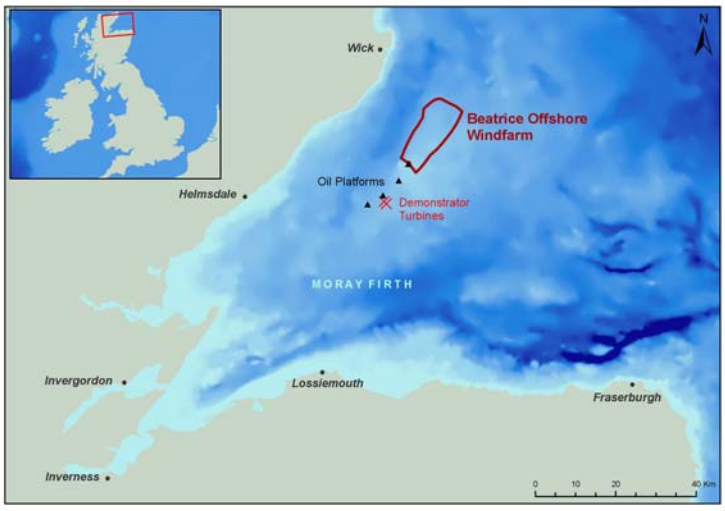

Beatrice
Offshore Windfarm Ltd

Environmental Scoping Report

12 March 2010

SSE Renewables

SeaEnergy

ERM

Project 0108603

Beatrice Offshore Wind Farm: *Environmental Scoping Report*

Prepared by Environmental Resources Management Limited.

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- Aberdeen University, Lighthouse Field Station.
- ABP marine environmental research (ABPmer).
- Anatec.
- Brown and May Marine Limited.
- Institute of Estuarine Coastal Studies (IECS).
- Marine Scotland.
- Moray Offshore Renewable Limited (MORL).
- RPS Limited (RPS).
- Scottish Natural Heritage (SNH).
- Sea Mammal Research Unit Limited (SMRU).
- Senergy.

Glossary

Appropriate Assessment	An assessment required by law for proposals that would likely have an effect on a European Site.
AIS	Automatic Identification System.
BERR	The Department for Business, Enterprise and Regulatory Reform.
BML	Below mudline.
BOWL	Beatrice Offshore Windfarm Limited.
CA	Countryside Association.
CAA	Civil Aviation Authority.
CEFAS	Centre for Environment, Fisheries & Aquaculture Science.
CNSRP	The Caithness and North Sutherland Regeneration Partnership.
COWRIE	Collaborative Offshore Wind Research into the Environment.
CPA	Coast Protection Act.
C-POD	Chelonia pod. A digital marine mammal monitoring device.
Cretaceous	When referencing geology this is the period of time between about 144 to 65 million years ago.
CRRC	Cetacean Research and Rescue Centre.
DECC	Department of Energy and Climate Change.
DEFRA	Department for Environment, Food and Rural Affairs.
DfT	Department for Transport.
DHI MIKE21	Engineering software package to simulate water conditions.
DTI	Department for Trade and Industry.
EC	European Commission.
EIA	Environmental Impact Assessment.
ES	Environmental Statement.
ESAS	European Seabirds at Sea.
FEPA	Food and Environment Protection Act.
FLOWW	Fishing Liaison with Offshore Wind and Wet Renewables Group.
GPS	Global Positioning System.
HVDC	High Voltage Direct Current.
ICES	International Council for the Exploration of the Sea.
JNAPC	Joint Nautical Archaeological Policy Committee.
JNCC	Joint Nature Conservation Committee.
LSVIA	Landscape, Seascape and Visual Impact Assessment.
MCA	Maritime Coastguard Agency.
MFA	Marine and Fisheries Agency.
MHWS	Mean High Water Springs.
MoD	Ministry of Defence.
MORL	Moray Offshore Renewables Limited.
MSL	Mean sea level.
MW	Megawatt.
NATS	National Air Traffic Services.
NETSO	National Electricity Transmission System Operator.
NFFO	National Federation of Fisherman's Organisation.
AWAC	Acoustic Wave and Current profiler, an ocean observing system.
OFTO	Offshore Transmission Owners.
Ofgem	Office of the Gas and Electricity Markets.
OREIs	Offshore Renewable Energy Installations.
PEXA	Practice and Exercise Areas.
Quaternary	When referencing geology this is the period of time between the present and 1.6 million years ago.
Round 3	Crown Estate identified offshore wind farm zones.
RSPB	Royal Society for the Protection of Birds.

Glossary

Scouring	A process by which surface material is removed through abrasive action.
SAC	Special Area of Conservation.
SEA	Strategic Environmental Assessment.
Seascape	The coastal landscape character including the coast and the sea.
SERL	SeaEnergy Renewables Limited.
SFF	Scottish Fishermen's Federation.
SMRU	Sea Mammal Research Unit.
SNH	Scottish Natural Heritage.
Soft Starts	A construction technique employed to allow wildlife dispersal prior to commencement of intrusive works.
SPA	Special Protection Area.
SSE	Scottish and Southern Energy.
SSER	Scottish and Southern Energy Renewables.
STW	Scottish territorial waters.
WDCS	Whale and Dolphin Conservation Society.
ZTV	Zone of Theoretical Visibility.

Contents

1 INTRODUCTION

1.1 THE DEVELOPMENT CONSORTIA

In February 2009 the partnership of SSE Renewables (75 %) and SeaEnergy Renewables (25 %), was awarded exclusivity by The Crown Estate to develop the Beatrice Offshore Wind Farm in Scottish territorial waters, off the Caithness coastline. This Joint Venture partnership is 'Beatrice Offshore Windfarm Limited (BOWL)'.

SSE Renewables (formerly known as Airtricity) is responsible for the development and construction of SSE's (Scottish and Southern Energy) renewable energy projects across the UK, Ireland and Continental Europe. SSE is the UK's leading generator of renewable energy with over 2,200 Megawatt (MW) of renewable electricity generation capacity and is the second largest generator in the UK with a total electricity generation capacity of 11,500 MW. SSE has over 1,900 MW of offshore wind farm capacity with consent for development in northern Europe, including the Dutch sector of the North Sea. SSE is ranked 31st in the FTSE 100 index.

SeaEnergy Renewables Limited (SERL) is made up of members of the team which conceived, developed and delivered the world's first deep water wind farm development - the Beatrice demonstrator project (10 MW) which is owned by Talisman Energy and SSE. SERL is a subsidiary of SeaEnergy Plc, the only listed company in the UK that is purely offshore wind focused.

1.2 BACKGROUND TO THE PROJECT

The UK Government has set a target of generating 15 % of energy from renewable sources by 2015, with a desired aim of 20 % of energy from renewables by 2020. In a similar move the Scottish Government has set a more ambitious target of Scotland generating 80 % of its energy needs from renewable sources by 2050.

It is recognised that there are significant opportunities to develop Scotland's capacity to generate electricity from offshore wind technologies. In response there have been numerous studies undertaken and moves made to realise this potential. *Section 1.5* of this Report describes further the policy and consenting framework relating to the Beatrice Offshore Wind Farm proposals.

In May 2008, The Crown Estate requested initial expressions of interest from companies wishing to be considered for developing commercial scale wind farms within Scottish territorial waters. Given the encouraging response to this request the Scottish Government announced on 29 October 2008 that they would carry out a Strategic Environmental Assessment (SEA) for offshore wind.

As background to the proposed Beatrice Offshore Wind Farm there is a need to briefly discuss these initiatives and a number of other key developments and references.

- The Beatrice demonstrator project, 10 MW.
- Scottish territorial waters wind farm sites.

- DECC, UK Offshore Energy Licensing SEA (2009).
- Round 3 wind farm zones.

1.2.1 *Beatrice Demonstrator Project*

The 10 MW (two turbines) Beatrice demonstrator project jointly developed and owned by SSE and Talisman has been generating electricity at the Beatrice oil field in the Moray Firth since May 2007.

This pilot demonstration project has helped examine the feasibility and benefits of creating a commercial deepwater wind farm in this area of the Outer Moray Firth. The project was subject to its own Environmental Impact Assessment (EIA), including Scoping and consultation. It is a natural progression and a long held aspiration of SSE to build upon this successful commercial demonstrator project and develop a full scale commercial offshore wind farm in the Moray Firth.

1.2.2 *Scottish Territorial Waters*

In May 2008 The Crown Estate invited expressions of interest from companies wishing to develop commercial wind farms in Scottish territorial waters.

Following the tender and selection process, exclusive development agreements were granted to various companies and consortia in February 2009 to develop ten sites with a potential total installed capacity of over 6 GW (see *Figure 1.1*). The Beatrice site was one such area and the development agreement lies with the consortia which is progressing this Scoping exercise (ie BOWL).

1.2.3 *Scottish Territorial Waters SEA*

In January 2009, an SEA was launched by the Scottish Government to examine offshore wind development in Scottish territorial waters. The SEA Environmental Report is expected to be issued for consultation in March 2010.

The grant of any agreement for lease by The Crown Estate will be subject to the SEA outcome. The lease, which enables the developer to proceed with wind farm construction works, will only be granted by The Crown Estate once the developer has conducted an EIA and obtained the necessary statutory consents and permissions from the Scottish Government (ie Section 36 of the Electricity Act, FEPA, CPA, or such consents under a replacement process – refer to *Section 1.5)*.

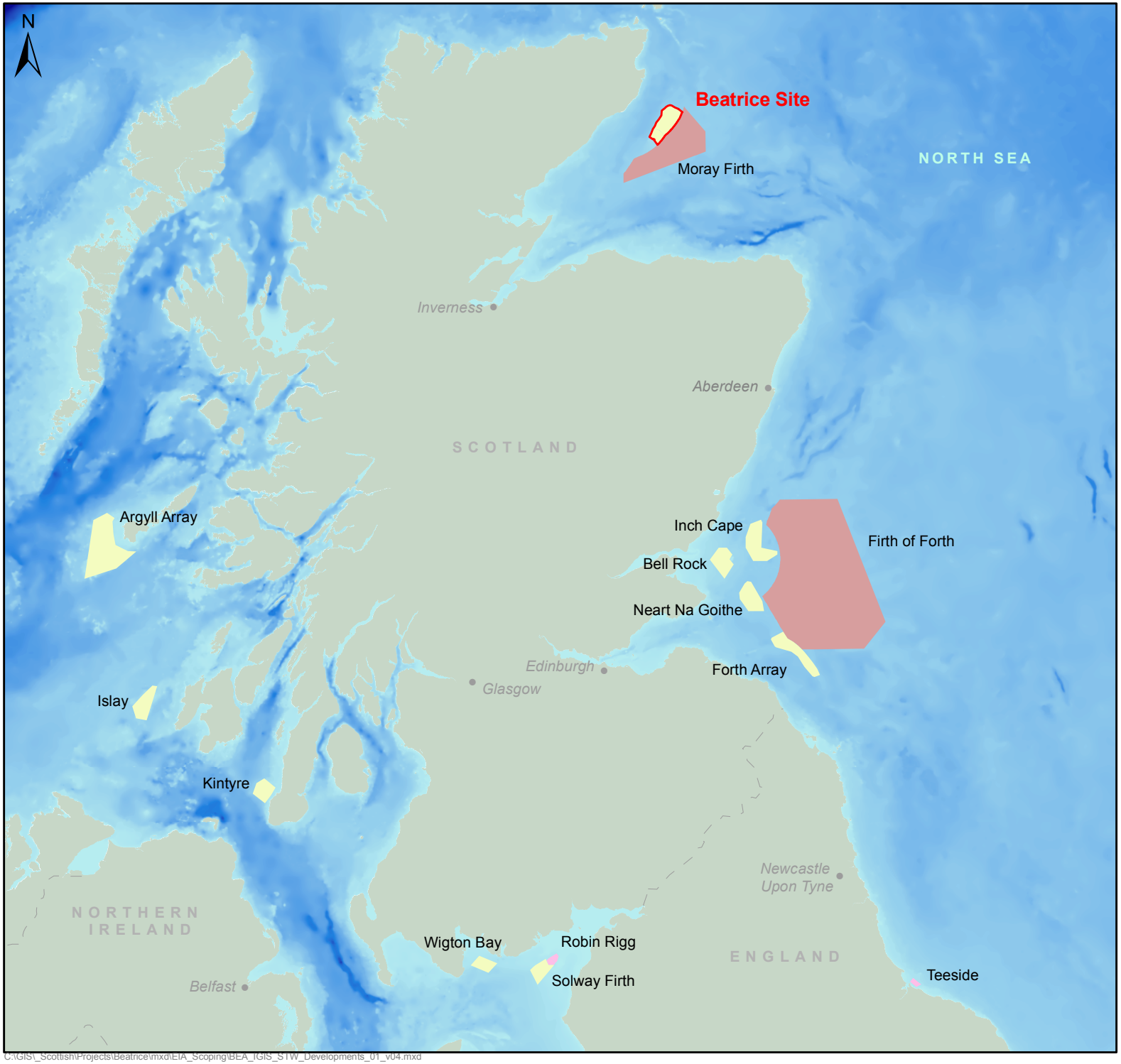
Therefore, the SEA process has a direct bearing on the future development of the Beatrice Offshore Wind Farm.

The Scottish Territorial SEA draws upon and compliments the DECC, UK Offshore Energy SEA (1).

1.2.4 *Round 3 Wind Farm Zones*

There are a total of nine Round 3 zones in the UK. Scottish Round 3 offshore wind farm zones are outside Scottish territorial waters. The two Round 3 zones in Scotland are located within the Moray Firth and the Firth of Forth (see *Figure 1.1*).

(1) see http://www.offshore-sea.org.uk



Beatrice Offshore Wind Farm Site Boundary

Scottish Territorial Waters Site

Round 1 Site

Round 3 Zone

Bathymetry

(Metres Below Sea Level)

0m

-1710m

0 15 30 60 Km

0 7.5 15 30 Nm

UK Offshore Development

Figure: 1.1

Scottish Territorial Water Developments

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Rev: 4	Date: 02/03/10	By: NvR	Checked: MM

Scale: 1:2,500,000

Datum: WGS 1984	Projection: UTM Zone 30N

Beatrice
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Introduction

In January 2010 The Crown Estate announced the names of successful bidders, chosen to progress the development of wind farms in each of the zones. The zone contiguous with the Beatrice site is the Moray Firth and the exclusive rights to develop the wind farm have been awarded to EDP Renováveis and SeaEnergy Renewables Limited (SERL). These companies have formed Moray Offshore Renewables Limited (MORL).

A collaborative approach to cumulative impacts assessment, between the Beatrice Offshore Wind Farm and the Moray Round 3 site, is proposed and considered further in *Section 3.5*.

1.3 Consultation and Communication

BOWL proposes to undertake its consultation and communication exercises with reference to best practice [2]. BOWL recognises the importance of consultation during all phases of the project with the regulators, marine stakeholder(s) and local communities and is committed to embarking on a thorough and focussed consultation exercise.

Section 4 of this Report discusses the proposed approach to communication and consultation throughout the project lifecycle. A list of organisations and bodies who are being consulted on this Scoping Report is also presented in *Section 4*.

(2) British Wind Energy Association, 2002, Best Practice Guidelines: Consultation for Offshore Wind Energy Developments, BWEA, London, 32 pp.

1.4 Objective of the Scoping Report

This Scoping Report has been produced at an early stage of the project planning and design development. This report represents an initial introduction to the Beatrice Offshore Wind Farm and is intended to seek views of stakeholders and others on the principles of the project.

The Report also sets out, in broad terms, the approach to assessing the environmental impacts which may result from the construction, operation and decommissioning of the Wind Farm. For Scoping purposes it has been assumed, at this stage, that decommissioning impacts will be similar in scale and nature to those predicted during construction. Therefore, unless otherwise stated, all construction impacts mentioned within this document are considered to occur during the decommissioning phase of the project also. The methods for assessing and mitigating these decommissioning impacts are also predicted to be the same as those identified for construction.

It is recognised that more detailed method statements for some key elements of data gathering and analysis will be developed and agreed with Scottish Government and key agencies including Scottish Natural Heritage (SNH) and Marine Scotland.

This report identifies the aspects of the environmental considerations which will be addressed during the EIA and additionally proposes an approach to assessment that will be employed within the EIA. EIA is an iterative process and the scope of the EIA may change during project development, for example, as a

result of the findings of technical studies or information supplied by consultees.

An aim of this Scoping Report is to seek a formal Scoping Opinion from the Scottish Government stating their opinion on the information to be provided in the supporting Environmental Statement [3] . This Opinion should be based on, and in response to, the content of this Report.

It should be noted that the development proposals and application will relate to the key development components listed below (see *Section 2.3* for further details).

- Turbines (tower, nacelle, rotors and hub).
- Turbine sub-structure and foundations.
- Electricity cables at the site (inter-array only).
- Site electrical substations.

It is not anticipated that the sub-sea grid connection cable requirements or onshore works would form part of the application. It is anticipated that they would be subject to separate consideration under the new OFTO process which is discussed further in *Section 1.5.2*. The environmental impacts of any sub-sea or onshore works are not considered within this Scoping Report. However, it is anticipated that the likely environmental impacts of these elements are discussed and considered at a high level within the Beatrice Offshore Wind Farm Environmental Statement.

(3) Regulation 7 of The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000

1.5 *Policy and Consenting Framework*

1.5.1 *Policy Framework*

Renewable Energy Policy

UK renewable energy policy centres around two key factors.

- The drive to reduce CO_2 emissions to tackle climate change; and the desire to increase diversity.
- Security of energy supply as part of a long-term sustainable energy policy.

Under the Kyoto Protocol, the UK set a target to reduce CO_2 emissions by 10 % in comparison with 1999 levels by 2012. The UK Government has set a target of generating 15 % of energy from renewable sources by 2015, with a desired aim of 20 % of energy from renewables by 2020.

The Scottish Government's Climate Change Act is amongst the most ambitious in the world. It commits Scotland to cut carbon emissions by 42 % from 1990 levels by 2020 and by at least 80 % by 2050. The view of the Scottish Government is that developing energy industries to utilise Scotland's renewable natural resources, in particular offshore wind, tide and wave resources, represents a significant opportunity to meet these ambitious targets.

A number of technologies will contribute to this target, including biomass technologies and landfill gas, but onshore and offshore wind are recognised as offering the most likely sources of a very considerable portion of this target.

The need to expand renewable energy development (including wind farms) into offshore areas has been recognised by the UK Government, which has produced two key documents.

- A UK Offshore Energy Strategic Environmental Assessment (SEA) [4].
- An Atlas of UK Marine Renewable Energy Resources (ie wind, wave and tidal) for the whole of the UK offshore region [5].

Offshore Wind Development

There are a number of Scottish Government and UK Government policies and strategic statements which promote the development of offshore wind in the Moray Firth. The Outer Moray Firth has been identified as a region able to accommodate a larger offshore wind development in the 2006 Scottish Government report 'Matching Renewable Electricity Generation and Demand' [6].

In the 2004 Scottish Natural Heritage statement 'Marine Renewable Energy and the Natural Heritage: an Overview and Policy Statement' [7], the Moray coastline is one of three areas identified as likely to be 'more suitable' for offshore wind farm development.

An assessment of the sensitivity and capacity of the Scottish seascape [8] in relation to wind farms indicates that the proposed Beatrice site lies within a seascape area of low to medium sensitivity, with a moderate to high capacity for wind farm development.

1.5.2 *Consenting Framework*

Two separate consenting frameworks are being considered at this stage of the Beatrice Offshore Wind Farm project. The current consenting process consists of a series of separate licences under various different pieces of legislation, whilst the second considers the emerging changes proposed within the recently passed Marine (Scotland) Bill (passed by Holyrood on 4 February 2010, and receiving Royal Assent on 10 March).

It should be noted that, since the applications for the Beatrice Offshore Wind Farm development are not anticipated to be submitted until 2011, it is likely that Beatrice Offshore Wind Farm applications will pass through the new consenting framework. The existing framework is however described here for completeness.

Existing Consenting Framework

The existing consenting framework follows a four-stage process as outlined in *Table 1.1* below.

(4) Department of Energy and Climate Change, 2009. UK Offshore Energy Strategic Environmental Assessment
(5) DTI, 2004b. Atlas of UK Renewable Energy Resources: Technical Report. Produced by ABPmer, The Met Office, Garrad Hassan, Proudman Oceanographic Laboratory
(6) http://www.scotland.gov.uk/Resource/Doc/112589/0027359.pdf
(7)www.snh.org.uk/data/boards_and_committees/main_board_papers/040207.pdf

(8) SNH 2005, Commissioned Report 103: An assessment of the sensitivity and capacity of the Scottish seascape in relation to wind farms, SNH

Table 1.1 Existing Consenting Framework

Stage	Activity
Stage 1 (Pre-Application)	The developer must: • undertake a feasibility study; • obtain Crown Estate agreement for lease of the seabed; • meet with the Scottish Government; • undertake an EIA Scoping exercise; • consult on the EIA Scoping Report; • prepare and consult on Terms of Reference for field studies; and • undertake an EIA, producing an ES.
Stage 2 (Application)	The developer must: • complete all required application forms (Electricity Act 1989, Food and Environment Protection Act 1985 and Coast Protection Act 1949); and • submit the application forms with accompanying documents and the application fee. A notice of receipt will be issued.
Stage 3 (Consultation)	The developer must: • advertise the proposal (prepare public consultation, advertise the proposal in newspapers and other publications, and lodge the ES with at least two nearby local authorities for the minimum prescribed period). The Scottish Government will: • co-ordinate the issue of copies of the ES to statutory consultees and the return of comments
Stage 4 (Determination)	The Scottish Government will: • consider their response under the Electricity Act in consultation with other agencies considering the FEPA and CPA applications, and submit to the Scottish Minsters for determination; • if minded to issue a consent, will consult with the Secretary of State on the application; and • grant the consents separately under the different Acts, providing the Secretary of State indicates no impediment to the application. The developer must: • provide such information and documentation as requested by the Scottish Government to fulfil any pre-construction conditions imposed by any consenting authority, including complying with monitoring and reporting requirements

There are certain consents which must be obtained for any offshore wind generating site in Scottish waters. These are outlined in *Table 1.2* below.

Table 1.2 Required Consents (Offshore)

Legislation	Topic
Electricity Act 1989 – Section 36	For offshore wind power generating stations within UK territorial waters adjacent to Scotland as defined in The Scottish Adjacent Waters Boundaries Order 1999.
Food and Environment Protection Act 1985 – Section 5	For depositing substances or articles in the sea or tidal waters below MHWS (Mean High Water Springs) around Scotland including the temporary placement of construction materials and/or disposal of dredged material etc.
Coastal Protection Act 1949 – Section 34	Restriction of works detrimental to navigation under or over the seashore lying below the level of MHWS.

Likely Consenting Framework - Marine (Scotland) Bill

The Marine (Scotland) Bill was passed by Holyrood on 4 February 2010 and received Royal Assent on 10 March. The Bill is intended to introduce a simpler and more streamlined marine licensing system, with key pieces of legislation being merged (as identified in *Table 1.2*) and the need to submit up to four separate applications under various different Acts to different agencies being replaced with a single licensing point of contact in Marine Scotland. Given BOWL's recent discussions with Marine Scotland it is understood that, in practice, this framework will be implemented in April 2010. The Bill is anticipated to come into force by 2011.

Marine Scotland is a new Scottish Government body created in April 2009 by the merging of Fisheries Research Services, the Scottish Fisheries Protection Agency and the Scottish Government Marine Directorate.

EIA Directive and Regulations

The European Commission EIA Directive (85/337/EEC as amended by 97/11/EC) requires that an Environmental Impact Assessment (EIA) must be carried out in support of an application for development consent for certain types of major projects.

The Directive lists a series of such projects in Annex 1 and Annex II which are likely to have the potential to give rise to significant environmental effects. Offshore wind farm developments are listed as an Annex II project as 'installations for the harnessing of wind power for energy production (wind farms)'. Annex II projects will require an EIA where they are likely to have significant effects on the environment by virtue of factors including their nature, size or location. The Directive has been applied to Scottish offshore wind developments through the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and the Marine Works (Environmental Impact Assessment) Regulations 2007.

Habitats and Birds Directives and Regulations

In 1992 the EC adopted Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive). The provisions of the Directive require EC Member States to introduce a range of measures including the protection of habitats and species listed in Annexes I and II of the Directive; the 189 habitats listed in Annex I and the 788 species listed in Annex II are protected by means of a network of sites (known as the Natura 2000 network of sites). Council Directive 79/409/EEC on the conservation of wild birds (EC Birds Directive) fulfils a parallel role for bird species.

In the UK both of the Directives have been transposed into national law by means of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), known as the 'Habitats Regulations'. Under these Habitat Regulations a network of protected sites for birds (Special Protection Areas (SPAs)) and certain habitats and species (Special Areas of Conservation (SACs)) have been established. Development plans or projects which may affect these European protected sites are subject to particular

consideration of their impact on the protected sites and their wildlife.

Offshore Transmission Owners (OFTO)

Considering grid connection issues the Government's new OFTO arrangements will apply to the Beatrice Offshore Wind Farm development. Under the proposed new OFTO process the sub-sea grid connection cable and transmission equipment cannot be owned by the wind farm developer. The OFTO process is at an early stage and some aspects remain under development and formal consultation. Accordingly, BOWL will monitor and keep under review the approach to the timely delivery of a transmission connection for Beatrice Offshore Wind Farm. As discussed in *Section 1.4* above the likely environmental impacts associated with this equipment will be discussed and considered at a high level within the Beatrice Offshore Wind Farm ES.

2 PROPOSED DEVELOPMENT DESCRIPTION

2.1 SITE SELECTION AND ALTERNATIVES

The decision to seek development of an offshore wind farm on the Smith Bank was guided by a series of factors.

- Previous studies by the Scottish Government and SNH indicating the area is a favoured as an area to develop large scale wind farms.
- The experience and learning gained from the Beatrice demonstrator site.
- Initial studies undertaken by the developers investigating the viability of an offshore wind farm on the Smith Bank.

The site is located on the Smith Bank which is, at its closest point, approximately 13.5 km off the Caithness coastline. The Smith Bank is an extensive sandbank which creates a large area (in total some 670 km^2) of water 35 m to 50 m deep. This combination of water depth, along with the wind resource, is ideal for development of an offshore wind farm.

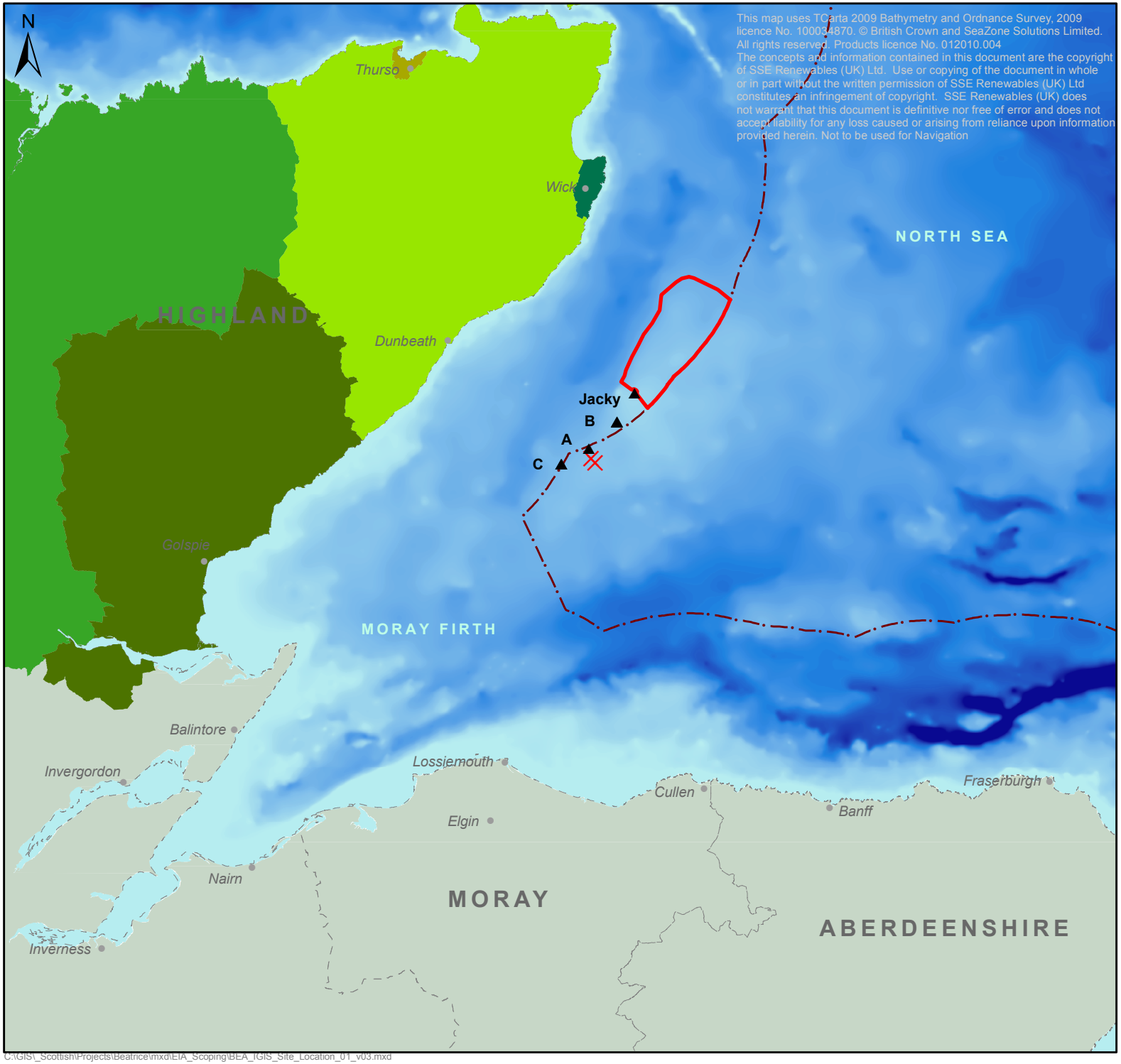
The Beatrice Offshore Wind Farm site boundary has been determined to the north and west by water depth (see *Figure 2.1b*). Both these boundaries follow the 50 m contour at the edge of the Smith Bank. To the south the site is bound by the Beatrice oil field infrastructure, more specifically the Jacky platform. To the east the site boundary is determined by the Scottish territorial waters limit (see *Figure 2.1a*).

