



Aberdeen Offshore Wind Farm

Request For an

Environmental Impact Assessment (EIA)

Scoping Opinion

May 2005





Document Change Record

Date	Rev	Author	Description of Change

Document Status: Public





Preface

This report scopes the Environmental Impact Assessment (EIA) for a proposal by Aberdeen Offshore Wind Farm Limited (AOWL) to develop the Aberdeen Offshore Wind Farm.

Ultimately AOWL intends to apply to the Scottish Ministers for consent for the wind farm project under Section 36 of the 1989 Electricity Act as the proposal would have an installed capacity of greater than 50 MW.

The project is also likely to require consent under Section 34 of the Coast Protection Act 1949, and a Marine Construction Licence under Section 5 of the Food and Environment Protection Act 1985.

This report represents AOWL's formal request to the Scottish Ministers, under regulation 7 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000, Regulation 4 of the Harbour Works (Environmental Impact Assessment) Regulations 1999 and the relevant provisions of the Food and Environment Protection Act 1985 for a "scoping opinion" regarding the information to be provided in the Environmental Statement (ES) presenting the EIA which will accompany the applications for these consents.

Comment on this document is invited both formally through the Scottish Executive consultees and informally through AOWL consultations on the studies to be included in the EIA and the nature and scope of these studies.

This report also formally notifies the Scottish Ministers, under Regulation 8 of the 2000 Regulations, that AOWL are intending to submit an application for a Section 36 consent in relation to the Aberdeen Offshore Wind Farm, and that they intend to submit an ES to accompany the application.





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1 INTRODUCTION

1.1 Background Information

AMEC and Aberdeen Renewable Energy Group (AREG) have entered into a joint venture with the aim of developing a wind farm in Aberdeen Bay. Construction and operation of the wind farm will be subject to achieving the appropriate consents (discussed below) and agreement with relevant landowners, including the Crown Estate.

The wind farm is likely to comprise approximately thirty three, three-bladed wind turbines, with an individual capacity of up to 5 MW, with a maximum height to tip of 150 metres, located approximately 1 km offshore, within the broad area shown in Figure 1, a hypothetical layout is also shown on Figure 1, this layout is based on constraints identified during initial desk top feasibility studies.

The final number of wind turbines is dependent on potential constraints identified during the Environmental Impact Assessment (EIA) process and the size of machine used.

The potential maximum output of the wind farm is approximately 165 MW (assuming thirty three, 5 MW wind turbines as illustrated on Figure 1). The associated electrical infrastructure will comprise buried cables between the wind turbines plus a cable to shore that will connect the wind farm to the onshore electricity distribution network.

Aberdeen Bay is considered suitable for wind farm development at this stage based on initial desktop investigations and through consultation with key statutory consultees.

Site selection took into account a number of environmental, technical and commercial issues. Principal among these were:

- Wind speeds likely to be in excess of 8 m/s at 60 metres
- Water depth around 10 m below Lowest Astronomical Tide (LAT), for cost effective foundations;
- Not in a known area for conservation importance;
- Not within a major international shipping route;
- Proximity to electricity transmission network;
- No national landscape designations in the vicinity
- No military low flying constraints
- Enthusiasm of local community / council for proposed development.

The final ES for this project will contain detailed information on site selection and a justification for the design of the final layout. This will be through an extensive consultation process and environmental surveys.





1.2 The Need for Wind Energy Projects

Climate change represents one of the greatest environmental threats faced by the world today with far reaching implications for the global environment and economy. The UK is committed to finding alternative, renewable, sources of energy and has set targets under the Kyoto Protocol to produce a certain percentage of our energy from renewable sources. Under the Renewables Obligation (Scotland), and its England and Wales equivalent, there is a legal commitment through suppliers to procure 10% of our total energy needs from renewable sources by 2010 with policy targets now in place to procure 15% of our energy needs from renewables by 2015.

The Scottish Ministers have adopted a 40% target for Scotland's energy requirements to be generated from a mix of renewable sources, including wind power, by 2020.

The maximum potential output from this wind farm if it were to be 165 MW would provide enough capacity to meet the demand of over 90,000 homes / just over 220,000 individuals, equating to a supply large enough to meet over 100% of the domestic need of Aberdeen City* for a 25 year lifetime, and would make a significant contribution towards steps to cut UK carbon emissions by 60% (from 1990 levels) by 2050.

* assumes Aberdeen City population is 203,450 (www.aberdeencity.gov.uk)

1.3 The Developer

The developer is Aberdeen Offshore Wind Farm Limited, a company whose shareholders are AMEC Project Investments Limited and Aberdeen Renewable Energy Group.

AMEC Project Investments Limited is a wholly-owned subsidiary company of AMEC plc, an international project management and services company, with headquarters in London and offices in Aberdeen. AMEC's wind energy business is one of the UK's leading wind energy developers with more than 10 years' experience in the conception, engineering, management, operation and maintenance of wind farms.

Wind farms that have been or are currently being developed by AMEC are listed in Table 1.

Name	Location	Number of wind turbines	Output MW	Planning status		
Offshore						
Race Bank	Greater Wash	~100	500	Pre-planning		
Docking Shoal	Greater Wash	~100	500	Pre-planning		
Lynn	Skegness	30	90	Construction due to commence soon		
Blyth	Northumberland	2	4	Operational (2000)		
Onshore						
Lewis	Western Isles	234	702	Application Submitted		
Kyle	East Ayrshire / Dumfries and Galloway	100	300	Application Submitted		
Clashindarroch	Aberdeenshire	47	82	Application submitted		
Aultmore	Moray	30	52	Application submitted		

Table 1 AMEC Developed Wind Farms





Minch Moor	Borders	12	24	Application submitted
Edinbane	Isle of Skye	27	49	Awaiting planning notice
Tees Wind North	Teesside	18	45	Awaiting planning notice
Clachan Flats	Argyll & Bute	9	16	Construction during 2005 / 2006
High Volts	Co. Durham	3	8.25	Operational (2004)
Hare Hill	Co. Durham	2	5.5	Operational (2004)
Holmside Hall	Co. Durham	2	5.5	Operational (2004)
High Hedley	Co. Durham	3	8.25	Operational (2001)
Kirkheaton	Northumberland	3	1.8	Operational (2000)
Great Eppleton	Northumberland	4	3	Operational (1997)
Blyth Harbour	Northumberland	9	2.7	Operational (1993)

AREG was formed from independent, interested parties across the energy and related research sectors to promote a wider understanding of the opportunities to be offered by renewable energy technologies and to drive forward the vision of Aberdeen as the focus and flagship for these projects and change in the energy industry.

1.4 Aims of this Document (requesting a scoping opinion)

AOWL request a Scoping Opinion from the Scottish Ministers under Regulation 7 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 specifying the information to be provided in the Environmental Statement (ES) which will accompany the application for a consent under Section 36 of the Electricity Act 1989.

