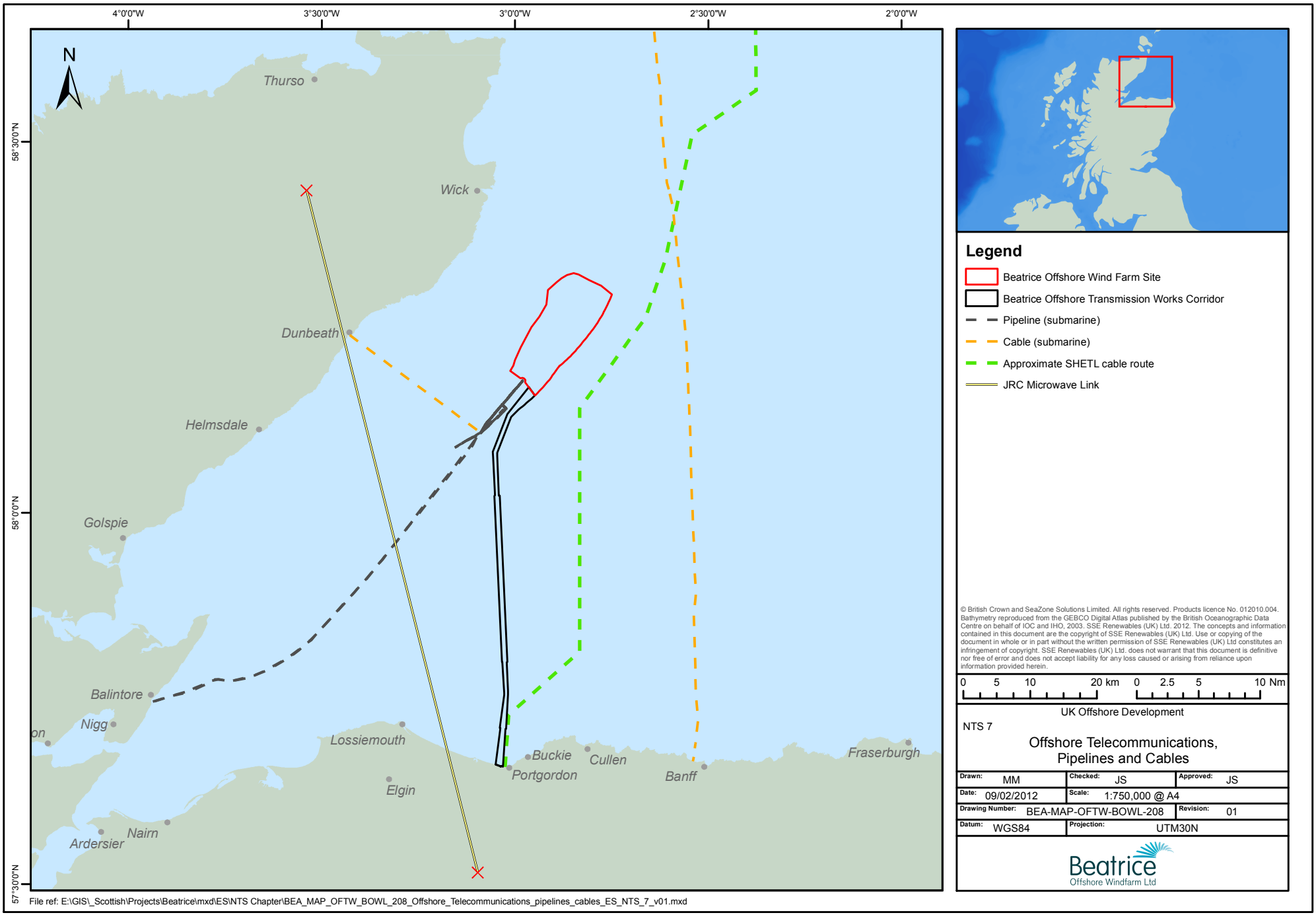

0 5 10 20 km 0 2.5 5 10 Nm

UK Offshore Development

NTS 7

Offshore Telecommunications, Pipelines and Cables

Drawn: MM	Checked: JS	Approved: JS	
Date: 09/02/2012	Scale: 1:750,000 @ A4		
Drawing Number: BEA-MAP-OFTW-BOWL-208		Revision: 01	
Datum: WGS84	Projection: UTM30N		

Beatrice Offshore Windfarm Ltd

File ref: E:\GIS_Scottish\Projects\Beatrice\mxd\ES\NTS Chapter\BEA_MAP_OFTW_BOWL_208_Offshore_Telecommunications_pipelines_cables_ES_NTS_7_v01.mxd