The consideration of alternatives, for example alternative technology, design, and site layout, is currently at an early stage. Alternatives will be appraised as the EIA and engineering investigations progress. A description of the main alternatives considered will form a stand alone section within the Environmental Statement.

2.2 SITE LOCATION AND KEY CHARACTERISTICS

The Beatrice Offshore Wind Farm site is centred and located approximately 18 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 *Figure 2.1a*. The site is approximately 19 km in length and 9 km in width. The total development site area is approximately 131.5 km^2 and sits at the north-western most point of the Smith Bank. As illustrated on *Figure 2.1a* and *2.1b* the existing Beatrice demonstrator turbines (2 number) are located approximately 11 km to the south west of the proposed Wind Farm site; the existing unmanned Jacky oil platform is located adjacent to the south west of the site; and the existing Beatrice B, A and C platforms are located approximately 5, 10 and 14 km south-west of the site, respectively.

The proposed Moray Firth Round 3 offshore wind farm zone is located directly to the east of the Beatrice Offshore Wind Farm site (see *Figure 1.1*). The proposed Beatrice Offshore Wind Farm site lies in water depths between 35 – 50 m.



Beatrice Offshore Wind Farm Site Boundary

Territorial Waters Boundary

Local Authority Boundary

Existing Fixed Platform

Existing Demonstrator Turbine

Bathymetry
(Metres Below Sea Level)

0m

-220m

Northern Highland Regions

East Sutherland and Edderton

North, West and Central Sutherland

Landward Caithness

Thurso

Wick

0 5 10 20 Km

0 2.5 5 10 Nm

UK Offshore Development			
Figure: 2.1a			
Site Location			
File: BEA_IGIS_Site_Location_01_v03			
Rev: 3	Date: 23/02/10	By: NvR	Checked: MM
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Datum: WGS 1984	Projection: UTM Zone 30N		

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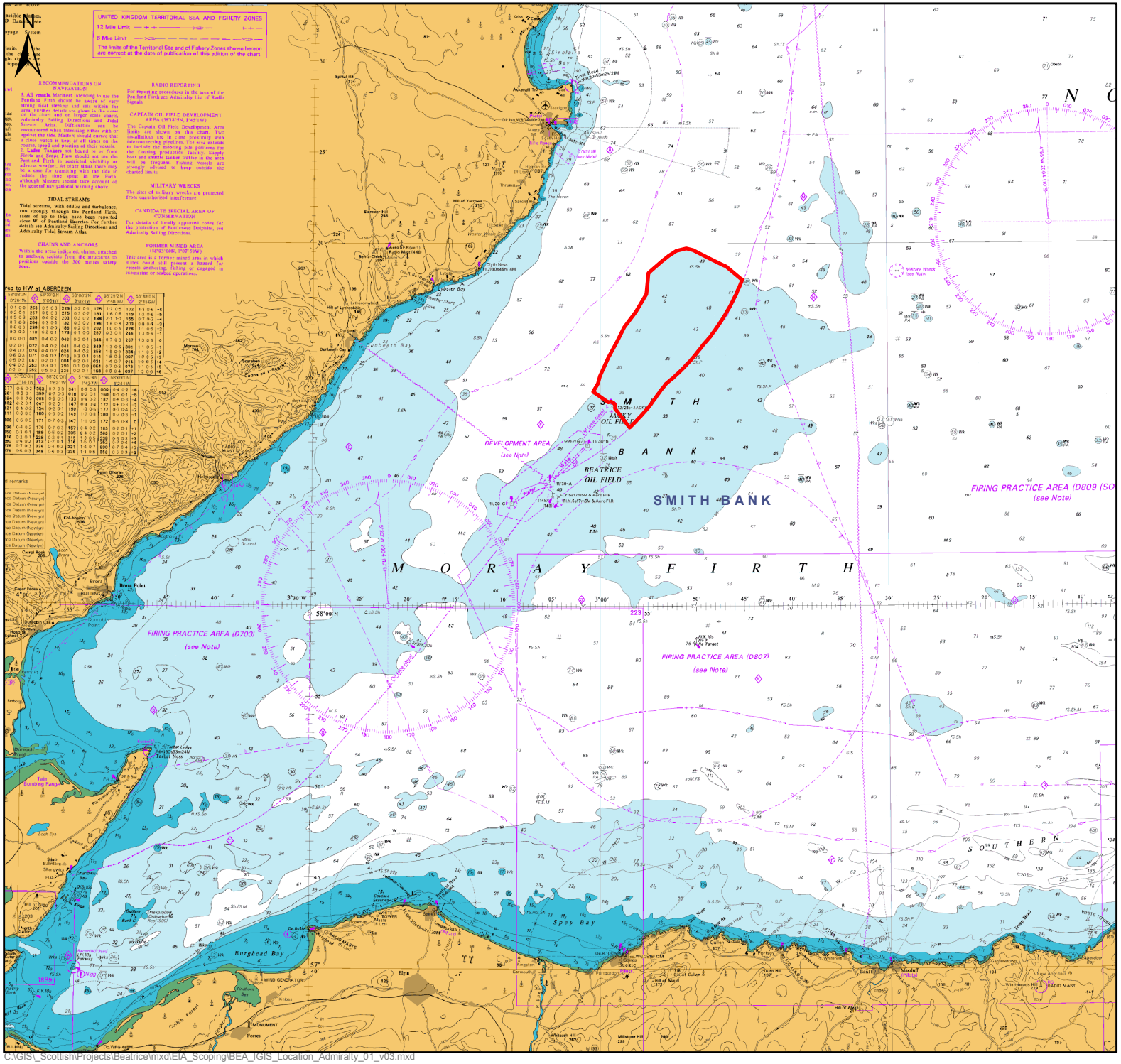

Beatrice Offshore Wind Farm Site Boundary

0 4 8 16 Km 0 2 4 8 Nm

UK Offshore Development

Figure: 2.1b

Site Location on Admiralty Chart

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Rev:3	Date: 23/02/10	By: NvR	Checked: MM
Scale: 1:550,000 A4			
Datum: WGS 1984		Projection: UTM Zone 30N	

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2.3 KEY WIND FARM COMPONENTS

2.3.1 Description

The key components required for the operational Wind Farm are listed below, each element is discussed in turn thereafter.

- Turbines (tower, nacelle, rotors and hub).
- Turbine sub-structure and foundations.
- Electricity cables at the site (inter-array only).
- Electrical substations (within site).
- The Wind Farm will have a minimum design lifespan of approximately 25 years.

Turbines

Should the turbine specification be the same as the existing 5 MW demonstrator turbines it is estimated that the Beatrice site could accommodate up to 184 turbines, giving a generating capacity of 920 MW. However, this element of the overall Wind Farm design will be subject to a detailed assessment of currently available and projected turbine designs.

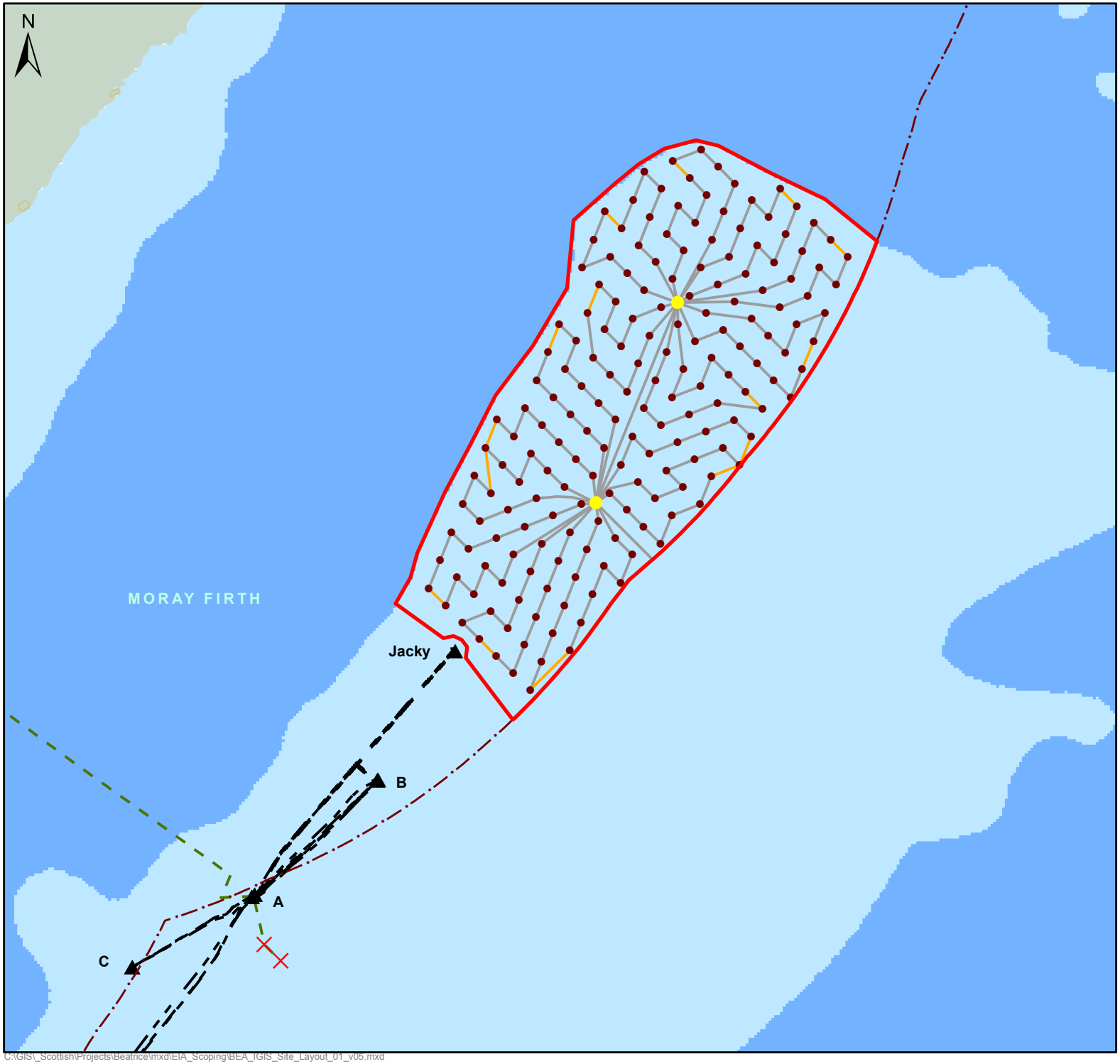
For illustrative purposes a potential site layout incorporating this specification of turbine is illustrated in *Figure 2.2*. The final design (eg turbine numbers, turbine type, generating capacity, layout of the Wind Farm etc) will ultimately be informed by a number of technical, physical, environmental, and economic considerations.

It is likely that the turbine to be employed will be similar in scale to the two demonstrator turbines currently in place at the Beatrice field. As mentioned above, each of these turbines have a generating capacity of 5 MW and weigh approximately 410 tonnes, fitted with three blades, each 63.25 m long, giving a maximum rotor diameter of approximately 132 m (including hub diameter). The rotor (comprised of the 3 blades and the hub) is mounted on a tower, which in turn is mounted on a sub-structure fixed to the seabed. The hub height is approximately 88 m above sea level. The nacelle measures approximately 19 m long by 6 m wide and 7 m high. The minimum clearance between the blade tips and the surface of the sea (at lowest astronomical tide) is approximately 25 m and the maximum blade tip height above sea level is approximately 150 m. The turbines operate at wind speeds of 3.5 metres per second to 25 metres per second (about 8 mph to 56 mph).

The colour of the Beatrice Offshore Wind Farm turbine tower assembly is likely to be matt light grey typical of other wind turbine developments, unless the Civil Aviation Authority (CAA) or stakeholder advice requires otherwise. The lighting scheme and navigation marks will be designed in consultation with aviation and marine regulators and stakeholders.

Turbine Sub-Structure and Foundations

At this stage of the project the sub-structure and foundation design are under development. The engineering team are currently undertaking a review of the potential design options in order to select the optimal approach to sub-structure and foundation design. Initial considerations have indicated that an open lattice tower of a



Beatrice Offshore Wind Farm Site Boundary

Territorial Waters Boundary

Existing Demonstrator Turbine

Potential Offshore Substation

Potential Turbine Layout

Existing Fixed Platform

Potential Cross-Array Links Added for Redundancy

Potential Inter-Array and Export Cables

Existing Pipeline

Existing Power Cable

Bathymetry

(Metres Below Sea Level)

Above 50m

Less than 50m

0 1 2 4 Km

0 0.5 1 2 Nm

UK Offshore Development

Figure: 2.2

Potential Site Layout

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Datum: WGS 1984	Projection: UTM Zone 30N

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quadropod configuration may be an appropriate design approach. The Beatrice demonstrator project uses a quadropod type of foundation technology, the specification of these being 70 m tall from seabed to tower connection point.

Currently the quadropod is under consideration along with other approaches such as monopiles and gravity base structures.

It is likely that the sub-structure elements exposed above sea level will be painted yellow for observational and navigational purposes.

Electricity Cables and Offshore Substations

Electricity produced by each turbine must be collected and transmitted to an offshore substation prior to transmittal to shore. It is likely that a number of these substations will be required at the Beatrice site. Linking the turbines together to enable the transmission of electricity will require the laying of a significant amount of cable within the site. There are a number of different construction techniques available to lay these cables and these will be investigated as designs progress. One possible option would be to plough the cable into a trench beneath the sandy surface sediments of the seabed.

Given the offshore location of the Wind Farm it is likely that the electricity generated will be converted to High Voltage Direct Current (HVDC) for transmission to the national grid (refer to *Section 1.5.2*).

Meteorological Masts

In order to assist in the finalisation the detailed design and layout of the Beatrice Offshore Wind Farm it is anticipated that one or two meteorological (met) masts will be erected on the site. These met masts will rise approximately 80 m above sea level and will support a range of anemometer and other remotely operated data gathering devices. The met masts will be subject to a separate licensing and consenting process through Marine Scotland.

2.3.2 *Construction of Key Offshore Components*

It is currently anticipated that the main construction activities of the Wind Farm will be undertaken during three to four phases. The earliest phasing could see the construction activities begin in spring 2014. The majority of the works phases thereafter are anticipated to be scheduled to avoid the worst periods of weather, usually encountered during winter. This timetable is provisional however. Access to the construction area will be required all year round, and during the construction phases it is considered that 24 hour working will be required.

There are a number of construction techniques that could be employed to install the Wind Farm components and these will be appraised during the course of the design development and EIA process. As an example, one technique could include assembling key components onshore and transporting these assembled parts to site for installation.

Various construction phases will be required and a typical programme would involve the following elements.

- Seabed preparation work undertaken if required.
- Substations and subsea cables installed.
- Construction vessels moved into position to begin foundation works.
- Key turbine components assembled onshore and transported to site.
- Turbines erected.
- Testing and commissioning undertaken.

During construction there will be a number of specialist vessels undertaking construction operations. These are likely to include a large construction vessel which may also be assisted by a number of specialist support vessels. Sub-sea cables will be laid by a specialist cable laying vessel.

2.3.3 *Operation of Wind Farm*

It is anticipated that the turbines will typically start to generate electricity at wind speeds of approximately 3.5 metres per second, rising to their maximum output at wind speeds of about 25 metres per second. If wind speeds exceed approximately 25 to 28 metres per second, the wind turbines will automatically shut down.

The Beatrice Offshore Wind Farm would operate 24 hours a day, 365 days a year. An ongoing programme of operation and maintenance activities would be developed and rolled out to support the efficient operation of the Wind Farm.

It is anticipated that this operation and maintenance programme will result in the creation of a local service base and the creation of a significant number of new permanent jobs.

Telemetry data relating to the operation of the turbines and the Wind Farm as a whole would be transmitted to an onshore service base, the operations will be monitored and controlled from this location.

A scour protection system may be required for subsea elements (eg around turbine bases).

2.3.4 *Decommissioning of Wind Farm*

The Environmental Statement is required to report on the likely significant impacts relating to the decommissioning of the Wind Farm. There are a number of factors and options that will determine any decommissioning strategy (for example, re-powering options, warranty and design life of key components).

The most likely decommissioning option(s) will be considered and assessed as part of the EIA process and will be reported in the Environmental Statement.

It is likely that a decommissioning plan will be prepared prior to the eventual decommissioning process to ensure all consent requirements, environmental impacts, and mitigation measures are fully understood and reported.

3 PROPOSED SCOPE OF THE EIA

3.1 INTRODUCTION

This section of the Scoping Report provides a description of the existing environmental conditions as they are understood at this time. The baseline conditions are presented for each topic area and, where appropriate, potential impacts of constructing, operating and decommissioning the Wind Farm considered. The proposed EIA studies, surveys and assessment methodologies for each topic area are then presented. Where relevant, potential mitigation measures have also been suggested and potential cumulative impacts identified.

It is on the content of these sub-sections (within *Section 3*) that the applicant is seeking to obtain opinion from the Scottish Government, its agencies and stakeholders. Information and opinions on the potential impacts of the construction or operation of the scheme; the scope of the assessment proposed; and any other existing information that may be available and of relevance to the EIA process would be welcomed.

3.2 PHYSICAL ENVIRONMENT

3.2.1 Coastal Processes

Baseline - Tidal Regime

Tidal range

The manner in which tidal range changes through the Moray Firth can be best illustrated using a co-tidal chart (*Figure 3.1*), with the most widely available information being derived from the Renewables Atlas (ABPmer et al, 2008) [9]. This figure indicates that within the Beatrice Offshore Wind Farm site tidal range varies between 2.8 and 3.1 m during mean spring tides and between 1.4 and 1.5 m during mean neap tides, with tidal range generally increasing westwards.

Tidal Currents

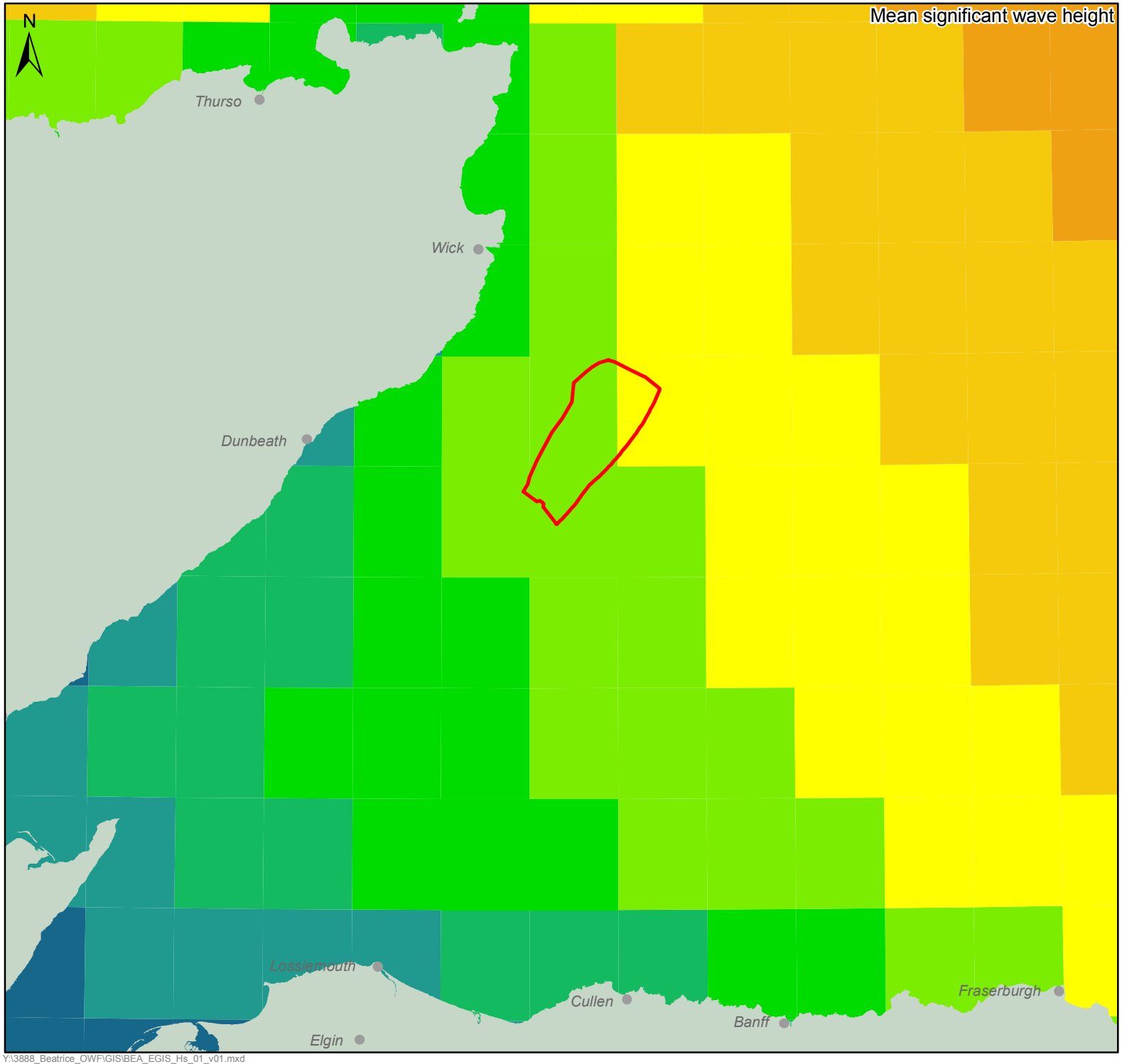
The relevant data for tidal currents (ABPmer et al, 2008) [9] indicates that peak currents vary between 0.52 and 0.45 metres per second during a mean spring tide, and 0.26 and 0.22 metres per second during a mean neap tide. Spatially, current speeds generally decrease towards the west.

Non-Tidal Influences

Non-tidal surges are formed by rapid changes in atmospheric pressure. These effects can cause water levels to fluctuate considerably above or below the predicted tidal level and have the potential to modify predicted current vectors within the Beatrice Offshore Wind Farm site.

The development of the Beatrice Offshore Wind Farm will also need to take account of predicted sea level rise in Scotland.

(9) ABPmer, Met Office and POL, 2008. Atlas of UK Marine Renewable Energy Resources: Atlas Pages. A Strategic Environmental Assessment Report, March 2008. Produced for BERR. Report and associated GIS layers available at: http://www.renewables-atlas.info/



Beatrice Offshore Wind Farm Site Boundary

Significant wave height (m)

> 2.76	1.51 - 1.75
2.51 - 2.75	1.26 - 1.50
2.26 - 2.50	1.01 - 1.25
2.01 - 2.25	0.76 - 1.00
1.76 - 2.00	0.51 - 0.75
	< 0.50

Annual Mean Significant Wave Height (m) sourced from Atlas of UK Marine Renewable Energy Resources

0 3 6 12 Km

0 1.5 3 6 Nm

UK Offshore Development

Figure: 3.1

Annual Mean Significant Wave Height

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Scale: 1:600,000 A4

Datum: WGS 1984	Projection: UTM Zone 30N

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ABP mer marine environmental research

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Baseline - Wave Regime

Figure 3.2 indicates that the wave climate within the Wind Farm site is relatively active with an annual mean significant wave height ranging between 1.33 and 1.54 m. Instantaneous significant wave heights of 2-2.5 m are experienced in the Outer Moray Firth for approximately 10 % of the year [10].

The largest waves encountered within the Moray Firth will originate in the North Sea and approach the site from northerly through easterly or south-easterly sectors where the available fetch is relatively large. Wave heights will however be smaller and more spatially variable when the wind is from other directional sectors, due to the more limited fetch.

Baseline - Marine Sedimentary Regime

Seabed Deposits

A desk-based geotechnical site evaluation has been undertaken on behalf of BOWL by Senergy Survey & GeoEngineering Ltd [11]. They report that the seabed of the Outer Moray Firth is predominantly fine sands down to a depth of about 50m.

Off Lossiemouth on the south coast of the Firth, at the mouth of the River Spey, there is over 100 km^2 of gravel deposits. Smaller patches of gravel are found along the north west coast of the Firth [12].

In the Inner Moray Firth, within the SAC, there are sandbanks that qualify as Annex 1 habitats.

Seabed Mobility

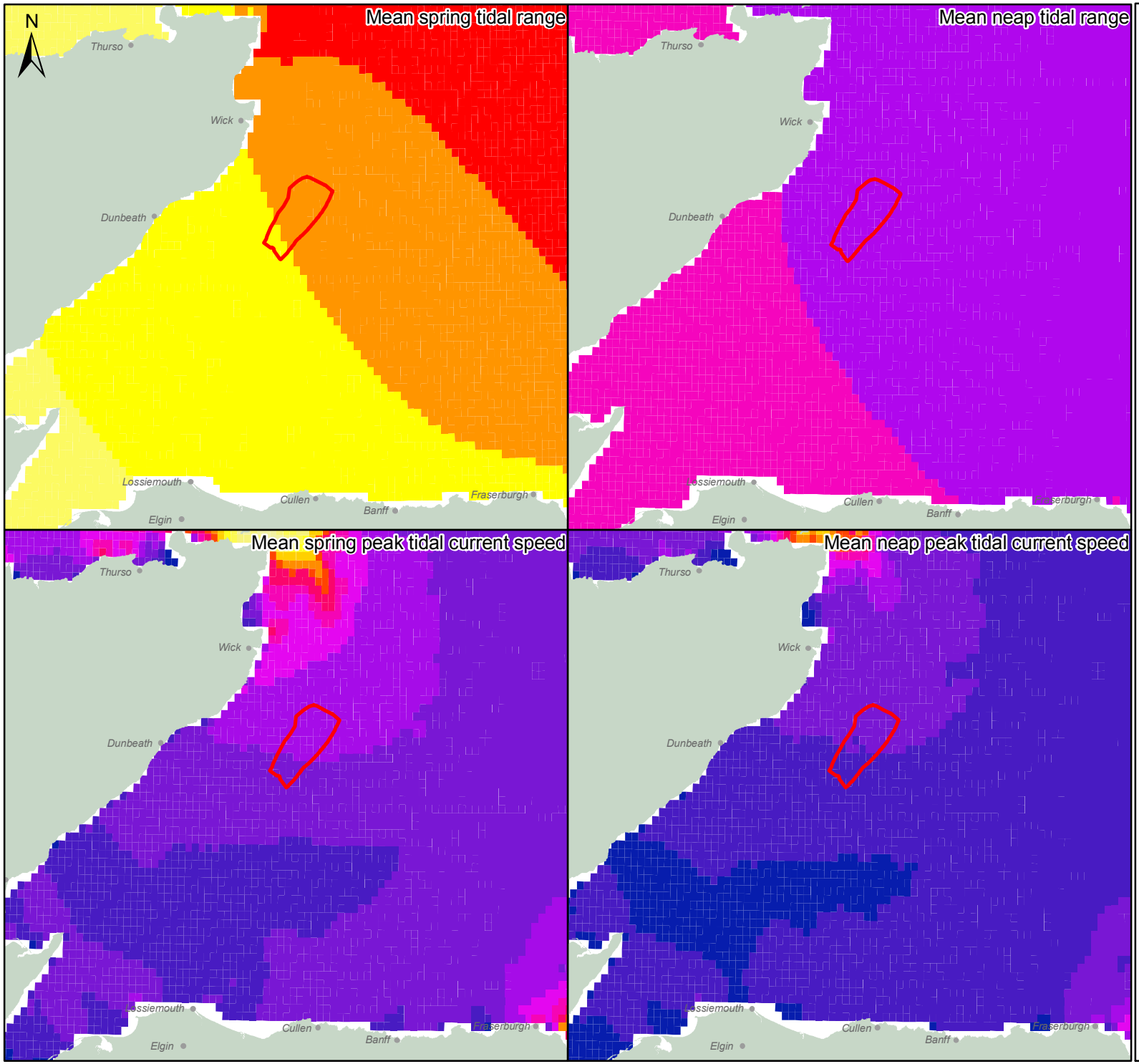
Marine sediment is thought to enter the Moray Firth from the north and migrates out to the south east [13]. There is, however, presently insufficient evidence to estimate the rate and direction of sediment transport, which will vary spatially and temporally depending upon the interaction between wind, waves and tidal currents and the local effect of deep channels, bank features, firths and headlands.