AOWL also requests the Scottish Ministers to procure Scoping Opinions on the basis of the same information under Regulation 4 of the Harbour Works (Environmental Impact Assessment) Regulations 1999 in relation to the intended application for a consent under Section 34 of the Coast Protection Act 1949 and under the provisions of the Food and Environment Protection Act 1985 in relation to the intended application for one or more licences pursuant to Section 5 of that Act.

In addition, AOWL formally notifies the Scottish Ministers under Regulation 8 of the 2000 Regulations described above, that it is intended to submit an application for a consent under Section 36 of the 1989 Act for the Aberdeen Offshore Wind Farm and that it is intended to submit an ES to accompany this application.

In accordance with the above Regulations, this scoping document includes:

- A plan to identify the proposed development site;
- A brief description of the nature and purpose of the proposed development and of its possible effects on the environment;
- Further information as required.

The document is divided into three further sections:





- Section 2 which describes the proposed development;
- Section 3 which outlines the legislative framework for consent ;
- Section 4 which provides information on the criteria to be used for the EIA.

This document has been prepared with reference to the above Regulations and the Guidance Notes on the Offshore Wind Farm Consents Process issued by Scottish Executive Consents and Emergency Planning Unit.

Under Directive 2000/42/EU (the Strategic Environmental Assessment Directive) an environmental assessment is required for plans and programmes in specific sectors, including energy, that sets the framework for development consents for projects listed in the EIA Directive and for those requiring an appropriate assessment under the Habitats or Birds Directives. At present no assessment has been carried out, or is intended to be carried out, by the Government which would impact upon this proposal. We welcome advice from the Scottish Executive on this subject.

1.5 List of Consultees

The information provided in this document is designed to help consultees and stakeholders comment on the assessment approach outlined, raise other issues of perceived concern, provide further information and, where necessary, advise on alternative methods of assessment.

Below is a list of consultees to whom this scoping report has been sent. Suggestions from other bodies of any groups, organisations or individuals not on the list would also be welcome.

Table	2: L	ist o	f (Consultees	who	will	be	sent	Sco	pina	Report
10010				001100110000			~ ~	00110	000	P	1.00010

Part 1: List of Statutory Consultees to be approached by the Scottish Executive for Scoping Opinion				
Aberdeen City Council				
Aberdeenshire Council				
Scottish Natural Heritage (SNH)				
Scottish Environment Protection Agency (SEPA)				
Scottish Executive Internal Consultees				
Royal Air Force (Defence Communications Service Agency)				
The Office of Gas and Electricity Markets				
National Air Traffic Services				
Ministry of Defence (Defence Estates)				
Health and Safety Executive (HSE)				
Department For Trade and Industry (Engineering Inspectorate)				





Civil Aviation Authority
British Telecom
Historic Scotland
Crown Estate Office
Climate Change Team – Scottish Executive
Ecological Advisory Unit – Scottish Executive
Other Scottish Executive Internal consultees
Architecture and Design Scotland
Fisheries Research Service (FRS) - Aberdeen Marine Laboratory
Scottish Executive Environment and Rural Affairs Department (SEERAD)
Association of District Salmon Fishery Boards
Part 2: List of Consultees to be approached by AOWL
Part 2: List of Consultees to be approached by AOWL Aberdeen / Aberdeenshire Tourist Boards
Part 2: List of Consultees to be approached by AOWL Aberdeen / Aberdeenshire Tourist Boards Aberdeen Environmental Forum
Part 2: List of Consultees to be approached by AOWL Aberdeen / Aberdeenshire Tourist Boards Aberdeen Environmental Forum Aberdeen Harbour Authority
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Friends of the Earth
Greenpeace Scotland
Joint Nature Conservation Committee (JNCC)
Local Fisherman's Organisations
Local sub-aqua clubs
Local Sailing Clubs
Maritime Coast Guard Agency (MCA)
Moray Coastal Partnership
National Trust For Scotland
Northern Light House Board
Receiver Of Wrecks
Royal National Lifeboat Institution
Royal Society For The Protection Of Birds (RSPB)
Royal Yachting Association
Scottish Fisherman's Federations
Sea Mammal Research Unit (St Andrew University)
Scottish Wildlife Trust (SWT)
Scottish and Southern Energy Plc
Scottish Water
Trinity House
University of Aberdeen
Consultees for radio communications / infrastructure only
BBC
Cable and Wireless
Channel 5 broadcasting
Crown Castle International
CSS Spectrum Management
Dolphin Tetra
Information and Communication Technology Unit
ITC
National Plant Enquiries
NTL
02
Ofcom
Oil and Pipelines Agency





Orange
Scottish Executive Communications division
Scottish Ambulance Service
Shell UK Ltd
Thus
Transco
Vodafone





2 PROPOSED DEVELOPMENT

2.1 Site Description

The wind farm lies approximately 1 km from the Aberdeenshire coast (See Figure 1). The proposed site comprises an area following the coastline between Girdle Ness and Newburgh, the study area for development covering approximately 26 km². The wind turbines are likely to be aligned either side of the 10 m water depth contour. Seabed sediments within the site are characterised as predominantly sand.

Table 3:	Site	co-ordinates
10010 0	0.00	

Point	Degrees latitude	Minutes latitude
1	N57	17
I	W1	59
2	N57	17
2	W1	58
3	N57	9
5	W2	3
Λ	N57	10
+	W2	4

2.2 Proposed development

The project will comprise:

- The offshore wind turbines and their foundations;
- The interconnecting cables between wind turbines;
- A connection to the electricity transmission network.

The exact specification for the wind turbines will be determined when more information becomes available on site conditions and will also depend on market availability. The EIA will be based on a hypothetical machine with a maximum height to tip of 150 m. The construction period for a wind farm of this size is approximately 8 months. The lifetime of the project is dependent upon seabed lease agreements and is likely to be 20-25 years.

2.3 Civil Engineering

Design of Site

The wind farm will comprise the wind turbines, their foundations and the inter-wind turbine cable network. The final design of the site will respond to technical, commercial and environmental constraints identified throughout the development process, such as geological conditions, the presence of wrecks, ecological constraints, visual appearance, and water depth. Although only prototype 5 MW wind turbines are currently available, it is anticipated that they become commercially available before construction commences and therefore for EIA purposes we will use dimensions equivalent to a 5 MW machine, although smaller machines will also be considered during the EIA process. A potential layout is illustrated in



Figure 1, based on thirty-three 5 MW wind turbines, this layout responds to the majority of constraints identified during desk and consultation based initial feasibility studies.

Wind Turbine Design

As stated above, the EIA will be based on hypothetical wind turbines with a hub height of 90m and a rotor diameter of 120 m. The colour and finish of the towers will be agreed with the appropriate authorities but is likely to be pale grey with a semi-matt finish. There is a statutory requirement for a yellow band on the lower part of the wind turbines/foundations for increased visibility to shipping. Navigation lighting will also be required.

Foundation Design

Foundations suitable for water depths of potentially up to 15 m need to be designed with consideration of wider issues than those for existing coastal structures. These include:

- Increased maximum wave heights in deeper water and at potentially more exposed locations;
- Increased forces on the base that will result from larger waves and deeper water;
- Potentially different seabed conditions over the site;
- Target design life of up to 25 years (Subject to the appropriate leases);
- Refined substructure design and installation method to minimise the overall capital expenditure;
- Decommissioning of the substructures at the end of the wind farm life;

The aim is to design a single wind turbine substructure for the whole wind farm area that can be installed quickly, efficiently, with minimal environmental impact and cost effectively and could have an operational life of 25 years with minimum maintenance.

The possible foundation types are:

- Gravity base;
- Driven/drilled piles;
- Suction piles,
- Jacket Structure.

Foundation diameter will range between 6 m for piles and 25 m for gravity foundations. The structural materials to be considered are:

- Steel;
- Concrete;
- Steel/concrete hybrid.

The possible methods for transportation and installation include:

- Cargo barge/crane vessel;
- Flotation/separate buoyancy unit;
- Flotation/self installing.





Electrical Layout

Inter-wind turbine cable circuits will electrically connect the wind turbines. The cable layout used will be designed for security of supply in the event of a failure but will have the minimum number of cables to satisfy this requirement. Cables are likely to be buried in the seabed to a depth of at least 1 m.

Project Connection to the Electricity Transmission Network

At this stage it is unknown exactly where the project would connect to the grid, however an extensive transmission network exists in the area into which the project could easily connect. Further details will be provided on grid connection options once they are known, If overhead lines are required these would be subject to a separate application under Section 37 of the Electricity Act and EIA.

Project Construction

The construction period is expected to last 8 months. The mobilisation and supply base for the works is likely to be in Aberdeen, while some components may be delivered directly to the site from their places of manufacture. The marine plant on site will be jack-up platforms or self-elevating vessels, tugs, barges, cable-laying vessels and other support craft.

There is likely to be a safety zone to regulate sea users during construction.

Project Operation and Maintenance

Once commissioned, the wind farm will operate for up to 25 years. The wind turbines will be individually controlled by computer and centrally monitored from a shore-based location. The wind turbines are likely to be serviced once each year, involving oil changes and greasing, as is necessary for any mechanical equipment. Primary access to the wind turbines will be by boat.

It is not considered a requirement to have formal safety zones during operation, but an area may be established around each wind turbine to regulate other users of the sea for safety reasons. The applicants understand that provisions within Section 36 legislation will be revised to allow this. The security of the cables, in terms of damage from anchoring and fishing methods, and the required burial depth, will be considered when defining the safety area requirements. Any safety areas will be proposed only after full consultation with the Maritime and Coastguards Agency (MCA) and Aberdeen Harbour Authority.

Project Decommissioning

The eventual decommissioning of the wind farm will be the reverse of the construction process. The foundations will be removed to a little below seabed with consideration made of likely changes in seabed level.

Currently there is no statutory requirement for decommissioned cables to be removed. However, the requirement may be reviewed in the future. The necessity for removal of the inter-wind turbine cables will be reviewed in terms of the environmental impact of the removal operation and the safety of the cable if left *in situ*.





3 LEGISLATIVE FRAMEWORK

3.1 The Crown Estate Lease

The Crown Estate owns much of the foreshore and seabed from Low Water out to 12 nautical miles (nm). AOWL are entering into talks with the Crown Estate and the Scottish Executive regarding the granting of an Agreement for Lease under Section 3 of the Crown Estate Act, 1961 for the proposed wind farm. The lease provides the right of occupation of an area for the purpose of placing structures on, or passing cables over Crown Estate land.

3.2 Other Consents Required

The Electricity Act 1989

Under Section 36 of the Electricity Act 1989, consent is required from the Scottish Ministers for the construction and operation of all power generating plant with an installed capacity of 50 MW and above.

The proposed Aberdeen Offshore Wind Farm could have an installed capacity of up to 165 MW, exceeding the 50 MW threshold. As such section 36 consent from the Scottish Ministers will be required for the project.

The Energy Act 2004

The Energy Act 2004, came into force in July 2004. Part II introduces a number of powers in respect of renewable energy. These include provisions relating to navigational safety and safety zones.

In connection with the Energy Act (2004) AOWL understand that Section 36 of the Electricity Act 1989 will be revised so that:

- Applications may be made to regulate the public right of navigation and fishing through the establishment of safety zones, with a view to ensuring the safety of all users of the sea. The domestic legislation proposed is enabled by Article 60 of the United Nations Convention on the Law of the Sea (UNCLOS). It would not be the AOWL's intention to prevent, except to the extent necessary, movements of vessels in relation to construction work or the operation of the wind farm;
- AOWL may apply to the Scottish Ministers to extinguish the public right of navigation and fishing on the site of the proposed wind farm. Whether or not such an application is to be made will depend on the navigational risk assessment, which will be carried out as part of the EIA process.

The Energy Act also contains provisions relating to the decommissioning of projects when redundant.

The Food and Environment Protection Act 1985 (FEPA)

The Scottish Ministers have a statutory duty to control the deposit of substances or articles in the sea / tidal waters; the primary objectives being to protect the marine ecosystem and human health, and minimising interference and nuisance to other users of the sea.

This duty is exercised under powers conferred by the Food and Environment Protection Act 1985 Part II, which require that a licence be obtained from the Scottish Ministers for the following works:





- the placing of materials in the marine environment during construction and related actions
- the disposal of waste at sea (primarily dredged material)
- the introduction of tracers and biocides and certain other activities in the marine environment

A FEPA licence will therefore be required to cover the wind turbine structures themselves and if the need arises for the disposal of any dredged material arising from excavation associated with the wind turbine foundations. Consultation with Aberdeen Marine Laboratory (FRS) will be undertaken with regards to this license and its requirements.

The Coast Protection Act 1949

Under Section 34 of the Coast Protection Act 1949 (as amended by Section 36 of the Merchant Shipping Act 1988) consent is required from the Scottish Ministers for the following operations:

- the construction, alteration or improvement of any works on, under or over any part of the seashore lying below the level of mean high water springs;
- the deposit of any object or materials below the level of mean high water springs;
- the removal of any object or materials from the seashore below the level of mean low water springs (e.g. dredging).

An amendment to be applied by virtue of the Energy Act 2004 will disapply certain sections (34) of the Coast Protection Act in respect of offshore energy generation activities, however consent may still be required under this Act for ancillary structures such as buoys, boreholes or cables to shore. In Summary it is currently anticipated the following primary consents could be required for the project:

- A consent from the Scottish Ministers under Section 36 of the Electricity Act 1989;
- A consent from the Scottish Ministers under Section 34 of the Coast Protection Act 1949;
- A Marine Construction Licence under Section 5 of the Food and Environment Protection Act 1985.