Net sediment transport into and within the Moray Firth, including over the Smith Bank, is thought to be intermittent (limited in frequency) and related to low-frequency, high energy (i.e. storm) events [14].

It is considered likely that sediment mobility will vary spatially across the Smith Bank and within the Beatrice Offshore Wind Farm site, due to variations in water depth and relative exposure to waves.

(10) Comber, D.P.M., Hansom J.D., Fahy F.M., 1994 Culbin sands, Culbin Forest and Findhorn Bay SSSI: Documentation and management, SNH
(11) Senergy Survey and GeoEngineering, Beatrice Offshore Windfarm Geotechnical Site Evaluation, July 2009

(12) Andrews IJ, Long D, Richards PC, Thomson AR, Brown S, Chesher JA, & McCormac M (1990). United Kingdom Offshore Regional Report: The geology of the Moray Firth. HMSO, London.
(13) Reid G & McManus J (1987). Sediment exchanges along the coastal margin of the Moray Firth, eastern Scotland. Journal of the Geological Society 144: 179-185.
(14) ABPMer (2009). R3 Sediment Gap Analysis. Report prepared by ABPMer Ltd for the Crown Estate. Report No. R.1538.



Beatrice Offshore Wind Farm Site Boundary

Mean tidal range (m)

- > 4.01
- 3.51 - 4.00
- 3.01 - 3.50
- 2.51 - 3.00
- 2.01 - 2.50
- 1.51 - 2.00
- 1.01 - 1.50
- 0.51 - 1.00
- < 0.50

Mean peak tidal current speed (m/s)

- > 4.01
- 3.51 - 4.00
- 3.01 - 3.50
- 2.51 - 3.00
- 2.01 - 2.50
- 1.76 - 2.00
- 1.51 - 1.75
- 1.26 - 1.50
- 1.01 - 1.25
- 0.76 - 1.00
- 0.51 - 0.75
- 0.26 - 0.50
- 0.11 - 0.25
- < 0.10

Mean tidal range (m) and mean tidal peak current speed (m/s) sourced from Atlas of UK Marine Renewable Energy Resources

0 6 12 24 Km

0 3 6 12 Nm

UK Offshore Development

Figure: 3.2

Mean Tidal Range and Peak Current Speed

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Datum: WGS 1984	Projection: UTM Zone 30N

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Suspended Sediment Concentrations

There is no evidence at this stage for significant quantities of fine sediment to exist in the surficial seabed sediments of the Outer Moray Firth. Therefore, it might be expected that intermittent peaks of suspended concentration will be observed, primarily as a result of storms, with a magnitude controlled locally by the wave intensity and water depth.

An ecosystem model was used in Baxter *et al.* (2008) [15] to provide a map of suspended sediment concentrations in the North Sea including the Moray Firth. The reported range of depth mean values in the Firth was approximately <5-10 mg/L, however, the degree of validation or comparison against any in-situ samples was not reported.

Potential Impacts – Construction / Operation / Decommissioning

Potential impacts of the Beatrice Offshore Wind Farm, both alone and in combination with other proposed developments, during each lifetime phase are identified below according to the Cefas (2004) [16] and COWRIE (2009 [17]) guidance. These items will be taken forward for further consideration in the EIA. Further details regarding sensitive receptors and the proposed methods for assessment are given in the following section.

Potential impacts during the construction phases have been identified as the following.

- Increase in suspended sediment concentration during installation of foundations or cables, or the initial phases of seabed scouring around foundations.
- Seabed compaction or smothering in the footprint of foundations during construction, leading to mortality of sensitive marine life in these areas.

Potential impacts during the operational phase have been identified as the following.

- Changes to patterns of tidal currents and wave activity leading to changes in sediment transport pathways (suspended or bedload) and the form and function of the Smith Bank, impacting on sensitive receptors.
- Impacts on swell waves.
- Changes to erosional / depositional processes along the adjacent coastline impacting on morphology and consequently on sensitive receptors.

Potential impacts during the decommissioning phases have been identified as follows.

- Increase in suspended sediment concentration during removal of foundations or cables.

(15) Baxter, J.M., Boyd, I.L., Cox, M., Cunningham, L., Holmes, P., Moffat, C.F., (Editors), 2008. Scotland's Seas: Towards Understanding their State. Fisheries Research Services, Aberdeen. pp. 174.
(16) Cefas 2004. Offshore Wind Farms: Guidance note for Environmental Impact Assessment in respect of FEPA and CPA requirements, Version 2. June 2004.
(17) COWRIE, 2009 Coastal Process Modelling for Offshore Wind Farm Environmental Impact Assessment: Best Practice Guide. www.offshorewindfarms.co.uk

Potential cumulative and in-combination effects on coastal processes can be identified at this stage as those listed below.

- The interaction between plumes of sediment created by the coincident installation of foundations or burial of cables as part of the Beatrice Offshore Wind Farm and Moray Firth Round 3 site developments during the construction phase, leading to enhanced levels of suspended sediment concentration or rates or thicknesses of sediment deposition, impacting on sensitive receptors.
- The cumulative changes to patterns of tidal currents and wave activity as a result of the presence of both the Beatrice Offshore Wind Farm and Moray Firth Round 3 site foundations in the operational phase, leading to changes in sediment transport pathways (suspended or bedload) and the form and function of the Smith Bank, impacting on sensitive receptors.
- The cumulative attenuation of waves as a result of the presence of both the Beatrice Offshore Wind Farm and Moray Firth Round 3 site developments in the operational phase, leading to greater changes or likelihood of changes in erosional / depositional processes along the adjacent coastline impacting on morphology and consequently on sensitive receptors.

Studies, Methods and Assessment

Each of the potential impacts identified in the previous section will be considered as part of the EIA. The requirements for assessment of each item will be individually considered as part of the EIA according to the best practice guidance in this regard found in COWRIE (2009).

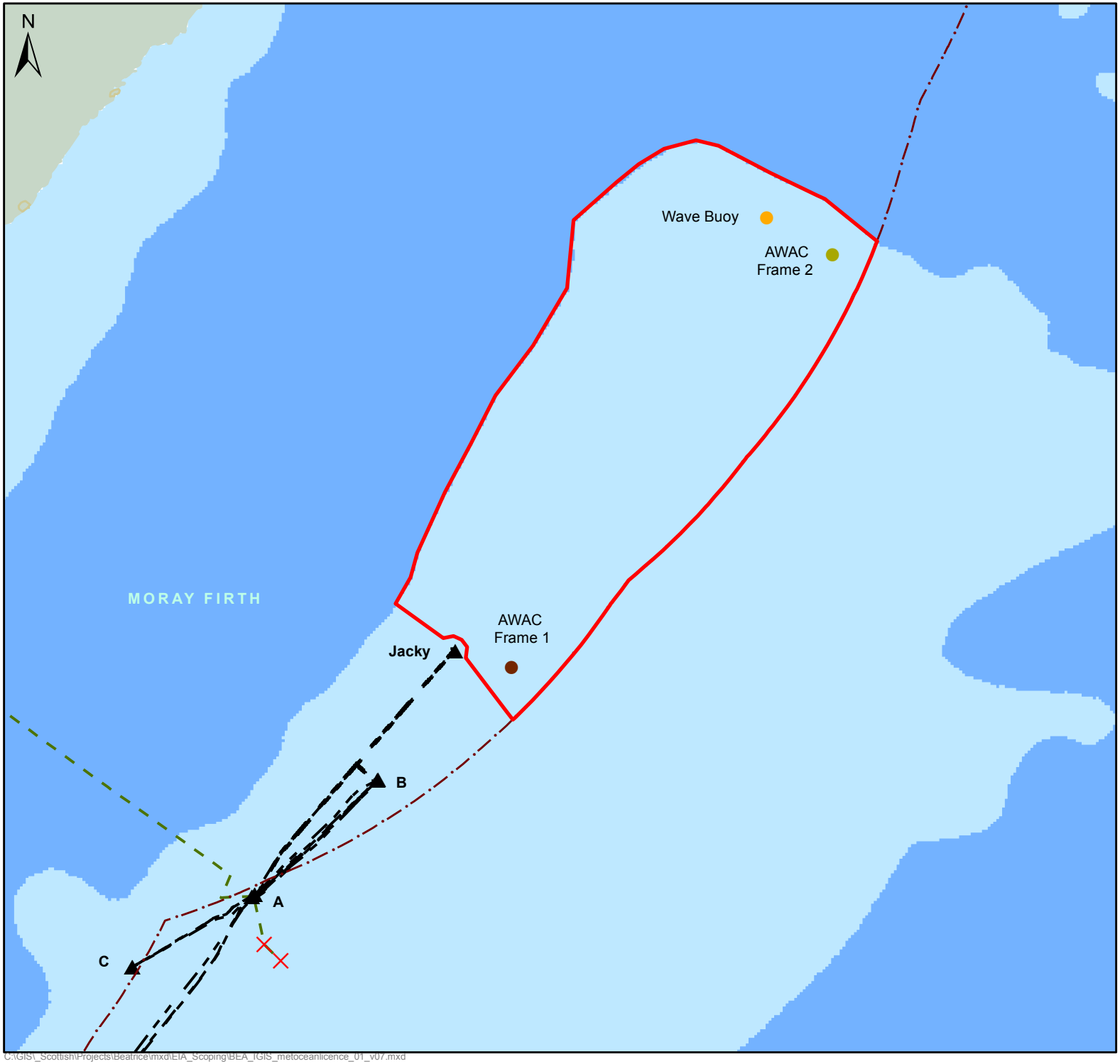
It will initially be necessary to identify and characterise any sensitive receptors present which might be potentially impacted by the Wind Farm as a result of changes/ impacts on coastal processes. Sensitive receptors may be environmental or socio-economic in nature.

In relation to the potential data requirements to inform desk-based assessment or further modelling studies, a historical environmental data search and a data gap analysis have been undertaken, including the following general data types.

- Bathymetry.
- Sediments.
- Waves.
- Tidal water levels.
- Tidal currents.

To address the data gaps identified, the following additional data collection will be undertaken.

- To provide in-situ wave, tidal and suspended sediment data scientific monitoring equipment was deployed by BOWL in February 2010. These deployments include the following equipment, the locations of these are identified on *Figure 3.3.*
  - Two seabed frames, each containing an acoustic profiler device (measuring water depth, tidal current profiles and wave climate. This equipment is called a Nortek AWAC device. The frame also hosts an



Beatrice Offshore Wind Farm Site Boundary

Territorial Waters Boundary

Existing Pipeline

Existing Power Cable

Bathymetry

(Metres Below Sea Level)

Above 50m

Less than 50m

Metocean Equipment Deployment

AWAC Frame 1

AWAC Frame 2

Wave Buoy

Existing Fixed Platform

Existing Demonstrator Turbine

0 1 2 4 Km

0 0.5 1 2 Nm

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Figure: 3.3

Metocean Equipment

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Datum: WGS 1984	Projection: UTM Zone 30N

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  - Optical Backscatter Sensor (OBS) measuring suspended sediment concentration.
  - One wave buoy (measuring wave climate).
- Bathymetry will be assessed initially using available charted bathymetry data, however, additional swath bathymetry and side scan sonar data will be obtained by a geophysical survey.
- A low power seismic survey will be undertaken to provide information on the sub-seabed geology.
- A geotechnical survey campaign collecting borehole samples of the marine sediments will be undertaken.
- Seabed sediment sampling (undertaken as part of the ecological survey) in conjunction with particle size analysis will provide information on seabed sediment composition and distribution.
- Drop-down video surveys will provide further qualitative information on seabed features and sediment type.

Predictive studies relating to sediment scour around foundations will be undertaken using accepted and industry standard empirical approaches (eg DNV, 2007) [18].

The understanding of the baseline sediment transport processes and pathways (without the Wind Farm structures in place) will be developed through the following approaches.

- A review of the geophysical survey data for bedform orientation and asymmetry.
- A review of the grab sample and geophysical survey data to characterize the distribution of sediment type.
- A review of any relevant previous studies.
- Numerical modelling of sediment transport pathways, incorporating use of a hydrodynamic model validated using field data.

Where specific numerical modelling studies are required, a suitable marine environmental tool, such as the DHI MIKE21 modelling suite, will be used. These models will be developed in conjunction with and validated using the historical and field data, as described above. The models can be used to further investigate patterns of tidal, wave and sedimentary (bedload and suspended load) processes across the areas of concern, and the potential impact of the Wind Farm development.

Potential Mitigation

Potential mitigation options will be considered as part of the main EIA, the details of which are pending the outcomes of the assessments recommended above.

3.2.2 *Geology*

Baseline

A desk-based geotechnical site evaluation has been undertaken on behalf of BOWL by Senergy Survey and GeoEngineering. A report [19] prepared

(18) DNV (October 2007). Design of Offshore Wind Turbine Structures. Offshore Standard DNV-OS-J101. As amended 2009.

(19) Senergy Survey and GeoEngineering, Beatrice Offshore Windfarm Geotechnical Site Evaluation, July 2009

presents the current state of knowledge of the Beatrice Offshore Wind Farm area. The sections below draw from this report.

As illustrated in *Figure 3.4* the seabed of the Moray Firth generally comprises coarse sands and fine gravels. Offshore the sediment is predominantly fine sands down to a depth of about 50 m. In the area off Lossiemouth, on the south coast of the Firth, there is over 100 km^2 of gravel deposits. Smaller patches of gravel are found along the north west coast of the Firth [20].

The Quaternary units comprise medium dense to very dense fine to coarse sand and stiff clay, isolated cobbles and boulders and are 15-30 m thick (up to 50 m locally). The underlying Lower Cretaceous deposits are hard to very hard clay with layers of fine sand and mica, clayey siltstone and sandstone. The Quaternary sediments to the north of the Beatrice Offshore Wind Farm thin to less than 10 m of soil deposits. It is possible this thinning may also occur within the northern area of the Beatrice Offshore Wind Farm. This will be confirmed during the geophysical surveys that will be undertaken to inform detailed engineering design.

Potential Impacts – Construction / Operation / Decommissioning

Impacts to the underlying geology of the area are unlikely during any phase and it is considered that the EIA need not assess this topic area in detail. As a result it is proposed that the topic area of Geology will be scoped out of the EIA.

Although not to be reported in the Environmental Statement the geology will, however, be surveyed as this information will be required to determine detailed engineering design.

Studies, Methods and Assessment

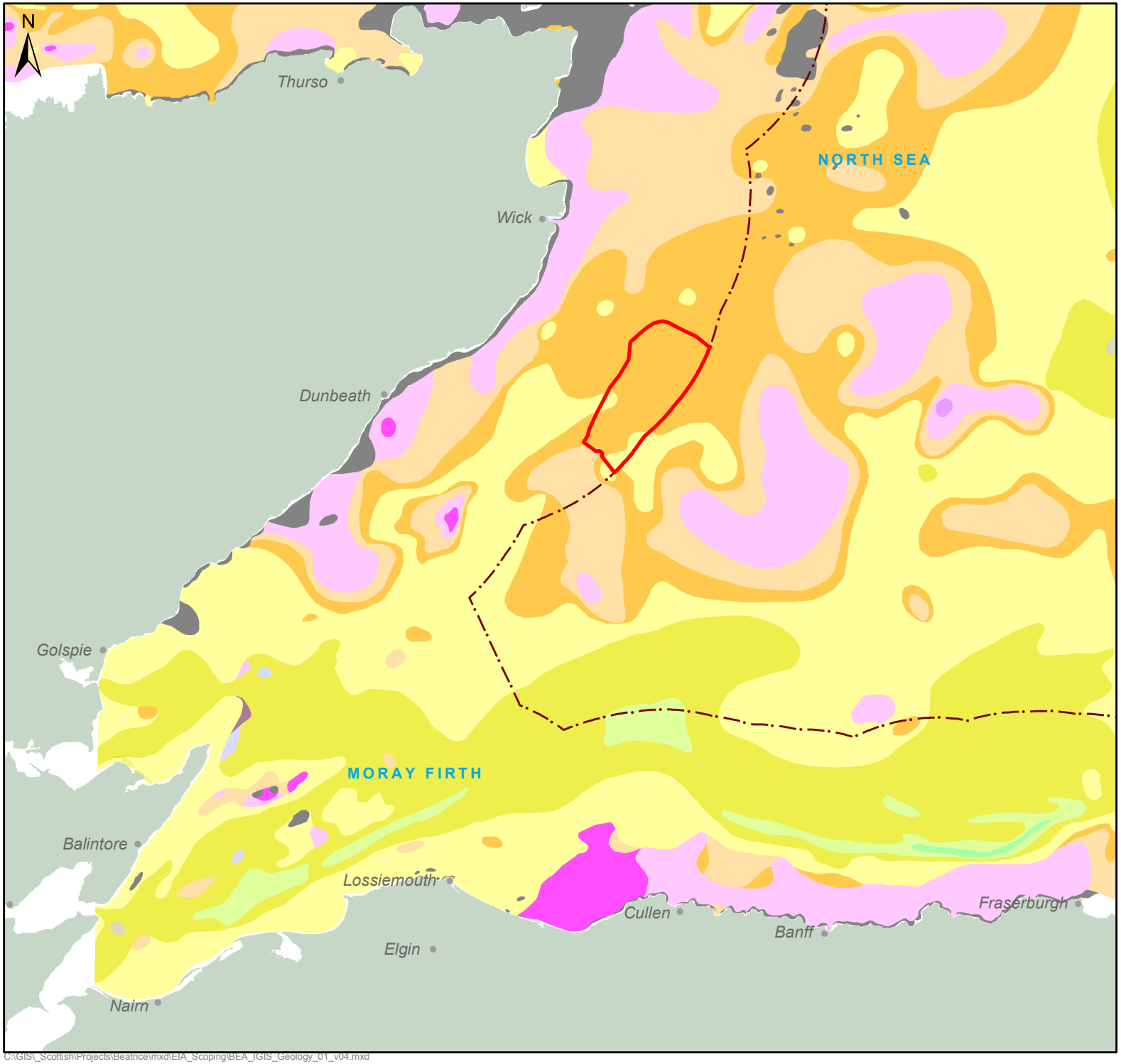
A site survey strategy has been prepared for BOWL by Senergy Survey and GeoEngineering. The strategy focuses on three potential phases.

- Phase 1 - Geophysical Survey (covered above in Bathymetry).
- Phase 2 – Initial Geotechnical Survey (including geotechnical boreholes, for Met Mast locations).
- Phase 3 – Detailed Geotechnical Survey.

Potential Mitigation

No significant impacts are predicted to the geology, although, the choice of foundation for the turbines will determine the footprint on the seabed and the technique required to attach the foundation to the seabed.

(20) Andrews IJ, Long D, Richards PC, Thomson AR, Brown S, Chesher JA, & McCormac M (1990). United Kingdom Offshore Regional Report: The geology of the Moray Firth. HMSO, London.



Beatrice Offshore Windfarm Site Boundary
Territorial Waters Boundary
Mud
Sand
Gravel
Rock
Sandy Mud
Gravelly Mud
Muddy Sand
Slightly Gravelly Sand
Slightly Gravelly Muddy Sand
Gravelly Muddy Sand
Gravelly Sand
Muddy Gravel
Muddy Sandy Gravel
Sandy Gravel

0 4 8 16 Km
0 2 4 8 Nm

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Figure: 3.4

Moray Firth Seabed Sediment

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Datum: WGS 1984	Projection: UTM Zone 30N

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3.2.3 *Air Quality*

It is proposed that air quality be scoped out of the assessment as no negative impacts of significance are anticipated.

3.2.4 *Noise and Vibration*

The noise and vibration assessment will be split between marine (underwater) and airborne noise and vibration. A specialist will be contracted by BOWL to undertake the required data gathering and assessments in relation to noise and vibration impacts.

Baseline

Marine

The existing noise environment at the Wind Farm site is not yet known. Ambient and background noise levels in the marine environment are highly variable. Ambient sea noise comprises a variety of individual sources, some of which are natural and some man-made. Anthropogenic sources of noise include shipping and fishing activities and the nearby oil and gas activities. Naturally occurring noise includes sources such as breaking waves, wind, rain and animal calls. However, ambient noise levels in coastal environments are generally thought to be higher than in offshore environments (21).

Airborne

The existing background noise levels at terrestrial noise sensitive receptors are not known. These are likely to be residential and commercial developments on the closest shorelines to the Wind Farm site. Due to the distance between the wind turbines and these receptors, and anticipated background noise from wind and other sources, disturbance caused by wind turbine noise is not expected to be significant.

Potential Impacts – Construction / Operation / Decommissioning

Marine

Potential underwater noise and vibration impacts from marine activities during construction and decommissioning have been identified as follows.

- Noisy activities such as vessel movement, trenching and piling. These activities have the potential to adversely affect marine mammals and fish.

These effects can result in behavioural responses, or at much higher sound levels, can result in temporary or permanent deafness (22). As discussed above, the key receptors to underwater noise from the Beatrice demonstrator project were identified to be bottlenose dolphins, harbour

(21) Nedwell, J. R., Langworthy, J. & Howell, D. (2003). Assessment of sub-sea acoustic noise and vibration from offshore wind turbines and its impact on marine wildlife; initial measurements of underwater noise during construction of offshore wind farms, and comparison with background noise. Subacoustech Report No 544RO423. Published by COWRIE.

(22) Turnpenny, A. W. H., Thatcher, K. P., & Nedwell, J. R. (1994). The effects on fish and other marine animals of high-level underwater sound. Report FRR 127/94, Fawley Aquatic Research Laboratories, Ltd., Southampton, UK.

porpoises, grey seals, common (or harbour) seals, minke whales and salmon. As the demonstrator project is close to the proposed location of the Beatrice Offshore Wind Farm site it is likely that similar key receptors will be identified during the full EIA for this project. There may also be potential that fish spawning grounds are located within proximity to the Wind Farm site. Any such areas will be identified and the noise and vibration impact assessed.

Potential noise and vibration impacts from marine activities during operational phases are considered to be significantly lower than construction/ decommissioning noise impacts. The operational effect on marine mammals such as dolphins and seals may prove to be insignificant but will need to be assessed as part of the full EIA.

Airborne

Potential airborne noise and vibration impacts from marine activities during construction and decommissioning have been identified as follows.

- Noisy activities such as manoeuvring large vessels and constructing/removing the turbines, has the potential to adversely affect sensitive human receptors.

Potential airborne noise and vibration impacts during operational phases are likely to be minimal. Given the distances between the Wind Farm site (13.5 km to nearest coastline) and any noise sensitive receptor it is considered that airborne construction noise will not be significant. Given this it is proposed that airborne noise be scoped out of the EIA.

Potential cumulative and in-combination effects resulting from noise and vibration can be identified at this stage as follows.

- It is possible that cumulative impacts of a similar type to those discussed above may arise from the Beatrice Offshore Wind Farm being constructed/ decommissioned in parallel or in sequence with the nearby Moray Firth Round 3 wind farm.

Studies, Methods and Assessment

A specialist will be contracted by BOWL to undertake the required data gathering and assessments in relation to noise and vibration. Underwater noise surveys will be conducted as part of the full EIA.

The underwater noise source levels and duration of use for the construction and operational equipment to be used will be obtained. This information will be used to undertake a predictive modelling of the anticipated likely worst case underwater noise levels arising from the construction and operation of the Wind Farm. These predictions will then be referenced against the distribution and population of sensitive marine mammals and fish to determine impact levels. The levels of noise and vibration emitted during construction and operation of offshore wind farms and the effects on fish and marine mammals is relatively well known. Impacts on fish and marine mammals are discussed below in *Section 3.3*.

Potential Mitigation

The approach to foundation design and their seabed attachment methods will aim to minimise the noise and vibration impacts.

Based on the proposed research, expert advice and the data gathering exercise, trigger limits will be set and agreed with SNH for underwater noise during construction. As far as possible noisy activities (including any required piling activities if this technique is used) and other works will be phased and managed to ensure these trigger limits are not exceeded.

During construction it is anticipated that, if required, marine mammal watches will be adopted prior to the start of any activities considered to be in exceedance of agreed noise limits. Watches will ensure activities do not commence with marine mammals in the immediate area. Techniques, such as 'soft starts', will allow time for sensitive marine mammals to leave the area before noisy operations commence.

3.2.5 *Traffic and Transport*

Given the proposals relate solely to the marine elements of the Wind Farm project (OFTO will be subject to separate licensing and permissions) it is considered that land based traffic and transport impacts would not give rise to significant environmental impacts. At this stage it is anticipated that turbine components would be delivered to a suitable port facility by sea before being transferred to the Beatrice Offshore Wind Farm site to be erected.

In this regard it is considered that land based traffic and transport will be scoped out and not assessed as part of the EIA. However, this element of the EIA will be kept under review by the BOWL team as the approach to construction is finalised. Marine shipping and navigation will however be assessed in detail (see *Section 3.4.5*).

3.3 *Biological Environment*

3.3.1 *Introduction*

This section of the Scoping Report looks at the biological environment and how the EIA for the Beatrice Offshore Wind Farm will consider and address potential impacts on the ecology, nature conservation and natural resources in the Outer Moray Firth. Cumulative and in-combination impacts will also be an important considerations during the EIA and thought is given in the following sections as to how these impacts may be assessed in the most efficient and effective way.

3.3.2 *Plankton*

Baseline

Phytoplankton off the north east coast of Scotland are dominated by diatoms, dinoflagellates and pico/nanoplankton (the smallest plankton groups). The most frequently recorded taxa are dinoflagellates (*Ceratium*) which are increasingly dominating phytoplankton populations [23].

(23) DTI, 2004a. Strategic Environmental Assessment of parts of the northern and central North Sea to the east of the Scottish mainland, Orkney and Shetland. SEA 5, May, 2004.

Zooplankton populations are dominated by copepods, particularly *Calanus helgolandicus* and *Calanus finmarchicus*. Meroplankton are the larval stages of bottom living (benthic) species. They include echinoderms (starfish and sea urchins), decapods (crabs and lobsters) and coelenterates (jellyfish). The higher concentrations of meroplankton in the North Sea are not observed off the north east coast of Scotland. Megaplankton are much larger zooplankton and include euphausiids (krill), thaliacea (salps and doliolids), siphonophores and medusae (coelenterates). This group are more abundant off the north east coast of Scotland than in the rest of the North Sea but their numbers have been declining.

Potential Impacts – Construction / Operation / Decommissioning

It is not anticipated that plankton will be significantly affected by the Beatrice Offshore Wind Farm project so it is proposed that this topic is scoped out of the EIA.

3.3.3 *Seabed Marine Life*

Baseline

The seabed marine life (benthos and epibenthos) of the Smith Bank itself is relatively well studied with data from a number of separate surveys available [24]. The resource of available information on the Smith Bank is mainly associated with the oil field developments along with the Beatrice demonstrator project site, and so existing data is concentrated to the south western area of the Smith Bank.

The Smith Bank, which appears to support a relatively rich seabed community of animals which are broadly representative of the moderately deep, moderately tide swept, sandy environments found in the North Sea. The animal communities living within the seabed are dominated by bivalve molluscs, polychaete worms and the amphipod crustaceans. There is a good level of consistency between the previous surveys, each recording broadly similar environmental conditions: sandy substrates supporting worm and bivalve dominated faunal communities living within the sandbank.

On the surface of the seabed the animal community is dominated by sponges and bryozoans growing on the occasional rocky or stony habitat within the predominantly sandy seabed. The large northern anemone (*Bolocera tuediae)* and the common northern spider crab (*Hyas coarctatus)* have also been recorded in more recent surveys on the Smith Bank.

It is known that boulders or groups of boulders occur on the Smith Bank and that these have a more diverse animal dominated community associated with them.

Commercial shellfish species are occur throughout the Moray Firth. The prawn (*Nephrops norvegicus)* is found in muddy areas of the Outer Firth and into the central North Sea whilst the sandier sediments of the sandbanks in the Outer Firth are

(24) Reviewed in Eleftheriou, A. Basford, D. Moore, D.C., 2004 Synthesis of Information on the Benthos of Area SEA 5, DTi (www.offshore-sea.org.uk)

suitable habitat for the King scallop (*Pecten maximus)*. The gravelly and sandy areas of the Smith Bank are amongst the most important areas for scallop fishing in the Firth.

There are a number of other commercially exploited shellfish species which are found in the Moray Firth, principally lobster, edible crab, whelks, razorfish, cockles, and mussels, however only whelk and edible crab are likely to occur on the Smith Bank.

The large horse mussel (*Modiolus modiolus*) is common throughout the Moray Firth, although its abundance on the Smith Bank is not known at present. More recently the introduced mussel species Magellan mussel (*Aulaomya ater*) has been recorded in the Moray Firth. There are no records of this species being present on the Smith Bank and its abundance at the Beatrice Offshore Wind Farm site is therefore unknown at present.

Potential Impacts – Construction / Operation / Decommissioning

Potential impacts during construction may include the following.

- Seabed disturbance and habitat loss from the installation of the seabed cables, turbine and substation foundations.

Following the laying of cables in trenches (if this technique is utilised) it is anticipated that the seabed would quickly restore and marine communities would re-colonise and recover within a few years. It may also be the case that the introduced turbine and substation sub-structures act as habitat themselves.

Potential impacts during the operational phase may include the following.

- The permanent physical habitat loss at each turbine and substation foundation.
- Localised impacts on tidal flows and sediment transport.
- Small changes in the make up of benthic communities.

Once operational, offshore wind farms tend to have a relatively small footprint within their development area. The total Beatrice Offshore Wind Farm site area is 131.5 km^2 although the total habitat loss resulting from foundations is predicted to be much less than 0.1 km^2.

In common with other offshore wind farms the installation of wind turbine foundations may have minor and minimal localised impacts on tidal flows and sediment transport due to scouring and localised changes in current regime. Over the larger area, the impacts are likely to be comparatively small and may result in small changes in the benthic communities associated with these areas.

Potential impacts during decommissioning may include the following.

- Seabed disturbance during the removal of seabed cables, turbine and substation foundations.

Potential cumulative and in-combination effects can be identified at this stage as listed below.

- It is possible that cumulative impacts of a similar type to those discussed above may arise from the Beatrice Offshore Wind Farm being constructed/ decommissioned in parallel or in sequence with the nearby Moray Firth Round 3 Wind Farm.

Studies, Methods and Assessment

It is considered likely that there is already sufficient contextual survey data for the benthic communities of the Smith Bank and Outer Moray Firth. It is recognised that further site specific information is required to allow the assessment of impacts on the immediate benthic communities within the Beatrice Offshore Wind Farm site. As a result it is intended that a number of marine biological survey techniques are used to gather information on the marine ecology of the area of the Wind Farm, including the following presented below.

- Using the geophysical survey data, broad seabed types and features, including any areas of boulders, can be identified and a survey campaign designed.
- A grab survey campaign will be undertaken to permit a comprehensive and quantitative assessment of the communities present.
- To be able to assess the epibenthic fauna, and area of boulders encountered, a campaign of drop down video or remote operated vehicle (ROV) surveys will be undertaken and analysed to provide semi-quantitative data.

Benthic ecology specialists will be contracted to undertake the required data gathering and assessments in relation to impact on seabed marine life.

Potential Mitigation

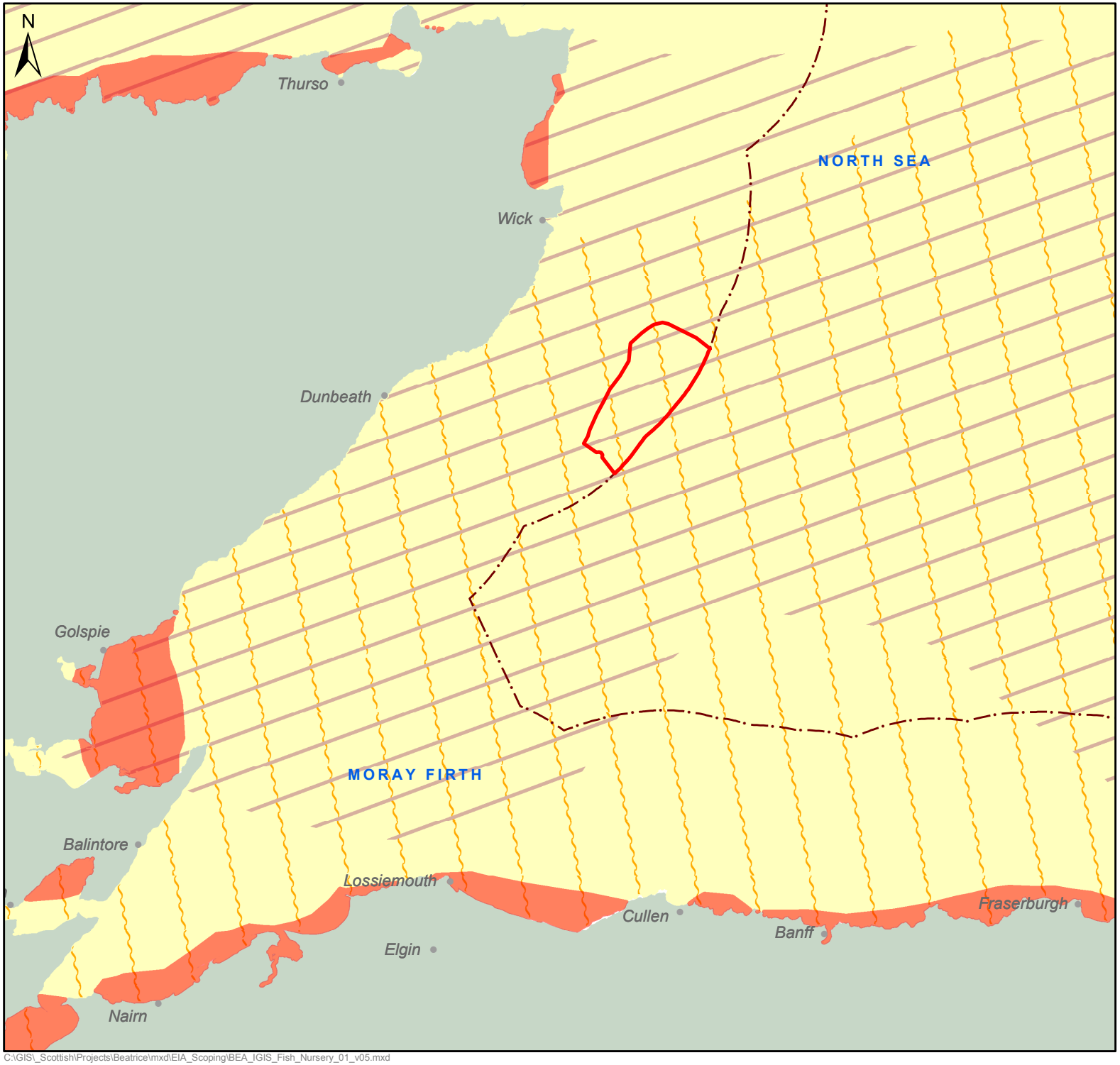
It is possible that boulder groups may be discovered within the Beatrice Offshore Wind Farm development area. Wherever possible, impact on these 'islands' of marine biodiversity will be avoided through micro-siting of the turbines and other seabed structures. The design of the foundations will be developed to minimise the required benthic footprint of the turbines as far as possible. Modern cable laying approaches will minimise the area of disturbance caused by installation.

3.3.4 *Fish Ecology*

Baseline

The Smith Bank area is identified, in full or in part, as a spawning and nursery area for a variety of fish species. The obtained SeaZone data presented in *Figures 3.5 to 3.8* illustrate the likely spawning and nursery areas within the boundary of the Wind Farm site for relevant species. The species identified within the Wind Farm boundary are listed below.

- Nursery: plaice; haddock; nephrops; lemon sole; sandeel; herring; saithe and whiting.
- Spawning: cod; lemon sole; nephrops; sprat; plaice; sandeel.



Beatrice Offshore Wind Farm Site Boundary

Territorial Waters Boundary

Plaice Nursery

Haddock Nursery

Nephrops Nursery

Lemon Sole Nursery

0 4 8 16 Km

0 2 4 8 Nm

UK Offshore Development

Figure: 3.5

Moray Firth Fish Nurseries

File: BEA_IGIS_Fish_Nursery_01_v05

Rev:5 | Date: 05/03/10 | By: NvR | Checked: MM

Scale: 1:650,000 A4

Datum: WGS 1984 | Projection: UTM Zone 30N

Beatrice Offshore Windfarm Ltd

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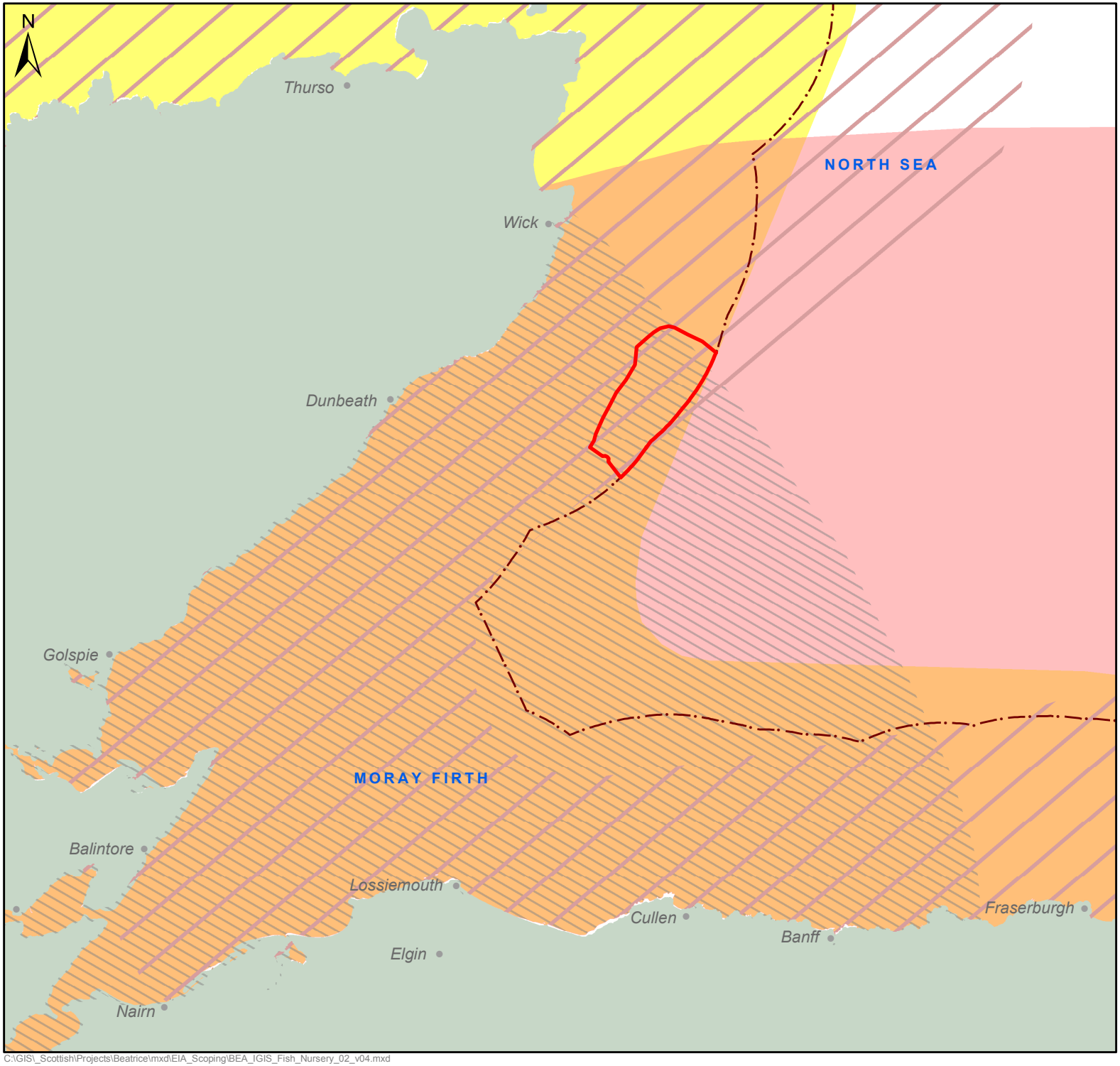

Beatrice Offshore Wind Farm Site Boundary

Territorial Waters Boundary

Sandeel Nursery

Herring Nursery

Whiting Nursery

Saithe Nursery

0 4 8 16 Km

0 2 4 8 Nm

UK Offshore Development

Figure: 3.6

Moray Firth Fish Nurseries

File: BEA_IGIS_Fish_Nursery_02_v04

Rev:4	Date: 05/03/10	By: NvR	Checked: MM

Scale: 1:650,000 A4

Datum: WGS 1984	Projection: UTM Zone 30N

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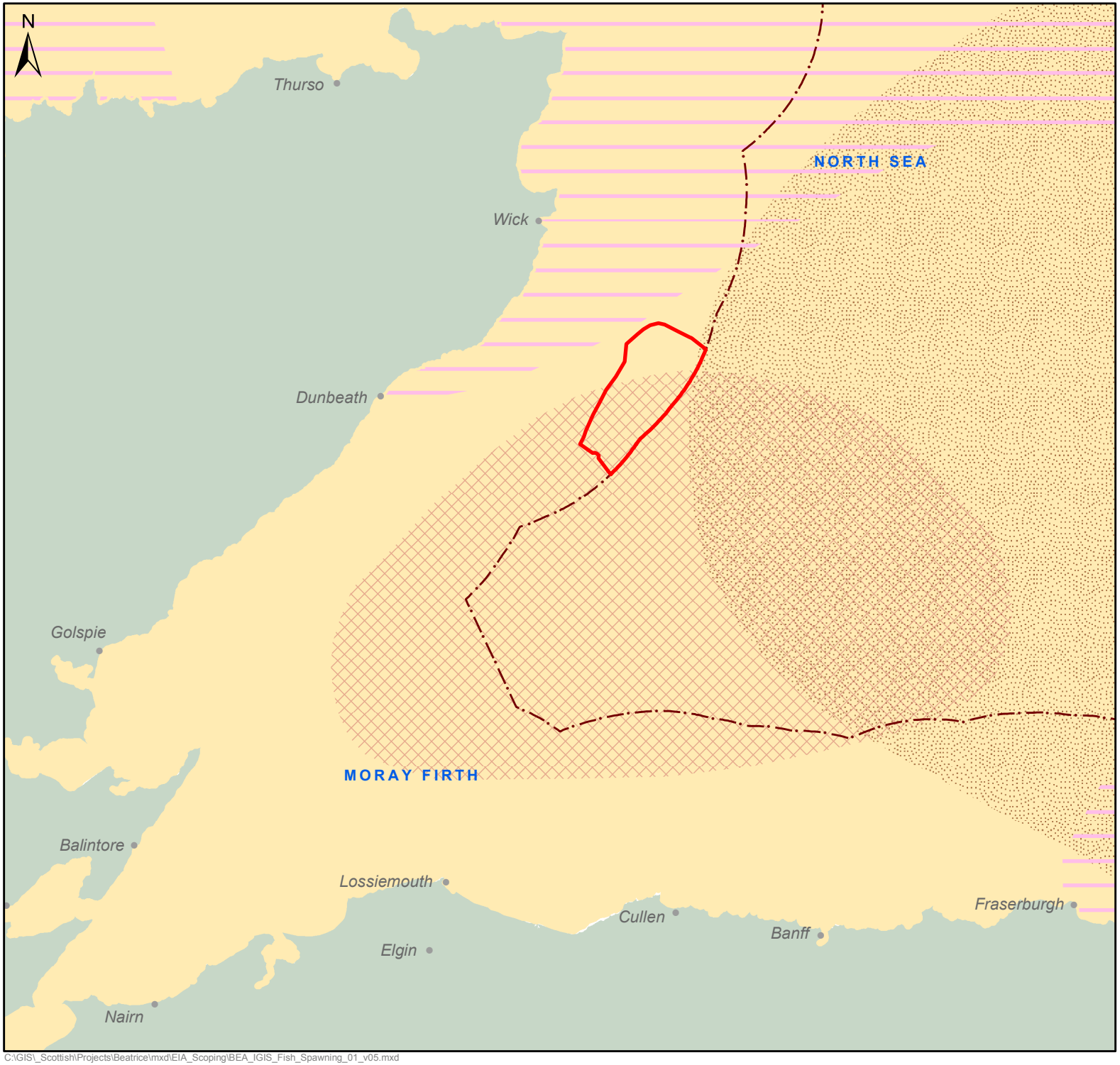

Beatrice Offshore Wind Farm Site Boundary

Territoral Waters Boundary

Herring Spawning

Cod Spawning

Whiting Spawning

Lemon Sole Spawning

0 4 8 16 Km

0 2 4 8 Nm

UK Offshore Development

Figure: 3.7

Moray Firth Fish Spawning

File: BEA_IGIS_Fish_Spawning_01_v05

Rev:5 | Date: 05/03/10 | By: NvR | Checked: MM

Scale: 1:650,000 A4

Datum: WGS 1984 | Projection: UTM Zone 30N

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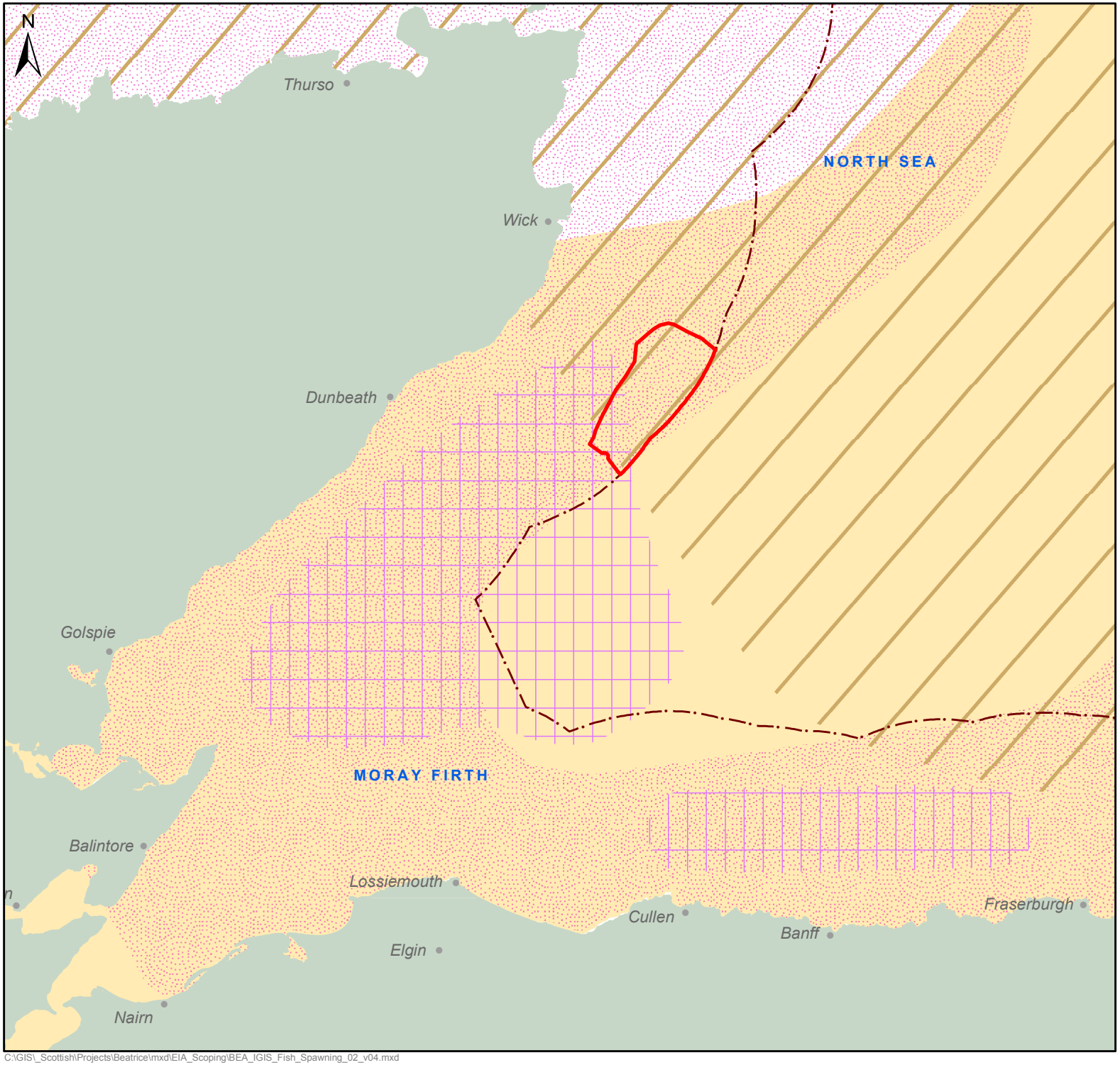

Beatrice Offshore Wind Farm Site Boundary

Territorial Waters Boundary

Sprat Spawning

Plaice Spawning

Sandeel Spawning

Nephrops Spawning

0 4 8 16 Km

0 2 4 8 Nm

UK Offshore Development

Figure: 3.8

Moray Firth Fish Spawning

File: BEA_IGIS_Fish_Spawning_02_v04

Rev:4	Date: 05/03/10	By: NvR	Checked: MM

Scale: 1:650,000 A4

Datum: WGS 1984	Projection: UTM Zone 30N

Beatrice
Offshore Windfarm Ltd

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Herring and whiting also spawn within the Firth but no spawning areas are known inside the Beatrice Offshore Wind Farm site area.

The Moray Firth supports a range of commercially valuable species of fish including sandeel, haddock, mackerel, herring, sprat, cod, whiting, lemon sole, plaice and dab. It is the shellfish fisheries of the Moray Firth which are the most commercially important and these are discussed in *Section 3.4.6.*

The major rivers of the Moray Firth are amongst the finest salmonid rivers in Scotland. Salmon and sea trout fisheries are discussed in further detail in *Section 3.4.7.* It is known that salmonids and other diadromous species noted in the rivers (lamprey species and eels) will pass through the Moray Firth. The River Spey supports important numbers of sea lamprey and they are listed as a primary reason for site selection of the River Spey SAC (see *Section 3.3.7*). There are also occasional records of allis shad and twaite shad within the Firth but they are relatively rare.

Basking shark are considered an elusive species but are observed during most summers within the Moray Firth.

Potential Impacts – Construction / Operation / Decommissioning

Potential impacts during construction and decommissioning may include the following.

- Seabed disturbance during construction/ removal of seabed structures may in turn impact on fish feeding and spawning patterns.
- Underwater noise from construction/ decommissioning activities may impact on sensitive species such as herring, sandeel and cod resulting in avoidance behaviour during these periods.

During construction and decommissioning the impact on the demersal and pelagic fish populations in the Moray Firth is likely to be limited.

During operation there are considered to be no significant impacts on fish.

Potential cumulative and in-combination effects on fish can be identified at this stage as follows.

- Seabed disturbance and noise impacts resulting from the Beatrice Offshore Wind Farm being constructed/decommissioned in parallel or in sequence with the nearby Moray Firth Round 3 Wind Farm.

Studies, Methods and Assessment

Following a detailed data review of available information on fish populations and ecology in the Smith Bank area, targeted studies will be undertaken to assess the epibenthic fauna and demersal fish populations utilising the Smith Bank and immediate area. It is anticipated that data gathering will include the following.

- The use of quantitative epibenthic beam trawls collected from the area of the Wind Farm.
- Commercial otter trawls may be used to sample the demersal fish species present in the area.

- The analysis of trawl data to establish the presence of noise sensitive fish species.
- The hearing range or 'audiogram' of several fish species is known and the underwater noise assessment undertaken to support the EIA will consider the potential for physical or behavioural underwater noise impacts upon fish species.
- A record of basking shark observations during summer months of 2010 and 2011.

Potential Mitigation

Impacts are likely to be small and localised, however, wherever possible the planning and phasing of construction activities will be timed to minimise impact on spawning and nursing periods of sensitive species within the Wind Farm site boundary.

3.3.5 *Marine Mammals*

Baseline

Key species forming the focus of this baseline section are as follows.

- Bottlenose, white-beaked and common dolphin.
- Common seal.
- Grey seal.
- Harbour porpoise.
- Common porpoise.
- Minke whale.

The Inner Moray Firth is internationally renowned for the presence of the UK's largest populations of resident bottlenose dolphins. The Moray Firth dolphins tend to be larger than average size for **bottlenose dolphins**, which may be connected to them being towards the Northern end of their global range. The population is estimated to be around 130 individuals but the level of confidence on this estimate is limited as dolphin populations are particularly hard to estimate.

The Moray Firth dolphins are comparatively well studied, with Aberdeen University's Cromarty Research station taking a leading role in research alongside the Sea Mammal Research Unit, other academic organisations and international, national and local voluntary conservation bodies. A report [25] by the Cromarty Research station published on 25 January 2010 provides a comprehensive review of the existing cetacean survey data in the area from 1980 to 2008. This report presents the results of a further survey of dolphins and other cetaceans conducted in May - October 2009. The report reviewed the following data.

- Peer-reviewed journals and grey literature.
- Unpublished data from the following.
  - The University of Aberdeen.
  - The Whale and Dolphin Conservation Society (WDCS).
  - The Cetacean Research and Rescue Centre (CRRU).
  - The Royal Society for the Protection of Birds (RSPB).
  - The European Seabirds at Sea database.

(25) Thomson, P. et al 2010, Assessing the Potential Impact of Oil and Gas

- Reports from Marine Mammal Observers aboard seismic vessels provided by the Joint Nature Conservation Committee (JNCC).
- Data collected during the SCANS II survey which was provided by the Sea Mammal Research Unit (SMRU).

The following generalisations were made about the distribution of key cetacean species in the Moray Firth.

- **Harbour porpoises** are the most commonly encountered species and are seen throughout the inshore and offshore waters of the Moray Firth.
- Bottlenose dolphin sightings have all been within 15 km of the coast in the inner part of the Moray Firth SAC and the coastal area along the southern Moray Firth. Whilst a few counts of bottlenose dolphins have been made in offshore waters, these are likely to be miscounts of common dolphins or white beaked dolphins.
- **Minke whales** are the second most commonly sighted species in offshore waters after harbour porpoises. This appears to be a more recent trend as earlier datasets had comparatively fewer sightings.
- The relative abundance of **white beaked and common dolphins** appears to have changed over the 30 year survey period.

Alongside dolphins the Moray Firth supports important breeding populations of **common seals**, particularly within the Dornoch and other Firths. The population of common seals in the Moray Firth is estimated to be around 1,200 to 1,400 animals. Common seals are often considered a coastal species but are able to forage in more offshore areas, particularly sandbanks where they feed on sandeels, herring and other clupeid fish. The seals are known to feed up to 40-50 km from their haul out sites (sites on land where they rest, mate, birth etc) [26].

Grey seals breed on rocky shores along the coast of the Moray Firth. Grey seal numbers in the Moray Firth have ranged from 200 to 900 during the period 1992–2003 following annual surveys. Grey seals will forage close to the seabed principally predating bottom living fish species such as sandeel, flatfish and white fish (cod, haddock and ling). Grey seals are known to range over larger distances than common seals.

There has been conflict between seals and salmon fisheries in the Moray Firth for many years. Both salmon and seal numbers have decreased in recent years and with the introduction of SACs to protect seals and salmon (see *Section 3.3.7*), the Moray Firth Seal Management Plan was put in place in April 2005 to try to protect both seal and salmon populations. However, the plan does show that whilst numbers have been decreasing, overall there are large numbers of both common and grey seal in the inshore and offshore areas of the Moray Firth.

Common porpoise are known to be present within the Moray Firth throughout the year. Sightings are geographically spread throughout the area but

(26) Scottish Government (2010). Information on Seals. Available from: < http://www.scotland.gov.uk/Topics/Environment/Wildlife-Habitats/19887/20877> Downloaded on 2nd February 2010.

tend to be further offshore than the bottlenose dolphin sightings. It is likely that porpoise will occur within the Beatrice Offshore Wind Farm area.

In addition, several other species of marine mammal have been sighted within the Moray Firth in recent years.