Environmental Impact Assessment

Any application made under the Food & Environment Protection Act (FEPA), The Electricity Act and, depending upon the location of the works, the Coast Protection Act (CPA) is required to be subject to a detailed scientific assessment of its environmental impact.

The Environmental Impact Assessment Directive (97/11/EC) requires an EIA to be carried out in support of an application for development consent for categories of project listed in the Directive at Annexes I and II.

Offshore wind farm developments are listed in Annex II as 'installations for the harnessing of windpower for energy production (windfarms)'. The EIA Directive has been transposed into UK legislation through various 'EIA Regulations', generally in the form of secondary legislation associated with existing consent provisions.

The Electricity Works (Environmental Impact Assessment)(Scotland) Regulations 2000 ("the EIA Regulations") apply Council Directive 85/337/EEC as amended by Council Directive 97/11/EC to the Electricity Act. The Regulations relate to the assessment of the





environmental impact of applications for consent to construct, extend or operate a power station or install or keep installed overhead electricity lines under Sections 36 and 37 of the Act.

Under the 2000 Regulations, all Section 36 developments, which are considered likely to have significant effects on the environment must be the subject of an EIA, and an Environmental Statement (ES) must therefore be submitted with the Section 36 application.

The Harbour Works (Environmental Impact Assessment) Regulations 1999 apply the EIA Directive to the Coast Protection Act and cover development sited in or partly within a port or harbour and similar provisions require the provision of an ES for specified works.

The EIA Directive has not been directly applied under FEPA regulations but there are existing provisions within the Act requiring developers to provide information equivalent to a formal ES.

3.3 Statutory Designations

Statutory designated sites situated in the vicinity of the proposed development are listed in table 4, and are shown in figure 2. Potential designated sites are afforded the same level of protection as those already designated. There are no potential designated sites in the vicinity of the development.

Designation	Legislative Information	Citation Information
Special Areas of Conservation (SACs)	Convention of Natural Habitats and of Wild	
River Dee SAC	Directive (92/43/EEC), transposed in the UK through the	Presence of Annex II species, Freshwater Pearl Mussel, Atlantic Salmon, Otter
Sands of Forvie SAC	Conservation (Natural Habitats) Regulations 1994.	Annex I habitats, Embryonic shifting dunes, shifting dunes along the shoreline with <i>Ammophila arenaria</i> , decalcified fixed duens with <i>Empetrum nigrum</i> , humid dune slacks
Buchan Ness to Collieston SAC		Annex 1 habitats, vegetated sea cliffs
Special Protection Areas (SPAs) and Ramsar Sites		
Sands of Forvie and Meikle Loch Special Protection Area (SPA)	The Birds Directive (79/409/EC). Wildlife and Countryside Act 1981.	Qualifying species, Pink Footed geese, Sandwich tern, common tern, little tern and general waterfowl assemblage
Ythan Estuary and Meikle Loch Ramsar	The Ramsar Convention on Wetlands of International Importance (1977, amended 1982)	Wintering Pink footed geese, breeding sandwich terns
National Nature Reserves (NNRs)		

Table 4: Statutory Designation in the vicinity of the site



Request For an EIA Scoping Opinion



Forvie NNR	National Parks and Access to the Countryside Act (1949)	Sand dune, foreshore, estuarine, spit, dune heath, slacks, rough pasture and cliffs habitat		
Sites of Special Scientific Interest (SSSIs)	Wildlife and Countryside Act (1981/1985)			
Sands of Forvie and Ythan Estuary SSSI		Sandwich tern, common tern and little tern		
Foveran Links SSSI		Mobile foreshore and dunes, interesting vegetation assemblages, migrating birds, moulting and passage sea ducks and divers, and coastal geomorphology		
Corby, Lily and Bishops Lochs SSSI		Wetland sites, aquatic vegetation, wildfowl roost		
Other Designations				
Forvie Biogenetic Reserve	Ministerial Conference on the Environment (1973)	Heathland Interest		
Balmedie Country Park	Countryside Act 1968	Recreation and leisure interests		
Donmouth Local Nature Reserve	National Parks and Access to the Countryside Act (1949)	Birds that feed and roost, Gre seals		

There are no national or local landscape designations such as national scenic areas within the vicinity of the proposal. In pre scoping consultation SNH have highlighted in conjunction with the JNCC that they are currently in the process of identifying marine SPAs, AOWL will keep up with this situation and if necessary consider providing information to inform an appropriate assessment.





4 TECHNICAL INFORMATION (ES CHAPTERS)

The following section provides basic information on various aspects of the environmental assessment criteria:

- Meteorological Conditions;
- Coastal Processes;
- Sediment and Water Quality, Plankton and Primary Productivity;
- Geology and Geotechnics;
- Benthic Ecology;
- Fish and Commercial Fisheries;
- Marine Mammals (and Basking Sharks);
- Ornithology;
- Marine Archaeology;
- Shipping;
- Aesthetic Impacts and Seascape;
- Other Marine Users;
- Acoustics and Vibration;
- Socio Economics;
- Electromagnetic Interference
- Aviation and MOD

This section provides background knowledge, which will be extended for the EIA. Potential cumulative effects have been considered for all topics, and where considered relevant they are "scoped" in further detail in the following sections.

4.1 Meteorological Conditions

Background Information

The local climate along this coast is dependent to a large extent on the shelter from winds from the North and East. Wind strengths along this stretch of coast are affected by local topography.

The strength and frequency of certain wind directions are quite variable. Information collected from the Coasts and Seas of the United Kingdom directory for this area indicate the following:

Predominant winds are from the south and west;

Proposed Scope of Assessment

In order to assess the wind conditions in the vicinity of the wind farm one meteorological mast is proposed along the coast, assuming planning consent is achieved. The mast will be 70 m high and carry an array of monitoring equipment and sensors to record and store the data collected. The mast will provide data on wind speeds, direction, at different heights, and air temperature, it may also collect information on other environmental parameters.





The data collected will be used in designing the offshore wind farm, predicting its output, monitoring performance and predicting the weather on site.

4.2 Coastal Processes

Introduction

This section of the EIA will address the proposals impact on the wave regime, current regime and seabed sediment environment.

Little is currently known about the sediment transport regimes in this area, information for this section has been taken from the Coasts and Seas of the UK directory Region 3, Coasts and Seas of the United Kingdom, Region 3, North East Scotland: Cape Wrath to St Cyrus.

Tidal flows are also generally weak in the region, littoral currents tend to be southwards and in some locations such as Balmedie beach, longshore currents generally (although not always) in a southerly direction can be relatively strong.