- Atlantic white-sided dolphin (seasonally and occasionally).
- Long-finned pilot whale (seasonally and occasionally).
- Killer whale (seasonally and occasionally).
- Risso's dolphin (seasonally and occasionally).
- Striped dolphin (seasonally and occasionally).
- Humpback whale (seasonally and occasionally).
- Fin whale (seasonally and occasionally).
- Sperm whale (seasonally and occasionally).

Otters are widely recorded in the rivers and coasts of the Moray Firth. However, as otters rarely forage more than 100 m off shore [27] and prefer to forage in depths of 10 m or less, it is not proposed to consider potential impacts upon otters within the EIA.

Potential Impacts – Construction / Operation / Decommissioning

Potential impacts during construction and decommissioning may include the following.

- Disturbance due to noise of vessel movements and construction/ decommissioning activities.

Whilst the design of the turbine sub-structure and foundations is not finalised it is likely that the technique used to secure the turbine foundations in place may be a noisy activity. As a result, understanding and accurately assessing the impact of the development on the underwater noise environment will be essential.

Potential impacts during the operational phase of the Wind Farm may include the following.

- Disturbance due to noise of operational turbines.
- Barrier effect created by the presence of new structures within the marine environment.

Noise arising from the operation of the turbine is a potential additional source of noise in the marine environment. However, recent research on other UK offshore wind farms [28] suggests that operational noise from the wind turbines is unlikely to have a significant impact on marine mammals.

Potential cumulative and in-combination impacts may include the following.

- Noise and disturbance impacts resulting from the Beatrice Offshore Wind Farm being

(27) Kruuk and Moorhouse, 1991, Otters : ecology, behaviour and conservation, Oxford University Press

(28) Nedwell, J.R., Parvin, S.J., Edwards, B., Workman, R., Brooker, A.G. & Kynoch, J.E. 2007. Measurement and Interpretation of Underwater Noise During Construction and Construction and Operation of Offshore Windfarms in UK. COWRIE NOISE-03-2003.

constructed/decommissioned in parallel or in sequence with the nearby Moray Firth Round 3 Wind Farm.
- Barrier effect created by the presence of new structures within the marine environment.

Cumulative impacts from other wind farms in the area will need to be assessed as part of the full EIA. The Moray Firth Round 3 zone is adjacent to the Beatrice Offshore Wind Farm and so will have direct cumulative impacts on marine mammals that are found within the area. The Firth of Forth Round 3 zone and Scottish territorial waters sites are much further south than the Beatrice Offshore Wind Farm but wider ranging marine mammals may be impacted by all of these proposed projects. The geographical extent of the cumulative impact to be considered as part of the Beatrice Offshore Wind Farm EIA will be discussed and agreed with relevant consultees. The scope of cumulative assessment will also be informed by knowledge of other surveys and methodologies proposed by other offshore wind farm developers.

Studies, Methods and Assessment

It is clear that assessing impacts on the underwater noise environment for both the construction and operational phases of the Wind Farm will be required to ensure a robust EIA. A specialist consultant will be contracted by BOWL to undertake the required data gathering and assessments in relation to impacts on marine mammals.

Coupled with the ornithological boat based survey work BOWL is currently undertaking, marine mammal observers are also undertaking marine mammal surveys from these boats (also including basking shark observations). In addition to this it is likely that data from a co-ordinated programme of Passive Acoustic Monitoring will be used to assess acoustically active cetaceans within the area.

It is also recognised, in particular in relation to the bottlenose dolphins of the Moray Firth, that significant academic research has already been undertaken. Wherever possible, BOWL will seek opportunities to collaborate with academic researchers to maximise the applicability of this research to the Beatrice Offshore Wind Farm.

It is understood that two 100-130 km transects of C-PODs have been put in place within the Moray Firth to monitor small cetaceans by Passive Acoustic Monitoring. The preliminary results were made available on 25 January 2010. These results demonstrate bottlenose dolphins tend to live along the Inner Moray Firth and the southern coastline of the Moray Firth. They also demonstrate that porpoises and minke whale are regularly recorded within and around the Wind Farm site. As part of the full EIA, the University of Aberdeen will be consulted to ensure the most up to date survey data is incorporated into the EIA.

Understanding the current underwater noise environment along with the likely impacts anticipated from construction and operational activities is recognised as a key element of the EIA. This will include underwater noise monitoring and modelling the results of which will be presented as part of the EIA.

Published best practice guides will be used to ensure the EIA includes all relevant information and follows best practice on assessing impacts to marine mammals. This guidance will include but is not limited to those below.

- Cefas, 2004. Offshore Wind Farms: Guidance note for Environmental Impact Assessment in Respect of FEPA and CPA Requirements (29).
- COWRIE's guidance documents including 'Measurement and interpretation of underwater noise during construction and operation of offshore windfarms in UK waters' (30).

Potential Mitigation

The approach to foundation design and seabed attachment techniques will aim to minimise the impacts to marine mammals wherever possible. During the EIA It is also likely that underwater noise limits (threshold levels) will be agreed and developed in consultation with the relevant statutory bodies. These limits will be based on the research and assessment undertaken and conclusions of the EIA.

During construction it is anticipated that, if required, marine mammal watches will be adopted prior to the start of any activities considered to be in exceedance of agreed noise limits. Watches will ensure activities do not commence with marine mammals in the immediate area. Techniques, such as 'soft starts', will allow time for sensitive marine mammals to leave the area before noisy operations commence.

(29) Cefas 2004. Offshore Wind Farms: Guidance note for Environmental Impact Assessment in respect of FEPA and CPA requirements, Version 2. June 2004.
(30) Nedwell, J. R., Langworthy, J. & Howell, D. (2003). Assessment of sub-sea acoustic noise and vibration from offshore wind turbines and its impact on marine wildlife; initial measurements of underwater noise during construction of offshore wind farms, and comparison with background noise. Subacoustech Report No 544RO423. Published by COWRIE.

3.3.6 *Ornithology*

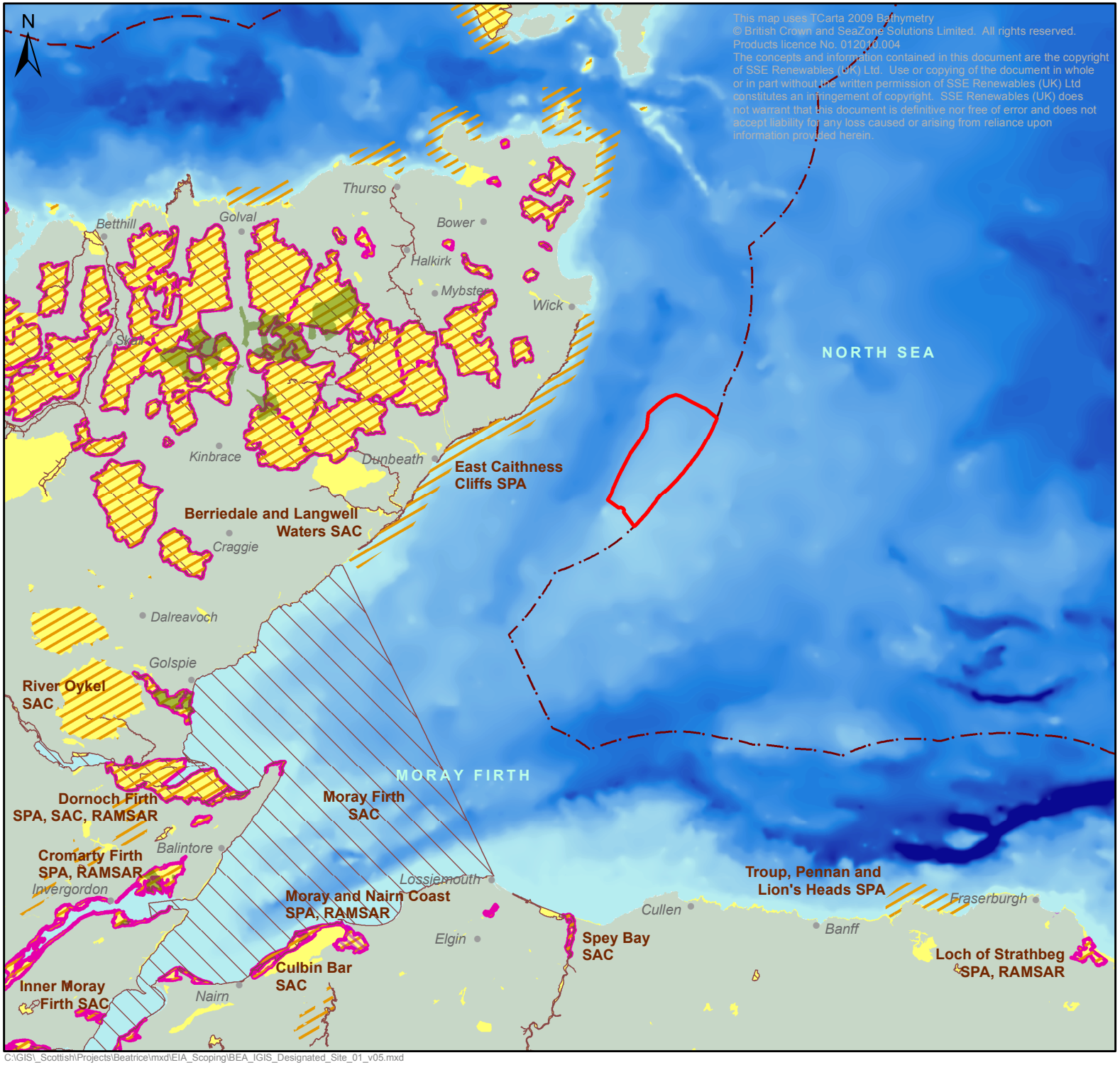
Baseline

The coastal and offshore waters of the Moray Firth are internationally important for populations of seabirds, seaduck, wader and wildfowl. Within the Moray Firth there are several protected areas that have been designated to protect these populations and has been classified as Special Protection Area (SPA) under the EU Birds Directive (see *Figure 3.9*).

The eastern coastal section of the Scottish north coast between Peterhead and Duncansby Head contains seven SPAs. Of these, five are also designated as Ramsar sites (see designated sites *Section 3.3.7* below). It is likely that there will be some degree of interchange between bird populations using these sites and other sites around the UK coast.

Large concentrations of seabirds are found in the Moray Firth during the breeding season (April – June). Species such as auks, guillemots, razorbills and puffins then disperse to feeding grounds further offshore to feed on sandeel and other prey fish species.

Overwintering species in the Moray Firth include seaducks (eider, goldeneye, long tailed duck, common scoter and velvet scoter), red throated divers and great crested grebes.



Beatrice Offshore Wind Farm Site Boundary

Territorial Waters Boundary

Local Nature Reserve, LNR

National Nature Reserve, NNR

Sites of Special Scientific Interest, SSSI

Wetland of International Importance, RAMSAR

Special Areas of Conservation, SAC

Special Protection Areas, SPA

Bathymetry

(Metres Below Sea Level)

0m

-220m

0 5 10 20 Km 0 2.5 5 10 Nm

UK Offshore Development

Figure: 3.9

Moray Firth Designated Sites

File: BEA_IGIS_Designated_Sites_01_v05			
Rev:5	Date: 05/03/10	By: NvR	Checked: MM
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Datum: WGS 1984	Projection: UTM Zone 30N		

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Species of Conservation Concern

From a review of the available ornithological data the key bird species groups considered to be of highest significance in relation to the proposed Beatrice Offshore Wind Farm are listed below.

- Divers (mainly red-throated).
- Migratory geese (mainly pink-footed, but also barnacle).
- Wintering and passage seaduck (scoters, eider, long-tailed duck) and migratory wildfowl (eg wigeon, teal etc).
- Fulmar.
- Gannet.
- Terns (common, Arctic, and Sandwich).
- Gulls (common, black-headed, lesser black-backed, herring, greater blackbacked and kittiwake).
- Cormorant, shag, and auks (guillemot, razorbill, black guillemot, puffin).
- Migratory waders (eg redshank, knot, bar-tailed godwit, golden plover, grey plover, dunlin, snipe etc).
- Migratory seabirds (eg shearwaters, petrels, skuas etc.).

It should also be noted that nocturnal movements of certain species (eg petrels and shearwaters) may occur in these waters at times, although observing and recording them at night is very difficult.

An assessment of existing ornithological data

Outputs from previous studies (eg the Beatrice demonstrator EIA) will be reviewed and utilised where appropriate. This information will also be used in discussion with the relevant consultees.

Potential Impacts – Construction / Operation / Decommissioning

Potential construction and decommissioning impacts may include the following.

- During construction/ decommissioning, disturbance impacts may occur as a result of works activities and vessel movements. Such impacts may affect birds resting on the sea surface in particular, but may also displace birds from the area which may reduce access to feeding, moulting or other important locations for specific activities.
- The construction of the turbines will create a new feature in the landscape that has the potential to create a barrier to movement and may present a collision risk.
- During periods of darkness (inclement weather or winter working) and during any periods of night time construction the vessels will be equipped with powerful lights that may attract birds to the area.

Potential operational impacts may include the following.

- During operation, the turbines will continue to act as a barrier to movement and present a collision risk.
- Small lights fitted to the top of each turbine for navigation purposes may have the potential to attract birds to the Wind Farm at night.

Potential cumulative impacts may include the following.

- The Beatrice Offshore Wind Farm along with the Moray Round 3 site represents a large feature on the Moray coast extending over 35 km along the Smith Bank. This represents a potential barrier to the movement of birds toward the Caithness Coast.
- The cumulative impact of navigational lighting from Beatrice and other wind farms in the area.

Studies, Methods and Assessment

The methods to be used in the survey of bird life will follow the accepted European Seabirds at Sea (ESAS) methods, as detailed in the relevant COWRIE guidance (Camphuysen et al. 2004 (31), Maclean et al. 2009 (32)). The BOWL bird survey teams are already in consultation with SNH to refine and agree the survey methods summaries below. It is anticipated that further guidance on survey requirements for offshore wind farms will be produced by SNH before the middle of 2010. Survey methods include the following.

- Monthly boat surveys have commenced and are anticipated to be conducted from October 2009 until September 2011. The location of the vessel will be recorded at all times using a GPS. These boat surveys currently comprise.
  - Twenty-four monthly surveys, subject to weather conditions.
  - Transects separated by 2 km to minimise double-recording of mobile birds.
  - Standard strip-transect techniques.
  - All birds encountered on the sea recorded along with details of species, number, precise time of day, and approximate distance from the boat.
  - Birds in flight recorded during snapshots at intervals of 500 m.
  - All marine mammals encountered recorded along with details of species, numbers present, and the precise time of day.
  - Three competent trained observers used per vessel for each survey, positioned on the observation platform of the vessels.
- A HiDef aerial digital video survey as part of the Round 3 process has already been conducted (completed the summer of 2009) that covers much of the Beatrice Offshore Wind Farm area.
- Aerial photography surveys currently underway for October 2009 – March 2010.

The survey findings will be collated and reported for each biologically distinct period, for example, reports for winter, breeding season, post-breeding dispersal and autumn migration.

Recent PhD research, undertaken at Aberdeen University, has assessed and reported on the effectiveness of observational and radar techniques adopted during the EIA of the Beatrice demonstrator project. This report will be utilised by BOWL to understand successes and limitations of various observational and radar techniques.

(31) Camphuysen, C.J., Fox, A.D, Leopold, M.F., & Petersen, I.K. (2004). Towards standardised seabird at sea census techniques in connection with environmental impact assessments for offshore wind farms in the UK: a comparison of ship and aerial sampling methods for marine birds, and their applicability to offshore wind farm assessments. NIOZ report to COWRIE
(32) Maclean, I.M.D, Wright, L.J., Showler, D.A. and Rehfisch, M.M. (2009) A review of assessment methodologies for offshore wind farms. British Trust for Ornithology Report commissioned by COWRIE Ltd.

Potential Mitigation

The design of the Wind Farm will be developed in light of the environmental sensitivities of the area. As far as possible the design of any required turbine lighting will take account of bird sensitivities.

During construction best practice guidance will, as far a possible, be followed and will including the following.

- Construction noise management.
- The use of standard vessel routes.
- Avoidance of rafting birds by vessels.

3.3.7 *Designated Sites*

Baseline

The Moray Firth and Caithness areas are noted for the richness of the natural heritage found there. Much of Caithness is covered in international or national nature conservation designations. *Figure 3.9* presents the location of these designations.

Whilst the proposed Wind Farm site is not directly within a designated site there are a number of designated sites within the vicinity which will be considered as part of the EIA. The principle nature conservation designations which may be relevant to the Beatrice Offshore Wind Farm will include the following Special Protection Areas (SPAs) and Special Areas of Conservation (SACs).

Special Protection Areas (SPAs) (see *Figure 3.9*)

The eastern coastal section of the Scottish north coast between Peterhead and Duncansby Head contains seven SPAs. Of these, five are also designated as Ramsar sites. It is noted that the bird populations using these sites are unlikely to be completely independent and that there will be interchange between sites around the UK coast.

Loch of Strathbeg (SPA and Ramsar)
The SPA provides wintering habitat for a number of important wetland bird species, particularly wildfowl (swans, geese and ducks), and is also an important staging area for migratory wildfowl from Scandinavia and Iceland/Greenland. In summer, coastal parts of the site are an important breeding area for Sandwich Tern (*Sterna sandvicensis)*, which feed outside the SPA in adjacent marine areas.

Troup, Pennan and Lion's Heads (SPA)
Troup, Pennan and Lion's head SPA is a 9 km stretch of sea-cliffs along the Banff and Buchan coast of Aberdeenshire. As well as cliffs, the site also includes adjacent areas of grassland and heath, and several small sand or shingle beaches punctuate the otherwise rocky shore. The cliffs rise to 150 m and provide nesting sites for seabirds, which feed in the waters offshore and outside the SPA. The site is particularly important for its assemblages of gulls and auks.

The Moray and Nairn Coast (SPA and Ramsar)
The Moray and Nairn Coast SPA is located on the south coast of the Moray Firth. The site comprises the intertidal flats, saltmarsh and sand dunes of Findhorn Bay and Culbin Bar, and the alluvial deposits and associated woodland of the Lower River Spey and Spey Bay. It is of outstanding nature conservation and scientific importance for coastal and riverine habitats and supports a range

of wetland birds throughout the year. In summer it supports nesting Osprey (*Pandion haliaetus)*, whilst in winter it supports large numbers of Iceland/Greenland Pink-footed Goose (*Anser brachyrhynchus)*, Icelandic Greylag Goose (*Anser anser)* and other waterbirds, especially ducks, sea-ducks and waders.

The Inner Moray Firth (SPA and Ramsar)
The Inner Moray Firth SPA comprises the Beauly Firth and Inverness Firth (including Munlochy Bay) which together form the easternmost estuarine component of the Moray Basin ecosystem. The site contains extensive intertidal flats and smaller areas of saltmarsh. The rich invertebrate fauna of the intertidal flats provide important food sources for large numbers of wintering and migrating waterbirds (geese, ducks and waders). The Firth is also of importance as a feeding area for locally breeding Osprey (*Pandion haliaetus)* as well as for breeding terns.

Cromarty Firth (SPA and Ramsar)
Cromarty Firth is one of the major firths on the east shore of the Moray Firth. The rich invertebrate fauna of the intertidal flats provide important food sources for large numbers of wintering and migrating waterbirds (swans, geese, ducks and waders). The Firth is also of importance as a feeding area for locally breeding Osprey (*Pandion haliaetus)* as well as for breeding terns.

The Dornoch Firth (SPA and Ramsar)
The Dornoch Firth and Loch Fleet SPA is one of the best examples in northwest Europe of a large complex estuary. Extensive sand-flats and mud-flats are backed by saltmarsh and sand dunes with transitions to dune heath and Alder (*Alnus glutinosa)* woodland. The tidal flats support internationally important numbers of waterbirds on migration and in winter, and are the most northerly and substantial extent of intertidal habitat for wintering waterbirds in the UK, as well as Europe. The Firth is also of importance as a feeding area for locally breeding Osprey (*Pandion haliaetus)*.

The East Caithness Cliffs (SPA)
The East Caithness Cliffs SPA is located on the east coast of Caithness. The site comprises most of the sea-cliff areas between Wick and Helmsdale. The cliffs are formed from Old Red Sandstone and are generally between 30-60 m high, rising to 150 m at Berriedale. Cliff ledges, stacks and geos provide ideal nesting sites for internationally important populations of seabirds, especially gulls and auks. The seabirds nesting on the East Caithness Cliffs feed outside the SPA in inshore waters as well as further away. The cliffs also provide important nesting habitat for Peregrine (*Falco peregrinus).*

Marine and Coastal SACs (See *Figure 3.9*)

The Inner Moray Firth SAC
The Inner Moray Firth is the largest marine SAC in the UK. Its primary reason for designation is the population of bottlenose dolphins. The dolphins are recognised to range widely but to favour particular areas within the Inner Firth. The Inner Firth is also designated for its sandbanks which are slightly covered by sea water all the time.

Dornoch Firth SAC
The Dornch Firth SAC is designated for multiple Annex I habitats. It is a fine example of a largely

unaltered, un-industrialised estuary. Within the overall Estuary designation the Dornoch Firth hosts extensive areas of mudflats and sandflats. Sub-tidally, the Firth supports rich biogenic reefs associated with commercial mussel beds and a range of subtidal sandbank habitats. The estuary hosts a range of qualifying salt marsh habitats, sand dune, dune slack and a priority habitat of coastal dunes. The Dornoch Firth is also designated for its large population of Common seals representing around 2 % of the overall UK population and 50 % of the common seals in the Moray Firth.

Berriedale and Langwell, Oykel, Morriston and Spey SACs
These riverine SACs which empty into the Moray Firth have all been designated to protect salmon and other migratory diadromous fish.

Culbin Bar SAC
The Culbin Bar SAC is designated for its coastal habitats, principally its extensive dunes, vegetated shingle and salt meadows.

Potential Impacts – Construction / Operation / Decommissioning

During construction, operation and decommissioning phases it is recognised that the Beatrice Offshore Wind Farm has the potential to impact marine mammals from the SAC and water birds from the SPAs (see *Sections 3.3.5* and *3.3.6*). It is anticipated that a Habitats Regulation Assessment process will be undertaken by SNH. The Habitats Regulation Assessment is required to comply with the EC Habitats Directive and will consider in detail the potential impacts of the proposed Wind Farm on the adjacent sites covered by European nature conservation designations.

It is anticipated that as part of the EIA, BOWL and their advisors will ensure that the required information and data is made available within the Environmental Statement to enable the competent authority to undertake their Appropriate Assessment, if required. The content and scope of the information to be provided to assist the competent authority with their Appropriate Assessment will take account of the following guidance listed below.

- European Commission (2001) Assessment of plans and projects significantly affecting Natura 2000 sites: methodological guidance on the provision of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.
- European Commission. Managing Natura 2000 sites, The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.
- Scottish Executive (2006) Assessing Development Plans in Terms of the Need for Appropriate Assessment, Interim guidance.
- Institute of Ecology and Environmental Management (2006) Guidelines for Ecological Impact Assessment in the United Kingdom (version 7 July 2006) - http://www.ieem.org.uk/ecia/index.html.

Potential Mitigation

The previous sections of the Scoping Report on the biological environment consider the data gathering assessment, mitigation measures and monitoring which may be appropriate to protect designated areas. See *Sections 3.3.2* to *3.3.6* for

details.

BOWL is committed to progressing design development and mitigation measures in consultation and agreement with SNH, Marine Scotland and other key regulators and stakeholders.

3.4 *HUMAN ENVIRONMENT*

3.4.1 *Introduction*

The Moray Firth is used in a variety of ways by a range of industries and activities. The Moray Firth attracts vessels to the Ports of Invergordon and Inverness, and the entrance to the Caledonian Canal. It is also an important area for recreational sailing and commercial fisheries. The area is also used for military training purposes. The military have a number of firing practice areas and a bombing range covering areas within the Firth. There are no marine aggregate dredging areas in the north of Scotland.

The Caithness coastline to the north and west of the Beatrice Offshore Wind Farm site is relatively sparsely populated. The Moray coastline to the south accommodates numerous traditional fishing villages with associated harbours, now also used as bases for recreational sailing. The coastlines of the Moray Firth encompass numerous features of cultural heritage including Listed Buildings and Scheduled Ancient Monuments.

In relation to the human environment the topic areas proposed for consideration during the EIA are listed below.

- Landscape, Seascape and Visual.
- Archaeology and Cultural Heritage.
- Aviation (Civilian and Ministry of Defence).
- Shipping and Navigation.
- Commercial Fisheries.
- Salmon and Sea Trout Fisheries.
- Oil and Gas.
- Pipelines and Cables.
- Marine Waste and Spoil Disposal.
- Socio-economics.

3.4.2 *Landscape, Seascape and Visual*

Baseline

Caithness and its coastline supports four designated National Scenic Areas which cover some 13 % of Caithness. An assessment of the sensitivity and capacity of the Scottish seascape in relation to wind farms (SNH 2006) indicates that the proposed Beatrice site lies within a seascape area of low to medium sensitivity, with a moderate to high capacity for wind farm development.

The Caithness and Sutherland Landscape Character Assessment (SNH, 1998) details the characteristics of the landscape within the coastal areas closest to the Wind Farm site as “Small Farms and Crofts”.

The Caithness and Sutherland coastline of the Firth is relatively sparsely populated and as such the number of permanent sensitive receptors (residential properties, for example) is likely to be relatively low. The A9 is the main north/south route in the area and runs on or close to the coastline between Invergordon and Latheron before turning inland towards Thurso. The A99

continues along the coast from Latheron via Lybster to Wick. These routes will be considered as potentially sensitive receptors during the course of the EIA.

Within the recommended 60 km study area (33), for cumulative impact assessment of the Beatrice Offshore Wind Farm site, there are a number of other wind farms operating, approved or within the planning system. These locations are illustrated on *Figure 3.10*.

Relevant guidance (33) suggests that sensitive receptors within 30 km of a wind farm may experience significant visual impacts. Given this guidance primarily relates to onshore developments BOWL is considering implementing a 35 km study area in relation to the visual impacts of the proposals. A 35 km Zone of Theoretical Visibility (ZTV) is presented in *Figure 3.11.*

Within the vicinity of the Wind Farm site the existing Beatrice demonstrator turbines, Jacky platform and Beatrice platforms add to the baseline conditions of views and seascape character.

Potential Impacts - Construction/ Operation/ Decommissioning

Potential landscape and visual impacts during construction may include the following.

- The visual impact of active, brightly coloured, construction plant and already constructed turbines on site over the construction programme.
- The visual impact associated with increased vessel movements in the area as plant, materials and personnel are moved to and from site.

Potential operational impacts may include the following.

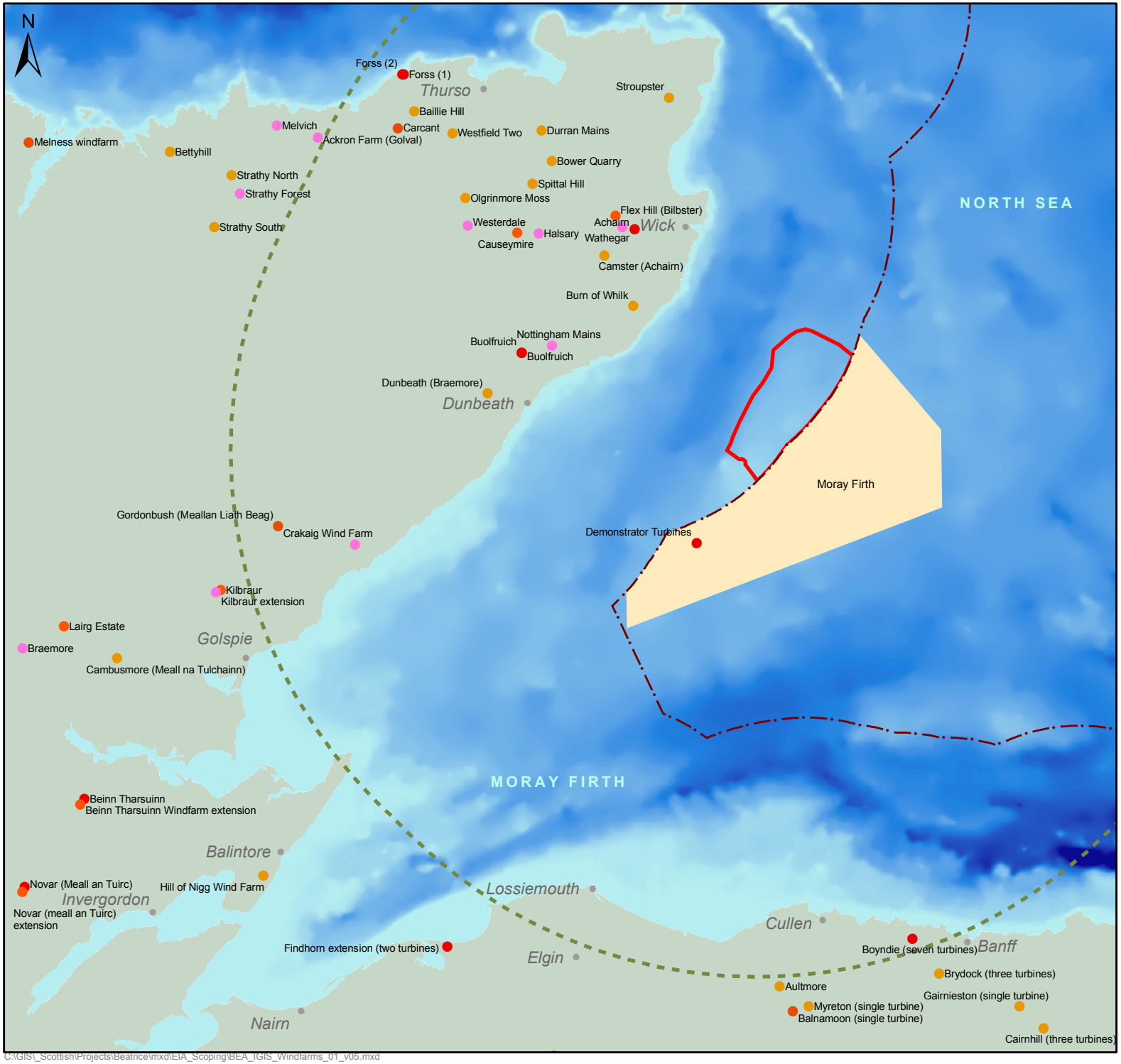
- The landscape and visual impact of the operating Wind Farm from sensitive receptors.
- The visual impact of increased vessel movements as a result of operation and maintenance activities.
- A change in the landscape or seascape character as a result of the new Wind Farm structures.

Potential cumulative impacts may include the following.

- Cumulative adverse landscape impact on combined, successive or sequential views from sensitive receptors. This could result where a receptor may experience the presence of other existing and planned wind farm developments in conjunction with the Beatrice Offshore Wind Farm once it is operational.
- Landscape impacts of the Beatrice Offshore Wind Farm viewed in combination with the existing oil and gas developments in this area of the Firth.

At its closest point the Caithness coast is within 13.5 km of the proposed Wind Farm and therefore the wind turbines would, at times, be visible from

(33) The Landscape Institute and Institute of Environmental Management and Assessment (2002) Guidelines for Landscape and Visual Impact Assessment: Second Edition. SNH (2007) Visual Representation of Windfarms: Good Practice Guidance.



Beatrice Offshore Wind Farm Site Boundary

Territorial Waters Boundary

Boundary 60km

Round 3 Zone (Crown Estate)

Bathymetry
(Metres Below Sea Level)
0m
-220m

Wind Farms
(Scottish National Heritage)

- Installed
- Approved
- Application
- Scoping

0 4 8 16 Km

0 2 4 8 Nm

UK Offshore Development

Figure: 3.10

Wind Farms Surrounding Beatrice Site

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Scale: 1:650,000 A4			
Datum: WGS 1984	Projection: UTM Zone 30N		

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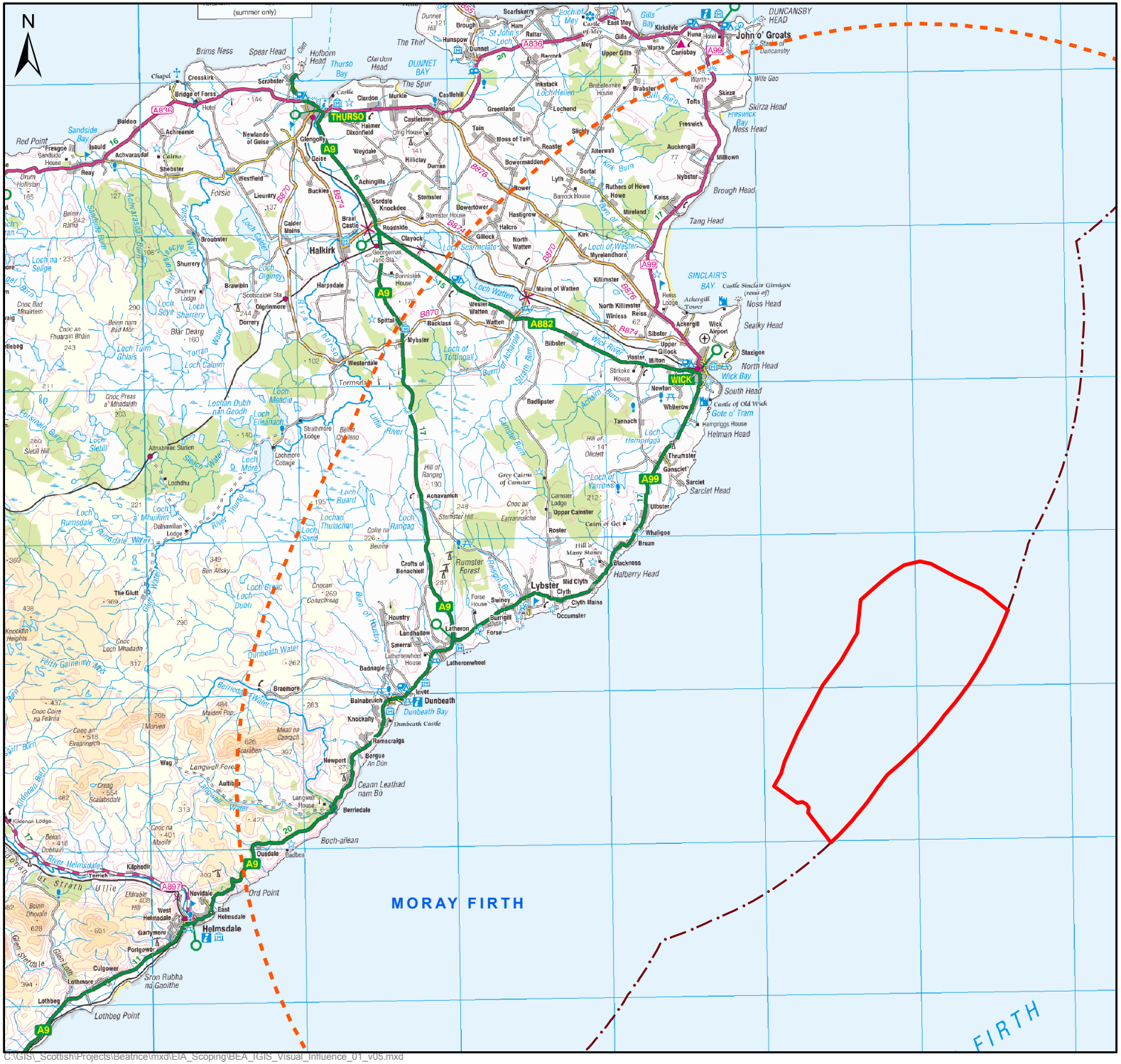

Beatrice Offshore Wind Farm Site Boundary

Territorial Waters Boundary

Zone of Theoretical Visability (35km)

0 2.5 5 10 Km 0 1.25 2.5 5 Nm

UK Offshore Development

Figure: 3.11

Zone of Theoretical Visibility

File: BEA_IGIS_Visual_Influence_01_v05

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Datum: WGS 1984		Projection: UTM Zone 30N	

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the coastal cliffs and some inland view points from Wick to Helmsdale. The visibility of the development from the coast would, however, be heavily affected by local climatic conditions (for example, haze, fog, cloud and rain).

It is important that impacts from the development upon landscape resources, landscape and seascape character and visual amenity are appropriately considered and assessed in the EIA. The development has the potential to impact on all of these elements and impact both users at sea and viewers from the coastline. *Figure 3.11* identifies a zone within which it is likely that the Wind Farm could be a visually significant feature in views. In relation to the terrestrial areas this zone is theoretical as it takes no account of screening by trees, buildings or localised topography.

Figures 3.12 and *3.13* show a conservative and approximate scaling of the appropriately sized Wind Farm when viewed from two locations; the picnic area at Latheronwheel harbour, just off the A9; and the cliff tops near Ulbster off the A99.

Studies, Methods and Assessment

A full Landscape, Seascape and Visual Impact Assessment (LSVIA) will be undertaken as part of the EIA. As part of this study the impacts of the proposed Wind Farm upon landscape character, amenity and also, through working with professional archaeologists (see *Section 3.4.3*), the setting of historic sites and buildings can be assessed.

In addition, the LSVIA of the Wind Farm will be assessed from a series of view points using modelled visualisations to assist in presenting the findings of the assessment.

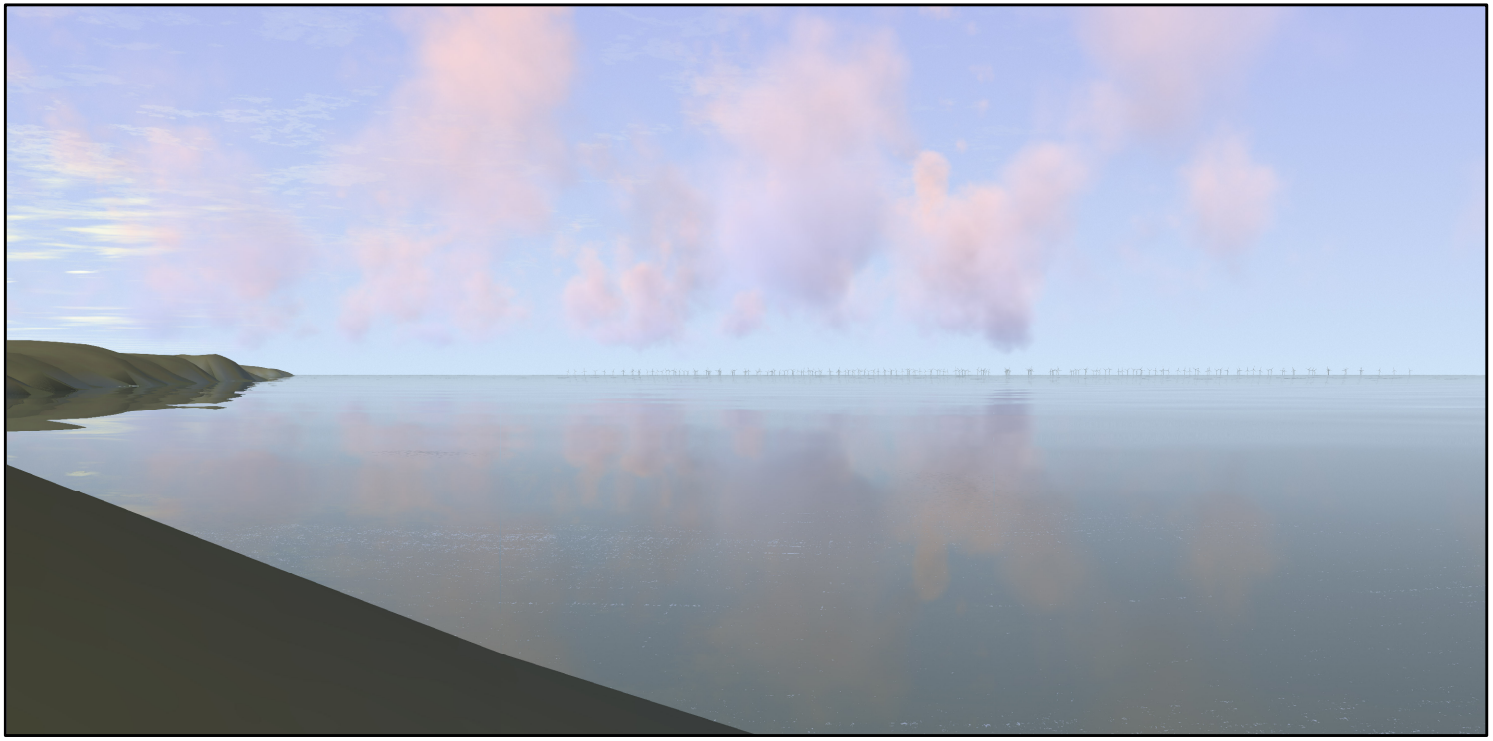
Relevant good practice guidance on landscape, seascape and cultural heritage setting impact assessment will be used. An example of such guidance is provided below.

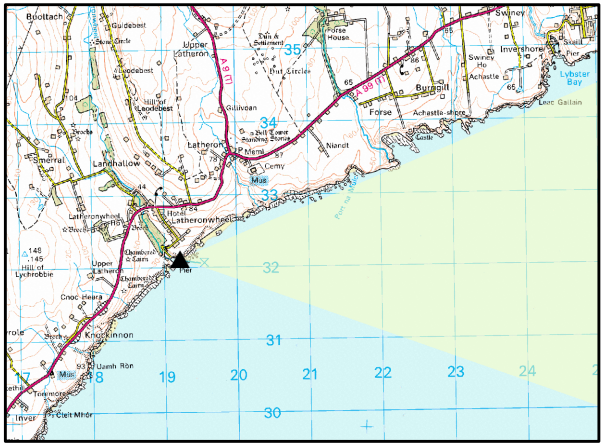
- DTI. (2005) Guidance on the Assessment of the Impact of Offshore Wind Farms: Seascape and Visual Impact Report.
- Landscape Institute and Institute of Environmental Management and Assessment. (2002) Guidelines for Landscape and Visual Impact Assessment.
- Institute for Archaeologists (2008). The Setting of Cultural Heritage Features: Setting Standards - A Review.

Although other wind farms have been identified within 60 km of the Beatrice site (see *Figure 3.10*) it is proposed that for the purposes of the EIA only wind farms located within 30 km of Beatrice will be included in the detailed cumulative impact assessment. This assessment will also include the Zone of Theoretical Visibility (ZTV) for each wind farm.

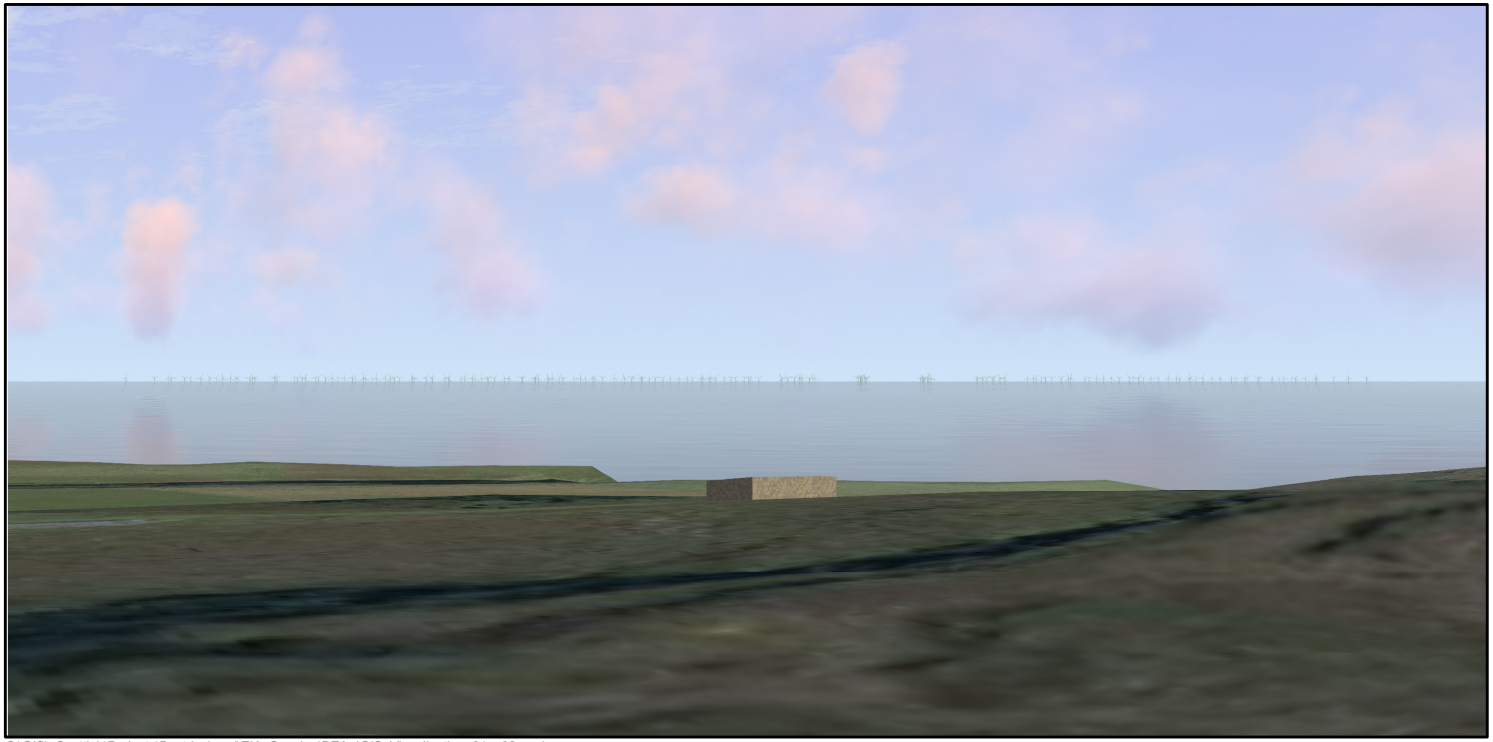
The LSVIA process will be undertaken as follows.

- Prepare ZTV for turbine layout including tips and hubs.
- Establish sensitive seascape, landscape and visual receptors and suggest representative viewpoints.





UK Offshore Development			
Figure: 3.12			
Beatrice Site Visualisation -Near Latherwheel			
File: BEA_IGIS_Visualisation_01_v02			
Rev:2	Date: 24/02/10	By: NvR	Checked: MM
Eye Level: 20m		Bearing: 87 Degrees	



UK Offshore Development			
Figure: 3.13			
Beatrice Site Visualisation -Hill of Ulbster			
File: BEA_IGIS_Visualisation_01_v02			
Rev:2	Date: 24/02/10	By: NvR	Checked: MM
Eye Level: 110m		Bearing: 130 Degrees	

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- Liaise with stakeholders regarding choice of viewpoints and extent of study area based on ZTVs.
- Carry out field work, visit sensitive receptors, takes notes regarding seascape and landscape character, take record photography.
- Compile baseline identifying sensitivities and capacity of resources.
- Prepare visualisation material including wireframes and photomontages to assist with carrying out assessment.
- Undertake impact assessment identifying magnitude of change and significance of impacts on each sensitive resource and viewpoint.
- Carry out cumulative assessment of other wind farms within 30 km of the Beatrice Offshore Wind Farm and report the significance of the additional impacts contributed by the project.

Potential Mitigation

Embedded mitigation includes the distance that the Wind Farm is located from sensitive receptors. The fact that for a large part of the year visibility will be limited out to sea due to atmospheric conditions, and the choice of colour for the turbines will also mitigate any landscape and visual impact.

3.4.3 *Archaeology and Heritage*

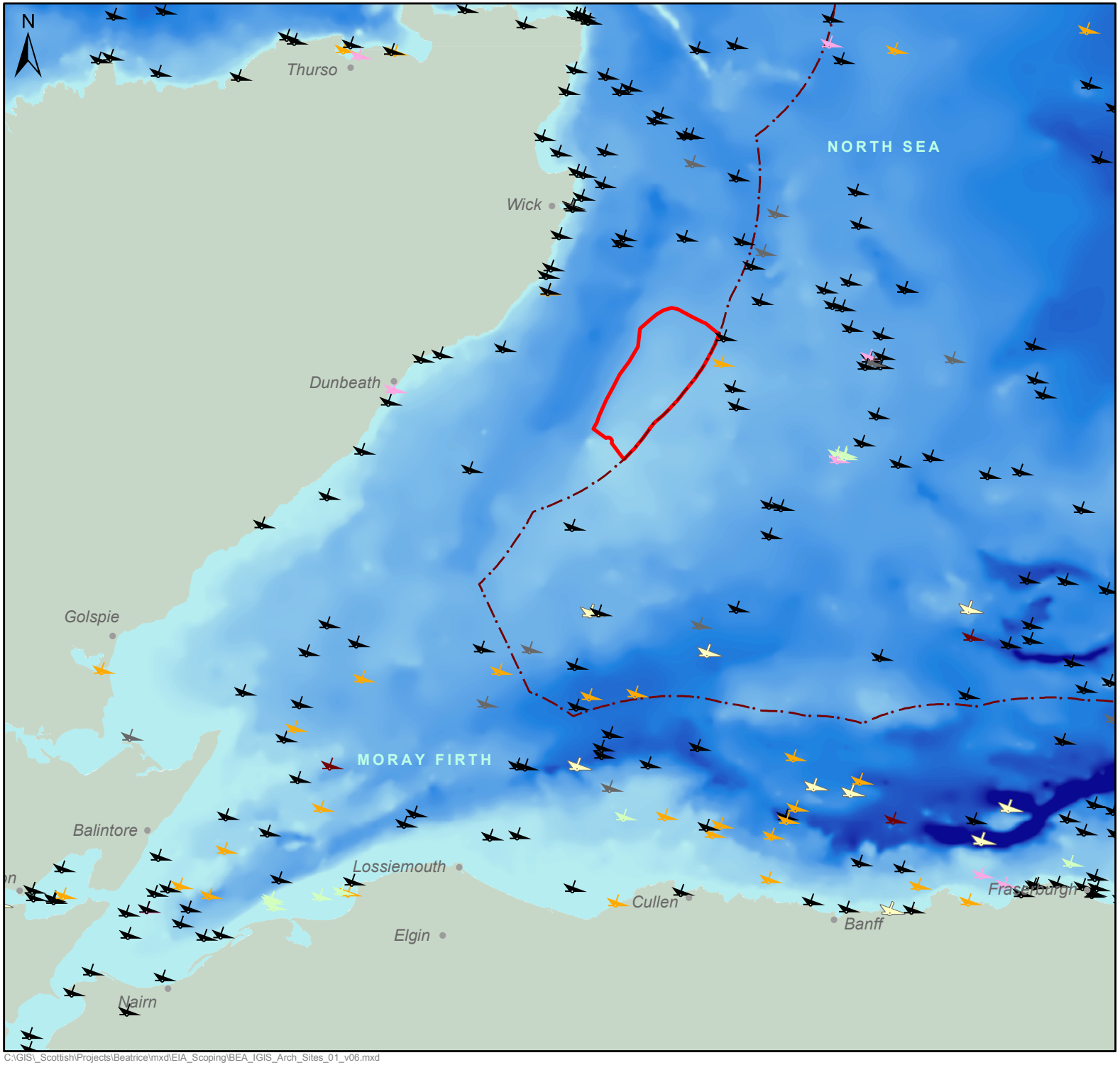
Baseline

There are many marine wreck sites along the Moray Firth coastline and it is likely that there are more as yet unknown wrecks within the Firth. Within the site boundary of the proposed Beatrice Offshore Wind Farm there are no known protected wrecks, however, there are four wreck sites marked on or close to the Smith Bank. *Figure 3.14* illustrates the locations of known wreck sites (maritime, aviation and others) within the area. Unlike the south of England, which has paleoarchaeological features, the north east coast of Scotland is subject to isostatic rebound following the retreat of the last Ice Age. No submarine prehistoric artefacts have ever been found within the Moray Firth area [34] which is largely due to the fact that at the times of early human occupation of the British Isles this region was covered by ice-caps, and /or the North Sea.

Terrestrial archaeology will not be physically impacted by the Wind Farm proposals and is not considered further in this Scoping Report. It is proposed that terrestrial archaeology will be scoped out of the EIA.

Terrestrial cultural heritage, and any impact on its setting, will however be considered during the EIA. The Caithness coastline and hinterland possesses a number of Listed Buildings, Scheduled Monuments and other cultural features. *Figure 3.15* displays an example of the recorded cultural heritage features.

(34) Dti, The scope of Strategic Environmental Assessment of North Sea Area SEA5 in regard to prehistoric archaeological remains, 1994



Beatrice Offshore Wind Farm Site Boundary

Territoral Waters Boundary

Bathymetry
(Metres Below Sea Level)

0m

-220m

Wrecks

- Aircraft
- Entire Wreck
- Geological Feature
- None reported
- Notable Debris
- Partial Wreck
- Other

0 4 8 16 Km

0 2 4 8 Nm

UK Offshore Development

Figure: 3.14

Moray Firth Marine Archaeological Sites

File: BEA_IGIS_Arch_Sites_01_v06

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Scale: 1:650,000 A4

Datum: WGS 1984	Projection: UTM Zone 30N

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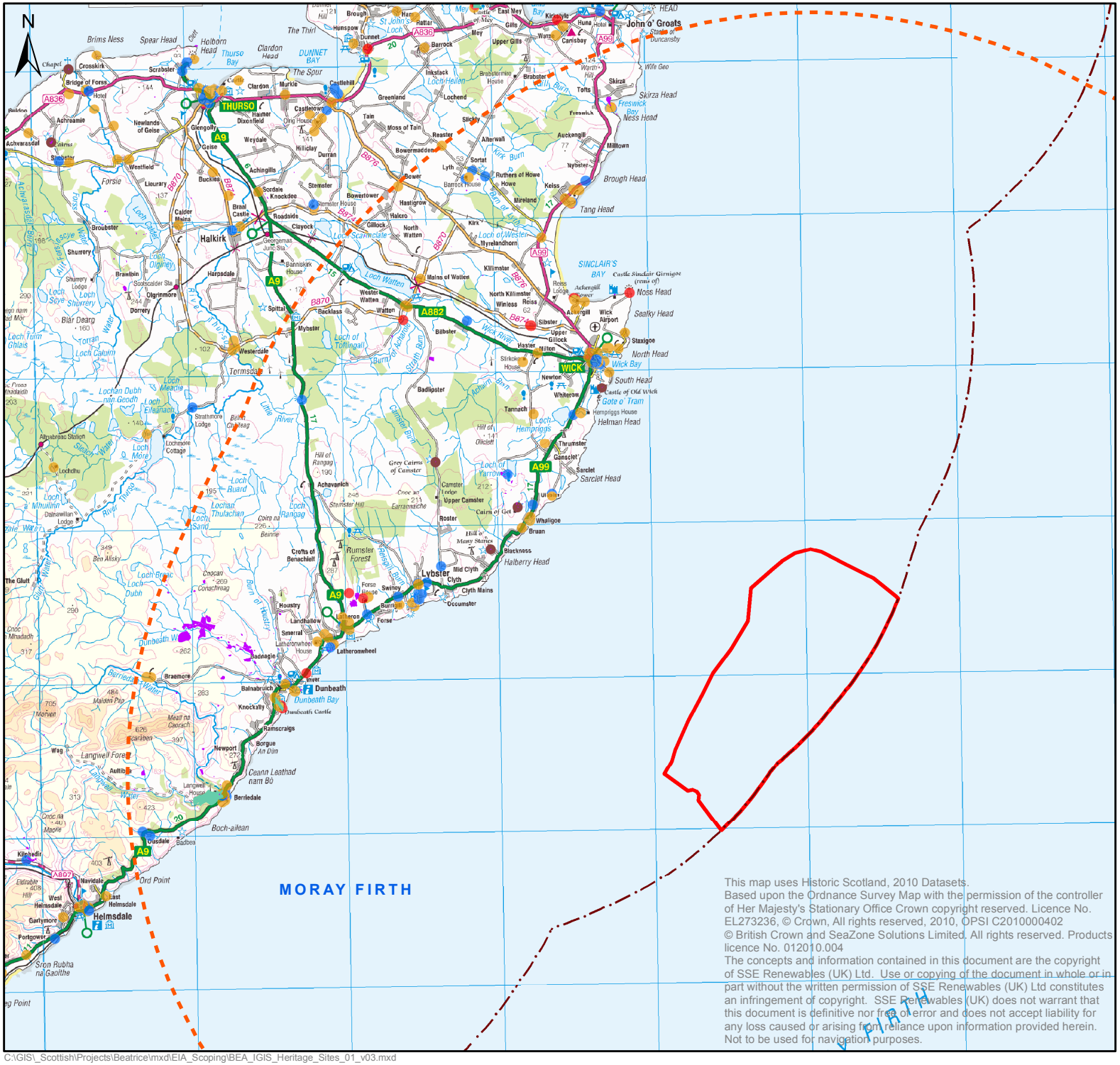

Beatrice Offshore Wind Farm Site Boundary

Territorial Waters Boundary

Zone of Theoretical Visability (35km)

Scheduled Ancient Monuments

Gardens and Designed Landscapes

Properties in Care

Listed Buildings

Grade A

Grade B

Grade C

0 2.5 5 10 Km

0 1.25 2.5 5 Nm

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Figure: 3.15

Terrestrial Cutural Heritage

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Scale: 1:350,000 A4			
Datum: WGS 1984		Projection: UTM Zone 30N	

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Potential Impacts – Construction / Operation / Decommissioning

Potential construction and decommissioning impacts may include the following.