Baseline information on coastal processes in the area exists in a number of reports which AOWL hope to acquire during the scoping process;

- Coastal Cells in Scotland, Cell 2 Fife Ness to Cairnbulg Point. Report to SNH, SOAERD and Historic Scotland. SNH RSM Report No 144. Battelby. HR Wallingford 2000.
- Aberdeen Bay Coastal Protection Study. Unpublished report to Aberdeen City Council, SNH and Grampian Enterprise. Halcrow Crouch 1999.
- Information on Coastal Sea Defence Work (Halcrow).

Baseline overview

Sediment Movements

The region between Cairnbulg Point to the north and Girdle Ness in the south is characterised by complicated nett drift as the direction is variable i.e. the northward wave-induced drift is cancelled out by the southward tidal currents described in the previous section. Dune erosion has also taken place at Balmedie and Blackdog.

Tidal Data

Tidal flows are relatively weak along the Aberdeenshire coastline, currents average 0.5 ms⁻¹ at mean spring tides.

Current Data

Water movements are influenced by the tidal regime of the North Sea, the tidal range at mean spring tide is between 3.5 m & 4 m.

Wave Data

Wave exposure and sea state – the significant wave height exceeded for 10% of the year is 2-2.5 m, the significant wave height exceeded for 75% of the year is 0.5-1 m;

Seabed Surface Conditions

Seabed sediments in the area have been categorised by the British Geological Survey (BGS) as being predominantly sand.

Potential Impacts

Although every offshore wind farm site is unique in terms of its location and regime EIA studies from other wind farms using predictive modelling give some idea of the extent of impact of offshore wind turbines on waves, currents and sediment movement. For example numerical modelling for wind farms in the Wash showed that changes to the current regime





and wave climate were predicted to be limited to the immediate vicinity of the wind turbines, and that these minor localised changes to the wave and current regimes would have negligible effect on overall seabed processes. with some scouring and erosion localised around the wind turbine foundations.

Cumulative Assessment

There are no other wind farms or seabed users within the vicinity of the proposed wind farm, it is not expected that there will be any significant cumulative effects in relation to coastal process.

Mitigation

Best practice procedures during construction and operation will be followed to minimise effects on coastal processes, seabed and water movements. Measures may include:

- Minimising disturbance to the seabed during construction;
- Minimising leakage of grouting material and other pollutants;
- Co-ordination of vessels carrying out work on the wind farm, to minimise collision risk and prevent loss of potential contaminants overboard during construction;
- Ensuring all vessels are sized so that there is adequate clearance between vessels and the seabed during all tidal states to ensure increases in turbidity do not occur;
- Removing/spreading excavated material.
- Appropriate scour protection.

Sea-level Rise and Flooding

Sea levels in the region are changing, it is the combined effect of local crustal movement, Scotland is rising and southern England is falling, and global sea level changes. Crustal uplift at Aberdeen is occurring at a rate of 0.5-1 mm per year (Shennan 1989). The relative sea level rise at Aberdeen over the past century is 1-2 mm per year (Woodworth 1990. The possibility of flooding in the area is therefore low.

Proposed scope of assessment

A detailed desk study will be carried out and presented within the ES. Baseline conditions will be established and the possible effects a wind farm may have on coastal processes examined through numerical modelling.

Baseline conditions for the site in relation to sediment movement, tides, currents and waves will be collected through consultation, collation of existing data such as that held by Aberdeen Harbour Authority and if necessary oceanographic surveys as outlined in Appendix A of this document.

A coastal impact study will also be carried out, which will model the physical impacts of the wind farm including those related to tides, currents, waves and sediment movement. The study will assess the following:

- Alterations to seabed bathymetry;
- Alterations to wave height and direction;
- Alterations to currents and water elevations;
- Alterations to suspended sediment concentrations;





Conclusions will be given that highlight the significance of any impact particularly relating to sediment movement, coastal erosion, coastal processes, depth and movement and coastal defences, with reference where appropriate to existing, consented and proposed wind farm development impacts else where in the UK.

4.3 Sediment and Water Quality, Plankton and Primary Productivity

Introduction

The landforms that occur along the coast all influence the water quality within Aberdeen Bay. Estuarine water quality is generally described as good throughout the region, although eutrophication and spreading algal blooms do occur in the lower part of the Ythan Estuary, as such the River Ythan has been proposed as a Nitrate Vulnerable Zone under the EC Nitrates Directive.

Any changes to water quality in and around the proposed site due to disturbance of pollutants and/or fine materials during construction and from leaching and scour during operation have the potential to affect plankton populations, benthos, bird and fish populations.

Recreational use will also be considered here, the coast along Aberdeenshire has a number of bathing waters identified under EC Bathing Water Directive (76/160/EEC).

Many of the Rivers draining into the Bay support Salmonids and the European otter in significant numbers

Baseline Description

Bathing Waters, as identified under the EC Directive, can be found at Balmedie and Aberdeen Ballroom (SEPA, 2004). The water at Balmedie has been classified as excellent since 2003, the rating is given on the amount of bacteria present in samples taken from the sites. The waters at Aberdeen Ballroom have been classified as good since 2000.

Water temperature and Salinity

The average winter temperature in the region is 6° C, while the average summer temperature ranges between 12.5° C – 13° C. Mean surface salinity in winter ranges between 34.25 g/kg - 34.50 g/kg, and in summer ranges between 34.50 g/kg - 34.75 g/kg.

Sediment

The proposed location of the wind farm is situated in clean sand, little historical contamination is recorded or expected.

Water Quality

Water quality in the region is generally good given the presence of a large sewage outfall, for trade and domestic effluent, at Aberdeen. The Ythan Estuary is, however, one of only 2 sites in the UK identified by the Department of the Environment in 1992, as exhibiting problems associated with eutrophication (nutrient enrichment). A possible cause of this enrichment is run-off from agricultural land.

Plankton

There are many types of plankton, which fall into three categories: bacteria (bacterioplankton), plant (phytoplankton) and animal (zooplankton) plankton. Plankton abundance is strongly influenced by depth, tidal mixing and temperature, distribution is directly influenced by salinity, temperature and water flows into the area and by local benthic communities.

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The regions phytoplankton is dominated by diatoms and dinoflagellates, and zooplankton by crustacean species such as copepods.

Plankton and primary productivity play a fundamental role in the food chain for benthos, fish and birds feeding in "upwelling" areas in the vicinity of the wind farm. The planktonic assemblage is made up of mainly northern intermediate (mixed water) and Neritic (coastal water) species. The region has been witness to a number of dinoflagellate toxic blooms, which have resulted in Paralytic Shellfish Poisoning (PSP).

Potential Impacts

Potential impacts due to the development of the proposed wind farm may require further investigation include:

- Discharges of contaminants from the construction vessels leading to changes in water quality;
- Release of fines during the construction process or through scour during operation could result in increased turbidity affecting plankton growth and benthos. Increasing suspended sediments could result in deposition at other sites;
- Disturbance of contaminated sediment (if revealed to be present) could lead to deterioration in water quality and mortality of plankton and benthos;
- Impact of the wind turbines on mixing within the water column and the subsequent effects on the "front" identified in the area

Mitigation

Implementing the following measures can mitigate potential impacts:

- MARPOL regulations, set out requirements to establish Pollution Action Plans to control pollution incidents;
- Good working practices will be adopted throughout the construction to prevent pollution incidents;
- Construction techniques will be used that minimise the amount of fines released into the marine environment;
- The required legislation will be adhered to for the use of paints and biocides.

Proposed Scope of Assessment

Further literature reviews and detailed consultation will be undertaken in order to collate existing data.

Where necessary surveys may be undertaken including trawls to identify planktonic species present.

Sediment metal levels in order to establish contamination will be assessed during the benthic survey.

The proposed wind farm lies close to a known front. Modelling will be undertaken to assess the impacts the wind farm may have on the location of the front.

4.4 Geology, Hydrogeology and Geotechnics

Introduction

This section provides a brief description of the offshore geology in the bay.





Baseline Overview

The following provides information on sediments at and below the seabed.

Seabed sediments

Seabed sediments are defined as non-solid sediments laid down on the seabed by the actions of the sea during the early Holocene. The sediments in this region reflect its glacial history and hydrodynamic regime. There is little input of sediment from land most being derived from peat deposits. Sand and sandy gravel predominate in this area.

Below seabed geology

Pleistocene deposits off the Aberdeenshire coast vary from soft red-brown, grey-brown and pink-grey muds to compact grey clays with scattered pebbles that probably indicate glacial tills. The soft muds probably date from late Devensian to Early Flandrian and were most likely deposited during the retreat of the last ice sheet. Seabed sediments mostly conceal bedrock in the area. The underlying bedrock along the coast between Aberdeen and Stonehaven comprises sandstones, conglomerates, mudstones and cherts.

Coastal Geomorphology

Forvie is designated as a geological conservation statutory review site, this is a non statutory designation which reflects the areas earth science interest in relation to coastal geomorphology.

Proposed Scope of Assessment

Geotechnical information currently available will be collated. A geophysical survey will be undertaken to assess the ground conditions in the area. This information will then be used to assess the potential impact of the wind farm on the seabed and substrata.

Best practice methods for construction and operation will be discussed in order to minimise any effects the wind farm may have on geology. Geotechnical information will be fed into engineering design and structural aspects of the wind farm.

The potential impacts of the proposal on the hydrogeology (ground water / aquifers) will be investigated if considered appropriate.

4.5 Benthic Ecology

Introduction

This section covers issues associated with seabed (benthic) species.

Baseline Overview

Benthic communities offshore from Aberdeen are dominated by bivalves molluscs and polychaete worms (McIntyre 1958). The Ythan and Dee estuaries are thought to be particularly important for mussels and the Ythan alone for cockles and commercially important bivalve molluscs. No rare protected species have been identified in large numbers off the coast of Aberdeen.

Potential Impacts

Possible impacts on the benthos, which will be investigated include;

- loss of seabed habitat due to addition of wind turbine foundations;
- loss of and disturbance to benthic habitats due to changes in sediment transport rates and therefore seabed sediment types;
- seabed disturbance and potential increases in suspended sediments during construction and decommissioning;





- potential release of contaminants during construction and maintenance operations;
- increased scour around wind turbine bases;
- noise and vibration during construction and operation;
- impacts of electromagnetic fields from cables.

Mitigation

The following measures could serve to mitigate the potential impacts listed above;

- good site management and managed transfer of excavated materials if drilling or gravity foundations are used;
- Appropriate pollution prevention plans;
- Location of wind turbine foundations so as to avoid more sensitive areas.

Monitoring of seabed communities will be undertaken post construction in order to identify any potential long term effects. Potential benefits associated with the foundations and scour protection (if required) include the introduction of new surfaces for colonisation and refuge.

Proposed Scope of Assessment

Collation and review of existing baseline material and a site specific benthic ecology survey will be undertaken, as outlined in Appendix B. The ES will provide the following information;

- a summary of survey work and the results;
- a description of the benthic communities present and an evaluation of them in terms of diversity, abundance, extent, representativeness and rarity;
- likely impacts on benthic communities;
- mitigation measures.

4.6 Fish and Commercial Fisheries

Introduction

The Northern North Sea is important for its fish stocks and the commercial fisheries it supports, fishing is important to local communities and the economy of coastal regions. However north sea fisheries are under threat due to years of high intensity fishing, the impacts of harmful inputs from human activity for example waste effluent streams, and possibly from climate change impacts upon plankton distributions.

Baseline Overview

The harbours at Aberdeen, Fraserburgh and Peterhead support significant fisheries in grounds further offshore than the proposed wind farm site. Drift netting for Salmon however may take place relatively close to the shore, investigations into fisheries will therefore target salmonid species.

Potential Impacts

Potential impacts to be investigated include;

During construction / decommissioning;





- Avoidance reactions of target salmonid species to suspended sediment, noise and vibration.
- Potential impacts of restricted areas set up for safety reasons if considered necessary

During operation;

- Practical limitations on access to the wind farm site depending upon the site design and the need for any safety areas
- Potential effects of sub sea structures on fish and shellfish stocks in the area, for example possible enhancement of fisheries through creation of fish aggregation areas.

Mitigation

Potential mitigation measures are likely to include;

• the timing of works to avoid key periods for salmonids;

Proposed Scope of Assessment

In order to investigate the potential effects on commercial fisheries in the area extensive consultation and a desk studys will be undertaken, this will include liaison with;

- The Associated District Salmon Fisheries Board;
- Aberdeen University,
- Scottish Sea Fisheries Committees,
- local fisherman's organisations

The ES will include;

- an assessment of the site area in terms of importance of the fisheries resource based on consultation responses;
- information on spawning and nursery grounds if any;
- potential impacts upon fish stocks and migrations,
- details of fishing method and duration in the area,
- an evaluation of the overall impact of the wind farm.

Recreational fishing within the site area will be considered under other marine users.

4.7 Marine Mammals (and Basking Sharks)

Introduction

Marine mammals are protected under several sections of conservation legislation. All species of cetaceans are listed in Annex IV of the Habitats Directive, which prohibits the keeping, sale or exchange, deliberate capture, killing or disturbance of listed species. In addition, the harbour porpoise, bottlenosed dolphin, grey seal and harbour seal are listed on Annex II of the Habitats Directive, under which the establishment of SACs should be considered.