- In relation to marine archaeology there is potential for construction / decommissioning activities to directly, or indirectly affect known wreck sites.
- There is potential that new wreck or debris sites are discovered within the site area during the data gathering exercises of the EIA. Discovering new archaeology could be viewed as a positive impact.

Potential operational impacts may include the following.

- The setting of cultural heritage features located on the coastline may be impacted by the presence of the Wind Farm once it is constructed and operational. Given this is a visual and landscape character related impact this assessment will be undertaken as part of the Landscape and Visual assessment (see *Section 3.4.2*).

No physical impact will occur to land based heritage features as a result of the proposals.

Potential cumulative impacts may include the following.

- The setting of cultural heritage features located on the coastline may potentially be impacted by the presence of both Beatrice Offshore Wind Farm and the Moray Forth Round 3 wind farm once it is constructed and operational.

Studies, Methods and Assessment

As part of the data gathering for the Wind Farm EIA there will be a detailed marine survey data gathering exercise (see *Section 3.2.1*) through swath bathymetry, sidescan sonar and underwater metal detecting (magnetometer). Results will be interpreted by specialist marine archaeologists to assess the likelihood of significant unknown wrecks or features being present in the area. Where wrecks are considered likely to be present it may be possible to micro site the turbine foundations, substations and cable routes to avoid them. Any new features will be recorded in the required manner and in accordance with an approved written scheme of investigation.

Data searches during the baseline data gathering exercise will include reference to the following documentation.

- Dti, SEA5, The scope of Strategic Environmental Assessment of North Sea Area SEA5 in regard to prehistoric archaeological remains.
- Royal Commission on Historic and Ancient Monuments for Scotland, data base and web tools.
- Historic Scotland, Scottish Heritage Environment Policy (SHEP) – Marine Historic Environment (Draft).

Potential Mitigation

Should new features be discovered on the seabed within the site area it may be possible to micro-site construction activity around these features. If micro-siting is not possible and the feature cannot remain in-situ it will be recorded in accordance with regulation and guidelines and removed or relocated in accordance with advice from the relevant cultural heritage stakeholders.

3.4.4 *Aviation and Ministry of Defence*

Baseline

Civil Aviation

The nearest civilian commercial and passenger airports to the development are as listed below.

- Wick airport - approximately 25 km to the north-west.
- Inverness airport - approximately 105 km to the south-west.

Figure 3.16 displays the Moray Firth Civil and Military Aviation Features. This figure also illustrates the location of the two closest civil airports to the Beatrice site and their suggested Aviation Aerodromes. Based on the NATS data set [35] the 'suggested' Civil Aerodrome areas would not be directly impacted by the proposed Beatrice Offshore Wind Farm. However, further propagation modelling and ongoing consultation with the relevant authorities will be required to ensure any possible issues are resolved at an early stage.

The existing Beatrice oil platforms lie immediately to the south of the Wind Farm site and are highlighted in *Figure 3.16* as 'existing fixed platforms'. The 6 nm boundary around the Beatrice platforms A, B and C represent helicopter safeguarding zones (note the Jacky platform does not have a helicopter pad). The intention of these zones is to allow space for helicopter operations around these oil platforms [36]. BOWL will consult the Beatrice oil platform operators to ensure that any potential issues of concern are discussed and adequately addressed by the EIA.

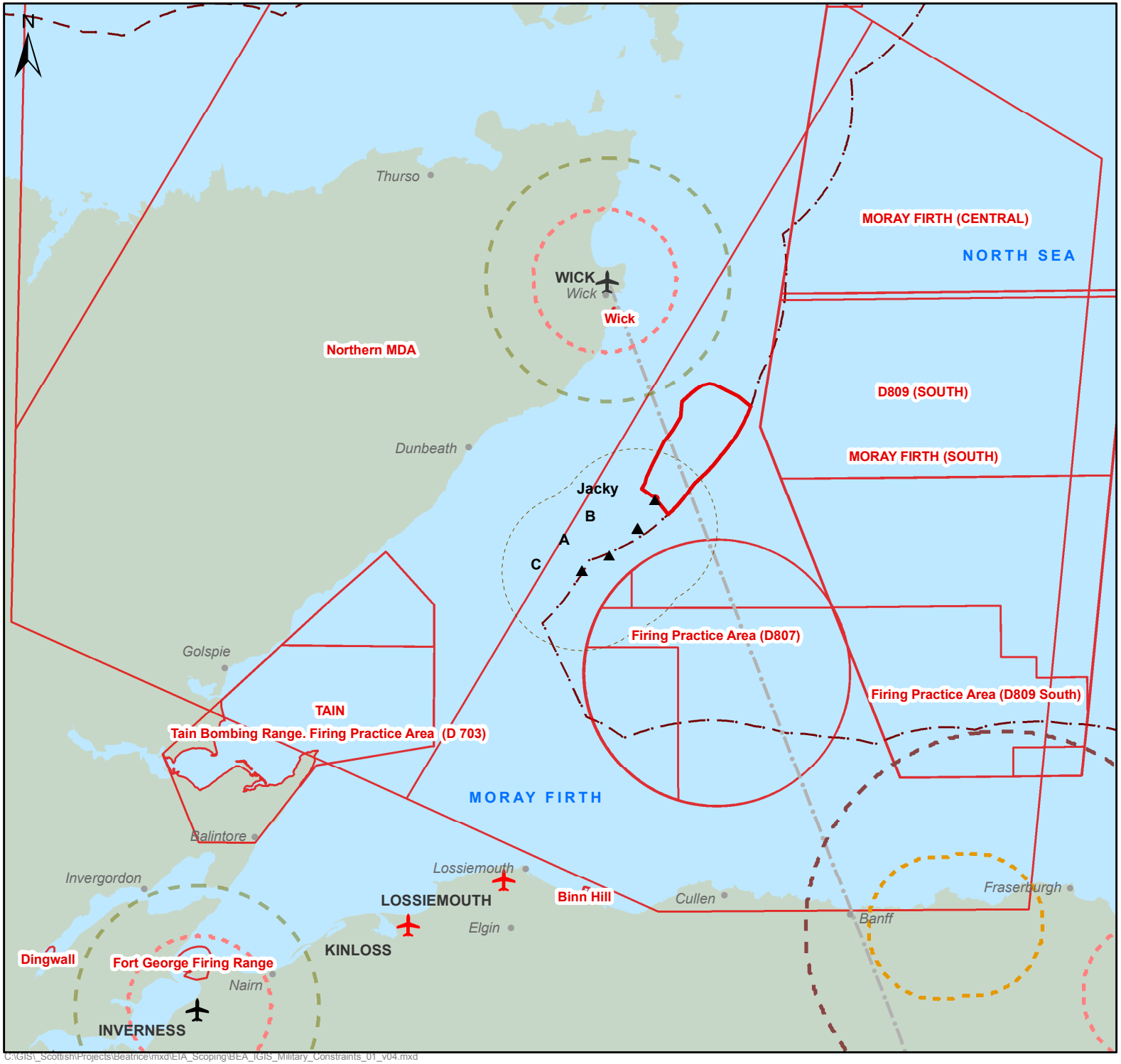
NATS En Route

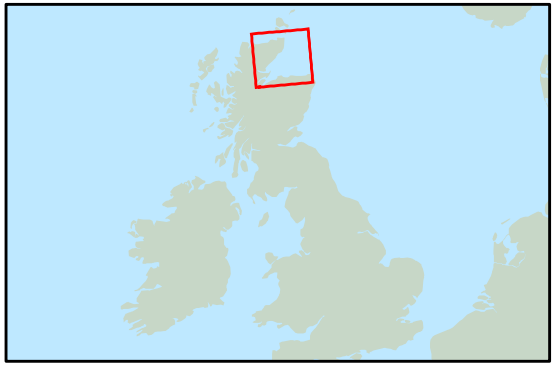
National Air Traffic Services (NATS) provides air traffic control services to aircraft flying in UK airspace, and over the eastern part of the North Atlantic. Initial consultation with NATS has highlighted that the Beatrice Offshore Wind Farm will be visible to the Allanshill Primary Radar located near Fraserburgh. In addition to this the NATS North Sea Helicopter Advisory Route W4D (Aberdeen to Wick) also routes directly over the site.

Consequently, NATS has suggested that the extent of the potential impacts will require further assessment.

(35) http://www.nats.co.uk/10491/NERL-Self-assessment-maps.html

(36) Civil Aviation Authority (February 2009), CAP 764 - CAA Policy and Guidelines on Wind Turbines.





Beatrice Offshore Wind Farm Site Boundary
Territorial Waters Boundary
Potential Helicopter Safeguard Zone (6nm)
Suggested Civil Aviation Aerodrome
Air-Ground-Air Communication Stations (10km)
Navigation Aids (10km)
Secondary Surviellance Radar (15Nm)
Military Practice Area
North Sea Helicopter Advisory Route WD4 (Aberdeen - Wick)
Civil Airport
Military Airport
Existing Fixed Platform

0 5 10 20 Km
0 2.5 5 10 Nm

UK Offshore Development

Figure: 3.16

Moray Firth Aviation and Military

File: BEA_IGIS_Military_Constraints_01_v04

Rev:4	Date: 05/03/10	By: NvR	Checked: MM

Scale: 1:750,000 A4

Datum: WGS 1984 | Projection: UTM Zone 30N

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Ministry of Defence (MoD)

Practice and Exercise Areas (PEXA) charts produced by the UK Hydrographic Office, identify the military activity zones within the Moray Firth area. These areas are illustrated on *Figure 3.16*. PEXA's are used for various military practice activities by Royal Navy, the Army, the Royal Air Force, the Defence Estates and the MOD Police.

The RAF uses the Moray Firth and Outer Moray Firth as low flying practice areas and firing and bombing ranges. The military air bases of RAF Lossiemouth and RAF Kinloss are located approximately 65 km and 80 km respectively, to the south west of the Beatrice Offshore Wind Farm site. BOWL is aware that both Kinloss and Lossiemouth have an exclusion zone surrounding them, however, BOWL does not anticipate having any impact on either of these airbases due to the distance they are from the proposed development. In addition the airbases, the Ministry of Defence (MoD) also use the Moray Firth as part of a larger marine operations area for surface and sub-surface naval activities and exercises. *Figure 3.16* presents the known aviation and military interests in the vicinity of the Wind Farm site.

Potential Impacts – Construction / Operation / Decommissioning

Potential impacts during construction may include the following.

- The presence of tall structures in areas where aircraft operate or military operations occur.

Potential impacts during operation may include the following.

- Adverse affects of Wind Farm operations on radar systems.
- Physical obstructions to aircraft or military operations.

As well as creating a potential physical obstruction on the sea bed, wind turbines can cause adverse affects on radar systems due to the movement of the rotor blades. As a result of the blades rotation at high speeds, radar signals can be scattered and this creates clutter on the air traffic controller's display. Wind turbines can therefore create blind areas on radar coverage. The magnitude of potential effect depends on the size, extent and location of the wind turbines in relation to the affected instruments [37]. This is an important factor if the affected area is an area of interest such as a controlled airspace or a military practice area. It is therefore important that the likely impacts of the proposals on aviation activities are understood, assessed and where possible mitigated.

Potential cumulative and in-combination effects on aviation and military operations may include the following.

- It is possible that cumulative impacts of a similar type to those discussed above may arise from the Beatrice Offshore Wind Farm being constructed/operated /decommissioned in

(37) National Telecommunications and Information Administration (July 2008), *Assessment of the Effects of Wind Turbines on Air Traffic Control Radars*

parallel or in sequence with the nearby Moray Firth Round 3 Wind Farm.

Studies, Methods and Assessment

BOWL has been working closely with Civil and Military authorities to ensure that any potential issues and possible mitigation is discussed at an early stage.

The MoD was first consulted with general site information in September 2008 and since has been provided with a more detailed information pack containing site boundary coordinates, turbine coordinates and anticipated dimensions. Ongoing consultation with the MoD will be maintained through out the development phase of the project. NATS has been commissioned to carry out an operational assessment for the site which highlights any operational impacts on flight routes that the Beatrice Offshore Wind Farm may have. This assessment will include an analysis of any impact on North Sea Helicopter Advisory Route W4D, and will also include proposed mitigation for any issues raised.

As part of the EIA, consultations will be undertaken with the civilian and military aviation operators in the area. A detailed impact assessment will be undertaken of the potential effects on aviation facilities (including radar), airspace structure and flight paths. The assessment will be undertaken by an aviation specialist in consultation with the appropriate bodies, including the CAA and Ministry of Defence.

In preparation for the assessment, reference has been made to the following documentation.

- Wind Energy and Aviation Interests – Interim Guidelines [38] published by the Working Group for Wind Energy, Defence and Civil Aviation Interests in 2002.
- CAP 764 - CAA Policy and Guidelines on Wind Turbines, February 2009.

Key tasks and activities that will form the basis of the assessment will be as presented below.

- A full aviation impact study will be undertaken in consultation with all aviation stakeholders and defence estates. This will include safeguarding zone evaluations and radar line of sight evaluations.

Potential Mitigation

If the Beatrice Offshore Wind Farm is anticipated to cause any adverse impacts on aviation, whether it has radar affects or is a physical obstruction, BOWL will make every effort to resolve these issues. Based on existing consultation it is firmly believed that mitigation is available for all possible scenarios and BOWL will work closely with all of the stakeholders involved to find a mutually agreed solution to any possible impacts.

(38) Working Group for Wind Energy, Defence and Civil Aviation Interests (2002), *Wind Energy and Aviation Interests - Interim Guidelines*

3.4.5 *Shipping and Navigation*

Baseline

The Moray Firth is used by a variety of vessels, fishing vessels being the most common vessel in the Firth with busy fishing ports at Fraserburgh and Buckie. The presence of several ports (principally Inverness and Cromarty Firth) and the entrance to the Caledonian Canal attracts both commercial and recreational vessel traffic within the Firth. Oil and Gas vessels navigate in this area in support of the Beatrice complex and its satellites and drilling operations. Drilling rigs also use Nigg and Invergordon yard facilities for refitting and repair and can often shelter in the Cromarty Firth when out of contract.

Commercial shipping densities within the Moray Firth, and within the vicinity of the Beatrice Offshore Wind Farm site, are generally low. Ten kilometres to the north east of the site boundary lies a main shipping route which accommodates in excess of 1,000 shipping movements per year. As part of the EIA the Automatic Information System (AIS) will be used to illustrate the shipping activity in the Moray Firth. It is recognised that this data will only represent AIS carrying vessels and will not accurately represent the levels of fishing and recreational activities in this area. A figure summarising the pattern of shipping within the Moray Firth is provided in *Figure 3.17*.

The Royal Yachting Association publish a Cruising Atlas detailing facilities and activities of recreational craft around the UK. There are two identified routes that pass through the Beatrice Offshore Wind Farm site.

The Department for Transport (DfT) Marine Statistics for 2008 indicated that the Cromarty Firth handled 2.3 million tonnes of foreign and domestic traffic and that 697,000 tonnes were handled at Inverness. In terms of arrivals the Cromarty Firth received 169 vessels during 2008 with Inverness receiving 267. Type and size breakdowns are presented in *Table 3.1*.

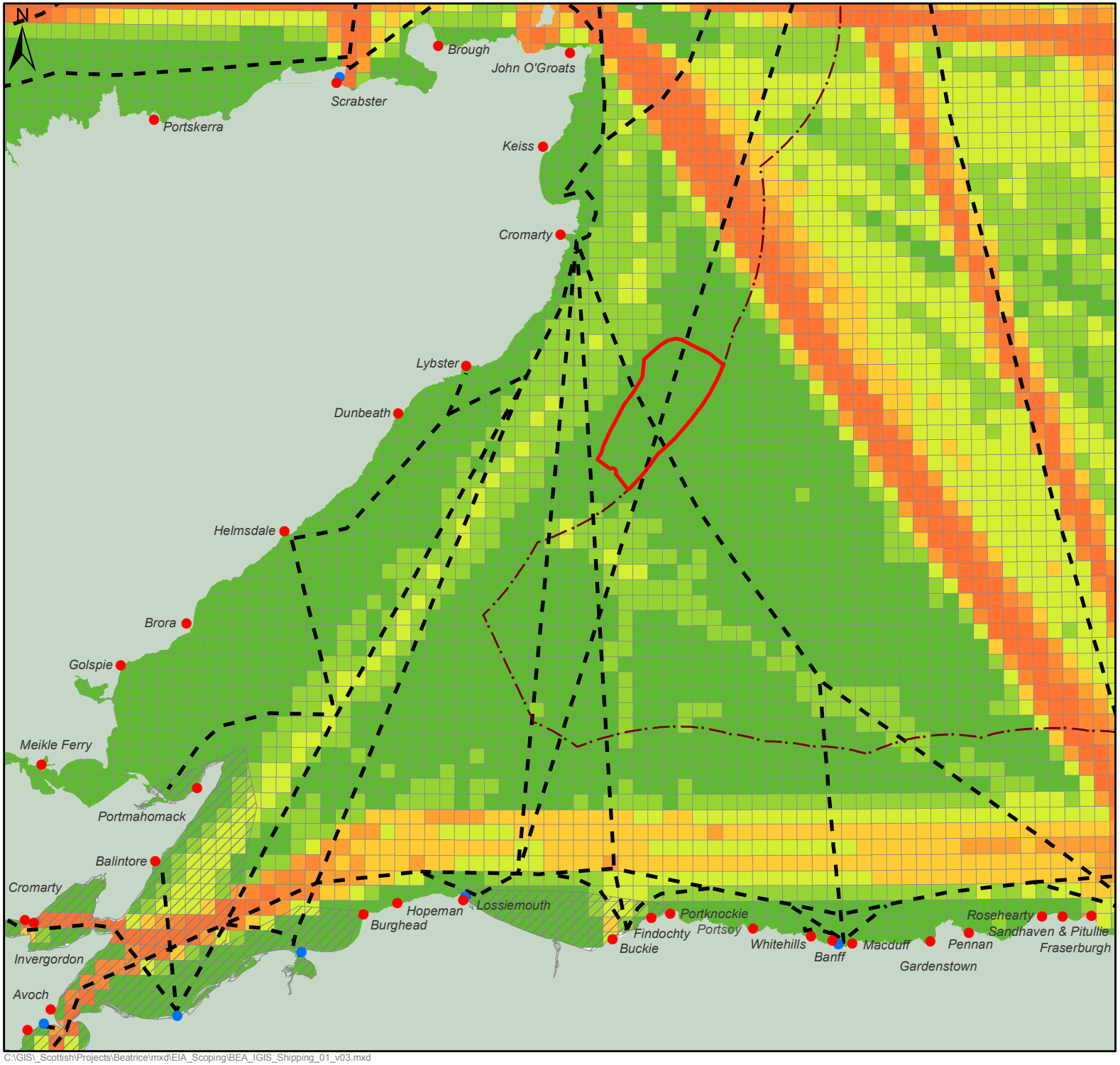
Table 3.1: Type and number of vessels arriving in 2008

Ship Type	No of arrivals at Cromarty Firth	No of arrivals at Inverness
Tankers	49	158
Ro Ro	5	0
Fully Cellular	6	3
Other Dry Cargo	109	106
Total	169	267

It is acknowledged that these statistics do not give full account to offshore related vessels, fishing, recreational and passenger traffic.

There were 52 cruise calls into Cromarty Firth in 2008 with a total of 48,100 passengers. This contributed significantly to the tourism economy of the Highlands [39].

(39) Cromarty Firth Port Authority, annual report for the year to 31 December 2008



Beatrice Offshore Wind Farm Site Boundary

Territorial Waters Boundary

RYA Sailing Area

RYA Cruising Atlas

Port

RYA Club

Relative Navigational Density
Ship Density / Year

- Less than 50
- 50 - 100
- 50 - 100
- 100 - 200
- 200 - 300
- 300 - 400
- 400 - 500
- Greater than 500

0 4 8 16 Km

0 2 4 8 Nm

UK Offshore Development

Figure: 3.17

Moray Firth Shipping and Sailing Routes

File: BEA_IGIS_Shipping_01_v03

Rev:3	Date: 23/02/10	By: NvR	Checked: MM

Scale: 1:650,000 A4

Datum: WGS 1984	Projection: UTM Zone 30N

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Proposed Scope of the EIA

Potential Impacts – Construction / Operation / Decommissioning

During construction, operation and decommissioning there is potential for the safe navigation of all vessel types to be affected. Such impacts may include those identified below.

- Collision with turbines (powered and drifting).
- Collision with other vessels due to increased activities during construction and decommissioning.
- Interference of turbines with radar resulting in higher navigational risks.
- Increased risk of fishing gear interactions with cable.
- Re-routing of existing cruising or shipping routes.

Studies, Methods and Assessment

As part of the EIA a shipping survey and navigational risk impact assessment will be undertaken by a specialist contractor. The risk assessment will include consultation with relevant shipping bodies, port authorities and the Maritime and Coastguard Agency (MCA).

The work will be carried out in accordance with the Guidance on the Assessment of the Impact of Offshore Wind Farms. Key tasks that will be carried out within this process will include the following.

- The use of maritime Traffic Surveys employing AIS and radar in line with MGN 371 requirements.
- Consultation with key stakeholders.
- Fishing Vessel Assessment.
- Recreational Vessel Impact Assessment.
- Collision Risk Analysis.
- Risk Management Assessment.
- Demonstration of ALARP (as low as reasonably practicable) risk.

Background and guidance documents that will be referenced during the assessment will include those identified below.

- MCA, Marine Guidance Note - MGN 371 (M+F), Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues.
- BWEA, Investigation of Technical and Operational Effects on Marine Radar Close to Kentish Flats Offshore Wind Farm, April 2007.
- DECC Guidance on the Assessment of the Impact of Offshore Wind Farms.

Potential Mitigation

Typical measures that will be considered within this assessment are listed below.

- Lights and markings.
- Safety zones.
- Routeing measures.
- Information to Mariners, eg Notices to Mariners, Kingfisher, etc.
- Guard vessel during construction.
- AIS, VHF and/or radar monitoring during operation.

3.4.6 *Commercial Fisheries*

Baseline

There is currently no single data set or model which can accurately quantify the precise levels or values of commercial or recreational fishing within a small discrete sea area such as an offshore wind farm. Previous experience on such projects has however identified methodologies that are acceptable to regulators in gathering this data. This technique involves utilising catch data alongside Vessel Monitoring Systems/Overflight data and attributing effort to the specific study area or site boundary. In order to ground truth these estimates a baseline data gathering exercise will be required from a range of sources including the following.

- International Council for the Exploration of the Sea (ICES).
- EU Fisheries Committee Publications & Data sets (Europa & Eurolex).
- Marine and Fisheries Agency/Marine Scotland – Fisheries Statistics Unit & Data and Communications Team.
- Marine Scotland Science.
- Seafish.
- UK Oil & Gas.
- Scottish Fishermen's Federation (SFF).
- National Federation of Fishermen's Organisation (NFFO).
- Regional SFF affiliated fishermen's associations and producer organisations.
- Local non affiliated fishermen's associations, groups and individual skippers.
- Local port merchants and agents.
- Marine Scotland District Fisheries Inspectors.
- Local harbour masters.
- Foreign National Fisheries Agencies (identified through the course of the EIA).

ICES statistical rectangles are currently the smallest area statistical units used for collating fisheries data. Rectangle boundaries align to 1° longitude and 30′ latitude and for the most part have sea areas equating to approximately 900 nautical miles. The Beatrice Offshore Wind Farm site is situated almost entirely within ICES Rectangle 45E7 and the assessment of the fisheries baseline provided below is based primarily upon data [40] from this rectangle.

Ports

Preliminary assessment of Marine and Fisheries Agency (MFA)/Marine Scotland fisheries statistics has identified the following ten ports with the highest averaged (2000-2008) recorded landings from rectangle 45E7, as shown in *Table 3.2* below. In addition to east coast ports, there are landings recorded into west coast ports, although these constitute proportionally a very low level of the total landings (2.6 %).

Table 3.2 Averaged Annual Landings Values (2000-2008) into Ports (top 10) from ICES Rect. 45E7

Port	Landings Values from 45E7	% of Total in 45E7
Fraserburgh	£685,806	42.8 %
Buckie	£356,094	22.2 %
Wick	£223,106	13.9 %

(40) MFA Fisheries Statistics, 2000-2008

Port	Landings Values from 45E7	% of Total in 45E7
Peterhead	£120,135	7.5 %
Macduff	£85,931	5.4 %
Scrabster	£37,667	2.4 %
Aberdeen	£17,806	1.1 %
Lochinver	£16,444	1.0 %
Kinlochbervie	£14,737	0.9 %
Ullapool	£11,318	0.7 %

Commercial Species

Table 3.3 below gives the averaged annual landings by species from ICES Rectangle 45E7.

Table 3.3 Averaged Annual Landings Values (2000-2008) by Species (top 10) from ICES Rectangle 45E7

Species	Landings Values in 45E7	% of Total into 45E7
Scallops	£917,910	57.3 %
Nephrops (Norway Lobster)	£240,742	15.0 %
Haddock	£204, 324	12.8 %
Monks (Anglers)	£120,668	7.5 %
Squid	£34, 637	2.2 %
Cod	£18,686	1.2 %
Megrim	£13,095	0.8 %
Whiting	£9, 135	0.6 %
Herring	£7,675	0.5 %
Other	£34,309	2.1 %

Scallops record 57.3 % of total catch by value in 45E7 (averaged value 2000-2008). Analysis confirms ICES Rectangle 45E7 as recording the highest landings values on the east coast, the grounds being of national importance to the fishery. Scallops represent proportionally high landings in inshore waters of the Moray Firth. The species is targeted by vessels operating toothed dredges attached to beams, the teeth raking scallops into bags.

Landings of nephrops (15 % in 45E7) are recorded within the rectangle where the Beatrice Offshore Wind Farm is located. Landings for this species are however proportionally higher in the southern portion of the Moray Firth, with the most important grounds located further offshore towards Fladen ground. Nephrops are a burrowing shellfish targeted by both demersal trawlers and creelers.

Haddock and monkfish are demersal fish species together comprising 20.3 % of the total landings in 45E7. In past years monkfish was landed as a valuable bycatch of other demersal species but it is now a fishery in its own right. Principal methods for targeting these species are demersal trawling and Scottish seining.

Brown crab and lobster are important inshore fisheries in the inner and north Moray Firth. The species are targeted by static gear vessels operating pots, also known as creels.

In recent years squid has been recorded along Scotland's north east coast and it is now an important fishery. The southern portion of the Moray Firth records the highest recorded landings with the species targeted by trawls.

The Moray Firth does not contain important fishing grounds for mid-water or pelagic species such as mackerel, herring or sprat.

Proposed Scope of the EIA

Potential Impacts – Construction / Operation / Decommissioning

Potential impacts during construction and decommissioning may include the following.

- During construction / decommissioning fishermen will be excluded from the area around the turbines. This will potentially prevent fishermen from accessing regular fishing grounds.

Smith Bank, and in particular the area of Smith Bank that the project will be located on, and its importance to fishing will be assessed as part of the full EIA.

Potential impacts during operation may include the following.

- If fish are displaced from the area as a result of construction of the Beatrice Offshore Wind Farm, the fishermen may need to travel to different areas to catch fish and shellfish or to set their gear.
- Any impact to recruitment of juveniles into the adult population due to impacts to spawning or nursery activity may result in a decrease in fish and shellfish populations which will increase the effort needed to record the same level of catch.
- There may be a need to restrict certain types of commercial fishing activity within proximity to Wind Farm structures.

Potential cumulative impacts may include the following.

- Impact of both the Beatrice Offshore Wind Farm and Round 3 wind farm being constructed / decommissioned in parallel or in sequence on the displacement of commercial species.
- Impact to commercial operations should fishing restrictions be imposed for certain types of fishing activity in proximity to the wind farms in the area.

Studies, Methods and Assessment

An impact assessment of the proposed Wind Farm upon Moray Firth commercial fishing operations will be undertaken by a specialist fisheries consultant. To assist this assessment, discussions and consultation will be undertaken with the relevant national and local marine fisheries bodies and fishermen's associations and representatives.

Based upon experience of other UK offshore wind farm developments, the assessment methodology as outlined in the Defra (2004) Guidelines has been assumed. The Guidelines state that the following aspects (potential impacts) should be addressed in respect of commercial fishing.

- Presence of seabed obstacles.
- Adverse impacts on commercially exploited species.
- Increased steaming times to fishing grounds.
- Safety issues for fishing vessels.
- Complete loss or restricted access to traditional fishing grounds.
- Interference with fisheries activities.
- Any other concerns raised by local fishermen and fishermen's organisations.