Baseline Overview

Cetaceans

The Small Cetacean Abundance in the North Sea (SCANS) survey in 1995 recorded nine cetacean species off Aberdeenshire, comprising two species of baleen whale, six dolphin species and the harbour porpoise (*Phocoena phocoena*). The four species most regularly sighted off the coast of Aberdeen are the bottlenose dolphin (*Tursiops truncates*), the harbour porpoise, the white-beaked dolphin (*Lagenorhynchus albirostris*) and the minke whale (*Balaenoptera acutorostrata*). Of these the most commonly recorded cetacean species in Aberdeenshire waters was the bottlenose dolphin (Stockin *et al* 2001).

It is likely that the coastal waters of Aberdeenshire provide an important feeding habitat for the harbour porpoise and the bottlenose dolphin and a seasonal feeding habitat for whitebeaked dolphins and minke whales (Weir *et al.* 2001).

Bottlenose dolphins have been recorded along the entire coast of Aberdeenshire including Aberdeen Harbour. Photo-identification studies have shown that a proportion of the animals sighted are individuals that form part of the population of bottlenose dolphins for which a marine Special Area of Conservation (SAC) was established in the Moray Firth (Stockin *et al* 2001). The same group also extend down the coast as far south as Newcastle.

Atlantic white-sided dolphins (*Lagenorhynchus acutus*) and white-beaked dolphins have been reported during surveys in the southern North Sea and just south of Aberdeenshire (Camphuysen *et al.* 1995).

Both the (SCANS) survey and the Joint Nature Conservation Committee (JNCC) Seabirds at Sea Team found higher concentrations of harbour porpoise along the coasts of North-east Scotland than in any other region of the North Sea (Northridge *et al.*1995; Hammond *et al.* 1995). Norwegian surveys show particularly high densities of minke whales in the N.Sea (Nordoy *et.al* 1993).

Seals

There are two types of seal commonly found in British waters, these are the grey seal – *Halichoerus grypus* and the common or harbour seal – *Phoca vitulina vitulina*. Both species are found along the coasts of Scotland.

Although there are no major haul out sights known to exist in the immediate vicinity of the proposed wind farm the area is used by both grey and common seals for foraging. There is a small winter haul out site used by harbour seals in the mouth of the Don and also one in the estuary of the Ythan just north of Aberdeen. The numbers of individuals observed in the area are small (SMRU).

However, the relative importance of the area for foraging is hard to assess from land-based distribution alone and satellite telemetry studies conducted by SMRU indicate that grey seals from Orkney, the Isle of May and Abertay use the area for foraging.

European Otter

Although not technically a marine mammal the European otter, *Lutra lutra*, does spend time in marine waters. It is limited to coastal waters so any impacts on it would be near the shore.

Basking Sharks

The basking shark (*Cetorhinus maximus*) (not a marine mammal) generally appears in British waters from April to September, peaking around June/July, which coincides with the plankton bloom (their food source). There are only occasional sightings of basking sharks in the North Sea, as their usual distribution follows the west coast of Britain.





Potential Impacts

Possible impacts upon marine mammals and basking sharks, which will be investigated, are:

- Behavioural changes due to noise and vibration and/or localised changes in water quality, e.g. avoidance, attraction, displacement from the area;
- Interference with communication.
- Masking, interfering with all uses of sound, communication, passive and active localisation

Cumulative Impacts

Noise generated by other activities, such as aggregate dredging, shipping, oil and gas drilling will be considered in detail in the Environmental Statement (ES). AOWL are committed to minimising any cumulative impacts from construction.

Mitigation

The following mitigation measures may be appropriate:

- Provision of appropriate construction equipment to keep noise levels to a minimum, i.e. use of the correct specification of pile driver for the job. Vibratory pile drivers may be used on softer sediments and are usually quieter than impact piling.
- Use of soft start procedures during drilling or driving operations to ensure minimal disturbance to cetaceans, seals and basking sharks.
- Presence of a marine mammal team on site during those construction operations, which generate significant noise in order to assess impacts. The team may undertake a planned mitigation process utilising both visual and acoustic methods as deemed necessary.
- The marine mammal team will identify the presence of marine mammals during construction operations and, where possible, influence proceedings. Experience from operational offshore wind farms will be incorporated into mitigation proposals.

Proposed Scope of Assessment

Cetacean and seabird surveys will, where possible, be conducted so that different methods and approaches may be utilised. Marine mammal sightings will be recorded throughout the year as agreed with the JNCC and SMRU.

Marine mammal sightings will be updated with reference to the Sea Watch Foundation and the SMRU website. The SCANS II (June 2005) programme will provide information on the abundance of cetaceans during the summer months.

The effects of construction and operation of the Aberdeen Offshore Wind Farm will be assessed by reference to the ETSU report, 'Assessment of the Effects of Noise and Vibration from Offshore Wind Farms on Marine Wildlife' and the COWRIE report, 'Assessment of subsea acoustic noise emission and vibration from offshore wind turbines and its impact on marine wildlife'. The COWRIE study is providing data in two stages. Stage 1 provides a literature review alongside noise data from North Hoyle and Scroby Sands. These data include background noise levels and noise measurements collected during specific construction operations – rock socket drilling, cable trenching and monopile hammering. The report also provides dB_{ht} levels (levels perceived by specific species) of





background and construction noise. Stage 2 of the study will provide generic information on noise levels during construction and operation of a Round 1 wind farm.

The ES is likely to include:

- A description of the marine mammals present; Including seasonal distribution;
- An indication of their importance; and the importance of the wind farm site for the species concerned;
- Potential sonic impacts on marine mammals.

4.8 Ornithology

Introduction

It is important to assess the potential impacts of wind farm developments on birds. An expert ornithologist has been commissioned by AOWL to undertake preliminary shore based surveys in Aberdeen Bay to assess the suitability of the area for development from an ornithological perspective. These surveys have been under way since March 2005.

The assessment of Aberdeen Offshore Wind Farm on the ornithological resource of the area entails identifying;

- Species that use the area, and could be affected by the development both directly and indirectly through food supply /habitat changes
- The nature of these changes to the ornithological value of the site
- The extent to which the value of the overall ornithological resource of the area could be altered both directly for example through increased mortality as a consequence of wind turbine collision or indirectly through disruption to food supply.

Baseline Overview

The coast of North East Scotland supports a wide variety of avian species and offers a variety of habitats from sea cliffs to sand dunes. A number of designated sites are located in the region, although outwith the proposed development area. The Ythan Estuary and Sands of Forvie being particularly important for a range of species, including;

- Pink footed geese
- Eiders
- Cormorants
- Common tern
- Little tern
- Sandwich tern, and
- Common Scoter

In the area of Aberdeen Bay, the sea out to 2 km is relatively shallow. It has been highlighted by RSPB that the area along the 10 m contour is an important area for upwelling of nutrient rich waters supporting a food chain of significance for many species. In general however the main concentration of internationally important birds is to the north of Aberdeenshire along the sea cliffs and in the Moray Firth. The Buchannon tidal fronts some 60 - 100 km offshore support large numbers of Puffin during the autumn months.