In the case of each impact, the assessment will take account of the following.

- The spatial extent of effect.
- The duration of effect.
- The scale of effect.
- Recoverability of the receptor.
- Importance of the receptor.

Potential Mitigation

In each instance, potential mitigation measures will be identified and the significance of effects will take these measures into consideration. The residual effects will then be identified, as will the monitoring requirements.

3.4.7 *Salmon and Sea Trout Fisheries*

Baseline

Salmon (Salmo salar) and sea trout (Salmo Trutta) are anadromous migratory species, spending their adult life at sea and returning to their home rivers to spawn. The salmon and sea trout fishery in Scotland is divided into commercial and recreational fishing. The rod and line industry is currently considered to form a 'pivotal part' of the Scottish rural economy, with salmon fishing amongst the more popular activities for visitors to Scotland.

The main commercial and recreational fishing methods are given in *Table 3.4*. Details of fish caught and retained in the vicinity of the Beatrice Offshore Wind Farm are shown in *Table 3.5*.

Table 3.4 Main Fishing Methods

Moray Firth Fishery districts	Commercial Fishing	Recreational Fishing
Bag and Skate (fixed engines)	✔	
Net and Coble	✔	
Rod-and-line		✔

Table 3.5 Details of Fish Caught and Retained in the Vicinity of the Beatrice Offshore Wind Farm Area (FRS, 2008)

Moray Firth Fishery districts	Salmon	Grilse	Sea trout
Deveron	1214	1016	289
Spey	1743	1201	1065
Lossie	49	61	153
Findhorn	565	525	32
Naim	296	631	59
Ness	289	358	51
Beauly	117	296	6
Conon and Alness	194	664	50

Source: Fisheries Research Service, 2008 (Statistical Bulletin, Scottish Salmon and sea trout Catches, 2007)
Note: Salmon figures are annual and include spring salmon (multi-winter, taken before 1st May) and summer salmon (multi-winter taken after 30th April). Grilse are salmon that only spend one winter at sea before returning to their natal rivers.

Potential Impacts – Construction / Operation / Decommissioning

The main impact on salmon and sea trout fisheries that in theory could be associated with the Beatrice Offshore Wind Farm would be the effects upon migratory behaviour. Given that the impacts on the fisheries will be directly related to the impacts on the ecology of these species, the assessment provided by the fish ecology component of the EIA will inform this section (see *Section 3.3.4*).

Studies, Methods and Assessment

There are to date no established methodologies to assess the impacts on salmon and sea trout fisheries caused by offshore wind farms in Scotland. The methodologies to be used will therefore be formulated and agreed in consultation with the relevant institutions.

The assessment of salmon and sea trout fishing activities in the area relevant to the Wind Farm development will be based on up-to-date fisheries statistics and information gathered through consultation with relevant stakeholders, such as the Fisheries Research Services (FRS Freshwater Laboratory) and Salmon District Fisheries Boards.

Mitigation

During the EIA process discussion and consultation with relevant stakeholders and consultees will be undertaken and used to shape any mitigation measures that may be required to reduce any identified significant impacts.

3.4.8 *Oil and Gas*

Baseline

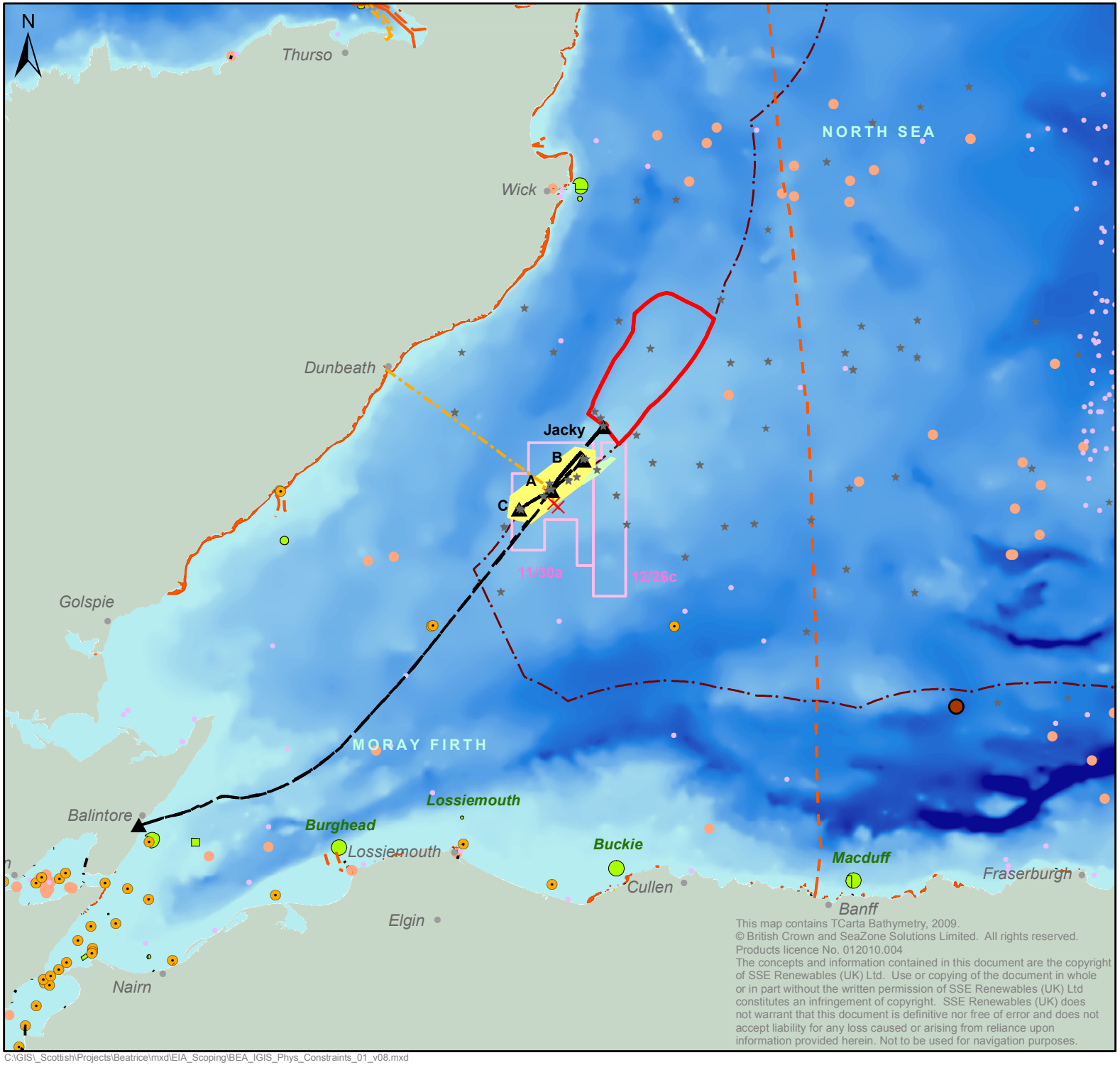
Much of the area off the north east coast of Scotland has never been licensed for oil and gas exploration, or was previously licensed but has since been relinquished. The main oil and gas activity in this Moray Firth area at present is the Beatrice oil field (Block 11/30a). This field was discovered in 1976 and began production in 1981. The oil field has produced over 160 million barrels of oil to date. In the 23rd Licensing Round, Ithaca was also awarded, as one licence, several further blocks and part blocks which surround the Beatrice Field. Polly, 2.5 km east of Beatrice oil field is an emerging opportunity and straddles blocks 11/30a and 12/26c. These are illustrated on *Figure 3.18*. The Polly oil field region has been illustrated with reference to Ithaca Energy website (41).

The existing oil and gas structures present in the area are illustrated on *Figure 3.18*. Key structures include the following.

- The Jacky platform.
- Beatrice Alpha, Bravo and Charlie platforms.
- Seabed cables and pipelines linking the platforms.
- Beatrice oil is exported via a 66 km long 16 inch pipeline from the Alpha complex to a shore terminal at Nigg in the Cromarty Firth, where it is stored until tanker shipment.
- The Beatrice complex is linked to the mainland via a 132/33 kV seabed power cable from Dunbeath. The demonstrator wind turbines provide approximately 30 % of the Alpha platforms daily requirements.

Beatrice oil platforms A, B and C are owned by Talisman Energy and operated by Ithaca Energy. The Jacky platform is owned and operated by Ithaca Energy. Existing oil and gas infrastructure will be afforded certain wayleaves and buffer zones, restricting certain types of activities and development within their proximity.

(41) http://www.ithacaenergy.com/greater-beatrice-area.asp



Beatrice Offhsore Wind Farm Site Boundary
Territorial Waters Boundary
Existing Demonstrator Turbine
Wellhead
Offshore Installation
Fixed platform/structure
Pipeline, submarine
Buoy
Obstruction
Obstruction, foul ground
Cable, submarine
Power Cable, submarine
Obstruction, foul area
Polly Oil Field (Indicative Region)
Dumping Ground
Offshore Production Area
Beatrice Oil and Gas Licence Regions
Bathymetry
(Metres Below Sea Level)
0m
-220m

0 4 8 16 Km
0 2 4 8 Nm

UK Offshore Development

Figure: 3.18

Moray Firth Physical Features

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Datum: WGS 1984	Projection: UTM Zone 30N		

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Figure 3.18 also illustrates the locations of other known features such as well heads, buoys and obstructions.

There is interest in the potential for future hydrocarbon finds in the Moray Firth. As a result a programme of detailed seismic survey of certain areas within the Moray Firth is planned for 2010.

Potential Impacts – Construction / Operation / Decommissioning

Potential construction and decommissioning impacts may include the following.

- An increased risk of accidental damage to existing oil and gas infrastructure. This could occur, for example, as a result of construction vessels breaking free from its moorings.

During operation there are no likely significant impacts predicted.

Potential cumulative or in-combination impacts may include the following.

- It is possible that cumulative impacts of a similar type to those discussed above may arise from the Beatrice Offshore Wind Farm being constructed/ decommissioned in parallel or in sequence with the nearby Moray Firth Round 3 Wind Farm.

Studies, Methods and Assessment

A thorough data gathering exercise will be undertaken to establish the location of existing structures and facilities located within and around the Beatrice oil field. Consultations will take place with the existing platform operators and owners to fully understand current and future exploration and production operations.

If early discussions with the operators and owners identify that no significant (negative or positive) impact would occur as a result of construction, operation or decommissioning of the Wind Farm then this topic area will be scoped out of the EIA.

The impact to shipping and helicopter navigation activities would be assessed as part of the wider EIA (see *Section 3.4.4* and *3.4.5*).

Potential Mitigation

In order to identify and minimise potential risk of damage to existing oil and gas infrastructure BOWL will undertake discussions with the owners and operators of the infrastructure.

The layout of the Wind Farm site would also be designed to ensure that no turbine structure has the potential to damage existing infrastructure during its operation, or in the unlikely event that a turbine topples over. Any existing safety zones or wayleaves afforded to existing oil and gas infrastructure will be mapped and incorporated into the Beatrice Offshore Wind Farm layout.

3.4.9 *Pipelines and Cables*

Baseline

The Kingfisher Cable Awareness Charts identify the main cable routes around the coast of the UK. In referring to these charts the closest cable to the

Beatrice Offshore Wind Farm site relate to a submarine power cable running north/south between Banff and Orkney (see *Figure 3.18*). The pipelines and cables associated with the Beatrice oil field are discussed above within *Section 3.4.8* of this report.

Potential Impacts – Construction / Operation / Decommissioning

Given the distance from the Beatrice Offshore Wind Farm site of existing submarine cable and pipeline infrastructure it is not considered that there will be significant impact on these features as a result of constructing, operating or decommissioning the Beatrice Offshore Wind Farm. Given this it is proposed that this topic area is scoped out of the EIA.

3.4.10 *Marine Waste and Spoil Disposal*

Baseline

There are four marine disposal sites between Burghead and Macduff to the south of the Beatrice field and are located as illustrated on *Figure 3.18*. Due to the coastal locations and the distances from the Wind Farm site it is not considered that there will be significant impacts on/from these sites during construction, operation or decommissioning of the Wind Farm. It is therefore considered that this topic area be scoped out of the EIA.

3.4.11 *Socio-economics*

The Beatrice Offshore Wind Farm project is of such a large scale that it is likely to have significant impacts at a national level. Significant impacts from the quantity of electricity to be provided, from helping to meet EU and national political targets for renewables and CO_2 emission reduction, and helping to achieve long term sustainable development of the Scottish economy.

At a more local level the project could also provide significant levels of employment during the construction phase and long term opportunities through the operational life of the project. There is an opportunity for many Scottish firms to be involved throughout the life of the project, ranging from development studies through construction, installation, operation and maintenance phases.

The key European and national policy framework relating to renewable energy production is presented in *Section 1.5* of this Report.

Baseline

It is proposed that the EIA focuses on impacts at a Scottish level as well as at a regional level, identifying significant social and economic impacts that the Wind Farm may give rise to within specified regions. The regions which the assessment will consider have yet to be finalised but are likely to consist of an Inner Study Area and a Broad Study Area.

To invite comment during this Scoping exercise the following study areas are suggested.

- Inner Study Area – Moray Firth area including Inverness, Cromarty Firth, Caithness and North Sutherland, Moray Coast.

- Broader Study Area – Other parts of Scotland. Potential impacts on areas such as Aberdeen and Fife will be considered due to the high number of potential suppliers that exist in these areas.

Potential UK level and European level impacts could be considered during the EIA at a high level.

Scottish Government, Regional Councils, Highlands & Islands Enterprise and Scottish Enterprise will play a large part in supporting the development of infrastructure and supply chains throughout Scotland.

Local organisations such as the Caithness and North Sutherland Regeneration Partnership (CNSRP) will also play a role in developing an integrated and strategic approach to employment and regeneration initiatives for their area.

The role of local ports, harbours and the potential links to manufacturing and assembly sites is an important consideration. The development of local infrastructure represents an opportunity to increase the economic impact from the project during the construction and operational phases. There are a number of larger facilities that may be relevant during the construction phase of the project and smaller facilities that could be relevant to ongoing operations.

The Inner Moray Firth Ports and Sites Strategy (42) developed by the Highland Council in 2006 intends to chart a future for these economically important assets. The National Renewables Infrastructure Plan (43) sets out the conclusions of the first stage of the development of the National Renewables Infrastructure Plan (N-RIP). The development of the N-RIP has three stages.

- Stage 1 - Development of spatial framework of first phase sites.
- Stage 2 - Development of investment plans for first phase sites by Delivery Group facilitated by Scottish Enterprise and Highlands and Islands Enterprise, further development of funding approaches and clarity on private and public sector investment support.
- Stage 3 - Delivery of phased investment at first phase sites based on industry demand.

Additionally, development programmes are being implemented for regional ports such as Scrabster and Wick through the work of the CNSRP.

Looking forward, the role of renewable energy both offshore as wind, tide and wave power and onshore wind farm development are considered important future players in the employment and socio-economic future for Scotland.

The importance of early engagement with the Scottish Government, Regional Councils, Highlands & Islands Enterprise and Scottish Enterprise is recognised by BOWL.

(42) The Highland Council (June 2006), Inner Moray Firth Ports and Sites Strategy: 2050.

(43) Scottish Enterprise and Highlands and Islands Enterprise (2010), National Renewables Infrastructure Plan.

Studies, Methods and Assessment

The methodology for this socio-economic assessment is likely to consist of six key stages.

- Definition of the study area(s) for the socioeconomic assessment.
- Establishment of the socio-economic baseline conditions for these areas.
- Identification of potential significant impacts of the construction, operational and decommissioning phases of the development. This will take into account those mitigation measures that have been incorporated into the design of the scheme (embedded mitigation).
- Establishment of an economic impact model that takes account of all possible impacts – direct, indirect, induced, supply chain effects, potential for local production and maintenance.
- Identification of any additional mitigation and enhancement measures.
- Assessment of residual impacts, taking into account all mitigation measures.

It is proposed that the study area consists of two distinct but interrelated geographical areas comprising the Inner Study Area and Broader Study Area. Consultation with key agencies and industry representatives will be a critical starting point for assessing the socio-economic impact and defining the study areas to be assessed.

The socio-economic baseline that will be established will provide data on the following topic areas.

- Population.
- Demographics.
- Employment and economic deprivation.
- Tourism and recreation.

Potential Impacts - Construction / Operation / Decommissioning

The socio-economic impacts of the construction (currently estimated to be in the region of £3 billion) and operation of an offshore wind farm of the size of the Beatrice proposal are likely to be significant, and will impact at a national and local level.

Impacts will vary considerably at each level depending on the technology deployed, type of structures, contracting strategy and other factors such as the availability and capacity of the supply chain. A range of scenarios will be considered in the assessment.

It is proposed that socio-economic impacts at national level will not be quantified as part of the EIA exercise. Impacts on the Inner Study Area and Broader Study Area will however be assessed and quantified at a level consistent with available industry sector multipliers.

Potential construction impacts may include those listed below.

- Significant need for local support services.

The construction of a wind farm of this magnitude will represent an intense period of activity as it is constructed. During construction there will be a requirement for significant local support services and the long term operation and maintenance

programme of the Wind Farm is likely to create further demand for local suppliers. During the construction phases it is likely suppliers and contractors will be required to fabricate and/or deliver the following elements.

- Turbines.
- Sub-structures.
- Cables.
- Electrical systems.
- Sub-stations.
- Control systems.

During construction any of the specialist contractors may be required to stay in the area over the construction period and may require the support of local hotel, accommodation and other service industries. Marine operations are less likely to require local service providers.

Potential operational impacts may include the following.

- During the likely operational life of the Wind Farm there will be an ongoing programme of operation and maintenance that will require the provision of permanent locally based work force and facilities.
- The operation and maintenance of the Wind Farm will require the provision and support of dedicated vessels and the creation of a dedicated work force which will be augmented by specialist contractors on a regular basis.
- The regular servicing and upgrades are likely to require external specialist contractors input, some will be required to stay in the area over the construction period and may require the support of local hotel, accommodation and other service industries.
- The operation and maintenance phase of the Beatrice Offshore Wind Farm represents a significant opportunity for new, highly skilled jobs in the Moray Firth area and beyond.

Potential cumulative impacts may include the following.

- The likely further substantial investment in the Moray Firth Round 3 wind farm site which will represent very significant positive economic opportunities for the wider Moray Firth area.

Wider, there are further positive cumulative economic opportunities when the Pentland Firth marine energy developments are taken into account. There are particular cumulative benefits in the power and marine sectors and associated service industries.

Social impacts will also be considered although the methodologies for assessing social impact tend to be less precise and more qualitative. However, such an assessment will complement the economic assessment. In the context of an offshore wind farm the definition of "community" needs to be examined at a local, regional and Scottish level. A qualitative model will be developed to look at how the project is likely to impact on people, considering – Community Structure, Community Infrastructure, Community Functioning (Behaviour and Perceptions), Social Equity and Individuals.

Potential Mitigation

It is anticipated that the overriding socio-economic impacts of the proposed offshore Wind Farm will be positive in nature. The key to maximising the positive socio-economic impacts will be to ensure the development of the Wind Farm proposals, and its construction and operational support facility requirements, are discussed with the local stakeholders.

The wider consultation strategy and the Communications Plan are discussed further in Section 4 of this Report.

3.5 *Cumulative Impact Assessment*

It is recognised that the Beatrice Offshore Wind Farm abuts a separate and larger offshore site that is to be developed as part of the UK Round 3 process (the development of offshore wind farms wholly outside the 12 nautical mile territorial waters limit). In assessing the environmental impacts of the Beatrice Offshore Wind Farm development it is important to consider the cumulative impacts arising from the Beatrice development taken together with the Moray Firth Round 3 development, as far as they are known at the time of assessment.

A cumulative and in combination impact assessment is also a requirement of the Habitats Regulations (44) with respect to the designated SACs and SPAs which may be affected. As a result, the cumulative and in combination assessment of impacts on the marine mammals and seabirds of the Moray Firth's European designated sites will be an important consideration within the EIA process.

Aside from the two offshore sites at the Moray Firth it is recognised that the other offshore wind farm developments under Scottish territorial waters and Round 3 processes are in three loose clusters (see *Figure 1.1*).

- The east coast group is based around the Firth of Forth to the Firth of Tay where 5 sites are in the process of development.
- The west coast group where three sites are in development.
- The Solway Firth group of two sites.

Regarding the east and west clusters, developers have already formed co-operative developer lead groups to consider cumulative and in combination environmental effects. Discussions with key regulators are already underway to develop a consistent approach to undertaking the cumulative impact assessment of the wind farm proposals in these areas.

A Moray Firth developers group has also now been formed to agree an approach to cumulative and in combination impacts for the Moray Firth offshore wind farms.

Key elements of this approach are likely to be as listed below.

(44) The Conservation (Natural Habitats, &c.) Regulations 1994 (OPSI)

- Ensuring consistency and inter-comparability of data gathering and analysis methods and protocols.
- Joint discussions with regulators concerning cumulative impacts as required

Other cumulative effects, which consider the impacts arising from the proposed Beatrice Offshore Wind Farm in the context of other non wind farm developments (eg oil and gas operations) and activities (eg the shipping and fishing industries) will also be considered in the course of the EIA.

To ensure the EIA is robust and addresses the key issues it is proposed that cumulative impacts are considered for each of the relevant topics within the proposed ES. It is also proposed that the interrelationship between each of the topic specific assessments is considered and any cumulative or in combination effects resulting from these interrelationships are reported in the ES.

3.6 *Structure of the Environmental Statement (ES)*

The structure proposed for the ES is in line with Schedule 4 of the *Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000* and relevant good practice guidance including those listed below.

- DCLG (2006) Environmental Impact Assessment: A Guide to Good Practice and Procedures (Draft).
- Preparation of Environmental Statements for Planning Projects that require Environmental Assessment.
- A Good Practice Guide (Department of Environment, 1995).
- Guidelines for Environmental Impact Assessment (Institute of Environmental Management and Assessment, 2004).

The ES will comprise three main parts.

- A non-technical summary.
- The main text.
- Supporting technical appendices.

The introductory chapters will contain background information on the project, set out the EIA methodology and planning policy. The remaining chapters will contain technical assessments of the potential environmental effects and mitigation measures proposed and/or adopted during the project design to avoid or reduce such effects.

Based on the content of this Scoping Report the following topics are proposed to be assessed in detail during the EIA and reported in the ES.

Physical Environment

1. Coastal Processes
2. Seabed (physical)
3. Noise (underwater)

Biological Environment

1. Marine Mammals
2. Seabed Marine Life
3. Fish
4. Ornithology
5. Designated Sites

Proposed Scope of the EIA

Human Environment

1. Landscape, Seascape and Visual
2. Archaeology and Heritage
3. Aviation and MoD
4. Shipping and Navigation
5. Commercial Fisheries
6. Salmon and Sea Trout Fisheries
7. Offshore Oil and Gas
8. Socio-Economics (including leisure and recreation)

Based on existing knowledge, data and understanding it is proposed that the following topics be scoped out of the EIA.

Topic Areas Scoped Out

1. Plankton
2. Air Quality
3. Airborne Noise
4. Geology
5. Existing and Proposed Pipelines and Cables (excluding oil and gas)
6. Marine Waste and Disposal
7. Land based Traffic and Transport

4 CONSULTATION

4.1 CONSULTATION AND COMMUNICATION

BOWL proposes to undertake its consultation and communication exercises with reference to best practice [45] and all applicable legal requirements. BOWL recognises the importance of consultation during all phases of the project with the regulators, marine stakeholder and local communities and is committed to embarking on a thorough and focussed consultation exercise. As well as this specific Scoping exercise and specific EIA consultations, BOWL will implement a wider stakeholder communication process to ensure all identified stakeholders are engaged in and/or informed of the project's development. This wider communication exercise will be informed by a detailed Project Communications Plan.

4.1.1 *EIA Consultation*

This Scoping Report aims to introduce the Beatrice Offshore Wind Farm proposals and to briefly set out an approach to the EIA and the associated data gathering exercise. It also aims to present what is considered by BOWL to be the main issues and topics that must be addressed in the EIA. One of the main aims of the Scoping exercise therefore is to consult with a variety of bodies and stakeholders to agree the scope, methodologies, surveys, assessments and outputs of the EIA. For this purpose the contents of this Report have been shared with the bodies identified in *Table 4.1* below. The table identifies what key areas of the environment these stakeholders are being consulted on. It is expected that as consultations progress BOWL will be informed of other appropriate organisations or bodies that may be consulted.

(45) British Wind Energy Association, 2002, Best Practice Guidelines: Consultation for Offshore Wind Energy Developments, BWEA, London, 32 pp.

Table 4.1 List of Scoping Report Consultees

Consultees	Key areas of EIA consultation
Scottish Government Energy Division	All elements of the EIA
The Crown Estate	All elements of the EIA
Marine Scotland	All elements of the EIA
Highland Council	All elements of the EIA
Moray Council	All elements of the EIA
Aberdeenshire Council	All elements of the EIA
Scottish Environment Protection Agency	All elements of the EIA
Moray Firth Partnership (and SAC Group)	All elements of the EIA
Scottish Hydro Electric Transmission Ltd (SHETL)	Design and technology
Department of Energy and Climate Change (Aberdeen)	Design and technology
Scottish Natural Heritage	Ecology, landscape and seascape
Joint Nature Conservation Committee	Ecology and nature conservation
Scottish Wildlife Trust	Ecology and nature conservation
Scottish Environment LINK	Ecology and nature conservation
RSPB	Ornithology
Sea Mammal Research Unit	Marine mammals
Whale and Dolphin Conservation Society Scotland	Marine mammals
The University of Aberdeen – Lighthouse Field Station	Marine mammals
Association of District Salmon Fisheries Board	Fisheries and aquaculture
Atlantic Salmon Trust	Fisheries and aquaculture
Scottish Enterprise	Socio-economics

Consultees	Key areas of EIA consultation
Highland and Island Enterprise	Socio-economics
Visit Scotland	Socio-economics
Caithness and North Sutherland Regeneration Partnership	Socio-economics
Historic Scotland	Setting of cultural heritage features, archaeology
Scottish Fisherman's Federation	Shipping and navigation, commercial fisheries
Moray Firth Inshore Fisheries Group	Shipping and navigation, commercial fisheries
Maritime and Coastguard Agency	Shipping and navigation
Royal National Lifeboat Institution	Shipping and navigation
Cromarty Firth Port Authority	Shipping and navigation
Northern Lighthouse Board	Shipping and navigation
Royal Yachting Association (Scotland)	Shipping and navigation, socio-economics of recreational yachting
Chamber of Shipping	Shipping and navigation
Marine Safety Forum	Offshore Oil and Gas
Talisman Energy (UK) Ltd	Offshore Oil and Gas
Ithaca Energy	Offshore Oil and Gas
Caithness Petroleum	Offshore Oil and Gas
PA Resources	Offshore Oil and Gas
NATS	Radar and aviation
Highlands and Islands Airports (Wick and Inverness)	Radar and aviation
Civil Aviation Authority	Radar and aviation
Defense Estates	Radar and aviation, military operation constraints

This list is not exhaustive and further consultees may be identified and consulted during the Scoping and EIA exercises.

Scoping consultations have already commenced with various bodies and organisations in the table above. Once all parties are engaged in the Scoping exercise BOWL and its specialist advisors will refine and agree the scopes, timetables and deliverables etc required to inform the EIA. These consultations will continue through the EIA exercise up until the submission of the applications.

As discussed in *Section 3.5* it is recognised that a collaborative approach to consultation will be sought in relation to cumulative impacts associated with the Moray Firth Round 3 offshore wind farm.

4.1.2 *Project Communications Plan*

BOWL is in the process of finalising a detailed Project Communications Plan that will guide stakeholder consultation for all phases of the project (design, construction, commissioning). Its primary purposes will be as presented below.

- To develop a communications protocol and strategy.
- To develop a communication plan for key stakeholders.
- To identify key documentation / activities required for implementing the strategy.

Communications with the public, community bodies, elected representatives and the media around Beatrice will be co-ordinated by BOWL and all communications with statutory bodies will be handled by the project team.

Project websites, press releases and public exhibitions are approaches that will be considered as ways of communicating with stakeholders through the various phases of the project.

4.1.3 *Get in Touch*

Whether formal or informal, your views and opinions about the proposed offshore Wind Farm, even at this early stage, are welcome and valued. If you have any comments, queries or views about the contents of this Report please feel free to contact BOWL by the methods below.

Your Scoping Opinions may also be sought by the Scottish Government.

In writing to:

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By Email to:
stuart.szylak@erm.com

Digital copies of this Scoping Report are available from the project website at:

www.sse-beatrice.com

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