Potential Impacts

The following impacts will be assessed within the EIA:

- Disruption to flight lines, including migratory flight paths;
- Potential mortality of birds which fly through the wind farm as a result of collision with wind turbine towers or blades;
- Disturbance effects resulting in the displacement of birds from the proximity of the wind turbines;
- Changes in food availability, potentially increased due to reduced fishing activity and the addition of in-water structures acting as artificial reefs or decreased as a result of seabed loss. Changes in sedimentation patterns and upwellings may also increase or reduce food availability.

Mitigation

Mitigation measures if necessary will be incorporated into the design and layout of the wind turbines. Other mitigation measures include the appropriate timing of construction activities and maintenance.

Proposed Scope of Assessment

A comprehensive review of existing baseline data for example information held by JNCC, SNH and RSPB and review of the North East Scotland Bird Reports.

A Comprehensive programme of surveys is underway for the site covering the period from March 2005 to late summer 2006 in order to clarify the baseline situation., These surveys include land (the location of land based vantage points are illustrated on Figure 3) and boat based observations and the use of radar at key migration periods.

The programme will aim to answer the following questions for the Aberdeen Offshore Wind Farm:

- Is the site an important feeding/roosting/resting/moulting area for significant numbers of birds?
- Is the site located on a major flight route, particularly for significant numbers of migrants?

Appendix C outlines the survey methods in more detail

The ES will include:

- An assessment of the importance of the area for seabirds and waterfowl, and their seasonal usage of the area;
- Identification of migration routes, if any;
- Identification of potential impacts on seabirds and their significance;
- Collision risk assessment and mitigation.





4.9 Marine Archaeology

Introduction

Marine archaeology includes not only wrecks but due to sea level changes palaeoenvironments also exist under the sea. These landscapes can be preserved under mobile sand dunes or underneath seabed sediments. Landscapes can be exposed by erosion in the intertidal zone especially within estuaries. Shipwrecks, however, are the most ovbious types of seabed archaeology.

Baseline Overview

Evidence of Mesolithic hunter-gatherers dating from about 7-6000 Before Present (BP) has been found in the Sands of Forvie sand dune system. During the last ice age Scotland was covered by large ice sheets, depressing the land, this meant that large areas of the present North Sea were dry land. The ice cleared approximately 12,000BP but presence of Mesolithic life wasn't discovered until approx 7-6000BP. Evidence of their presence has been the discovery of flint and bone tools.

Over the last 6000 years or more, humans have been using the sea for many purposes so wrecks and associated material may lie on the sea floor or be buried by seabed sediment. This material may include ships, aircraft, military vehicles or other craft as well as antique or archaeological artefacts. Depending on the importance of the objects remains may be designated or have the potential to become designated in the future. If such a designation occurs within the site it may then be necessary to invoke an exclusion zone around the site to prevent any disturbance or damage during construction, operation or decommissioning of the wind farm. Under the Protection of Military Remains Act 1986, all aircraft that have crashed in military service are also protected. The exact positions of lost military craft is difficult to confirm and often unknown.

There are a number of wrecks in Aberdeen Bay including three classified as dangerous. The positions of these wrecks can be seen in Figure 4. None of the wrecks identified are as far as AOWL is aware designated.

Potential Impacts

There are many aspects of wind farm development and construction that have the potential to impact on archaeological sites. Sites may need protection from:

Cable burial;

Foundation construction;

Scour protection;

Anchoring;

Vessel movement associated with construction;

Decommissioning.

Mitigation

Mitigation measures will include:

Production of a documented procedure in consultation with relevant consultees This will include a protocol for recording finds and will make provision for other forms of mitigation that may be required following pre-construction investigations;

Wind turbines will not be placed in sensitive areas or known sites of interest;

A watching brief will be kept during construction;





If a wreck or site of interest is discovered during development or construction, it could be designated at very short notice, such a designation would occur irrespective of construction activities.

Proposed Scope of Assessment

Initially various bodies including Historic Scotland, relevant local authority archaeologists and Royal Commission on the Ancient and Historical Monuments of Scotland will be contacted.

An assessment will be carried out to determine the potential effects of the wind farm upon the cultural heritage, this will include a review of available data. Suitable mitigation methods will also be suggested as part of this assessment. A protocol will also be developed to record finds during construction.

A geophysical survey will take place across the site to identify submerged or buried archaeological remains.

4.10 Shipping

Introduction

Aberdeen harbour is important to the people and the local economy of Aberdeenshire and is one of the main commercial ports in the North of Scotland. Other harbours under the control of Aberdeenshire Council of considerable commercial importance include Peterhead and Fraserburgh. These harbours support international trade and offshore activity. Coastal traffic also exists along the Aberdeenshire coast.

Baseline Overview

Aberdeen Harbour saw 8334 vessel arrivals in 2004, and handled over 4 million tonnes of cargo valued at about £1.5 billion. Aberdeen Harbour is important for the following reasons:

- principal commercial port in Northern Scotland;
- an international port for general cargo, roll-on/roll-off and container traffic;
- principal mainland port for freight, passenger, vehicle and livestock services to Orkney and Shetland;
- a major centre for forest product imports and finished paper exports;
- a gateway for agricultural products and supplies;
- an important fishing port, serving a local processing industry;
- a marshalling point for exports of oilfield equipment;
- largest oil support harbour in Europe;
- centre for charter market for oil and gas offshore support;
- a port of call for cruise ships;
- one of the busiest Trust Ports in Britain.

As well as Aberdeen, Fraserburgh and Peterhead harbours there are a number of smaller harbours in Aberdeenshire, including Macduff, a commercial harbour serving cargo vessels and six further recreational harbours at Stonehaven, Johnshaven, Gourdon, Rosehearty, Banff and Portsoy providing berths for local pleasure craft and foreign visiting yachts.





Potential Impacts

At this stage it is proposed that possibly a few wind turbines could be located within the harbour limits, however ongoing discussion with the Harbour Authority may alter this to ensure safe harbour operations. Currently it is proposed that they would be located very close into shore and not encroach significantly into the port and harbour limits, thus avoiding the main shipping routes in and out of the harbour.

Initial consultation with the Harbour Authority has indicated that wind turbines located within the harbour limits may impact upon procedures in relation to vessels awaiting berthing. Potential areas for further investigation highlighted by the Harbour Authority include;

- potential impact on shipping lanes;
- potential impact on anchorage areas;
- potential impacts on vessels awaiting berthing
- and, potential impact on radar systems.

Impacts on marine systems such as VHF radio and GPS will also be investigated. Where appropriate reference will be made to existing published information on wind turbine / marine systems interactions.

Mitigation

A navigational risk assessment of the area will be performed to assess the navigational impacts and identify appropriate mitigation measures.

The establishment of any safety zones will be subject to demonstrating that such controls are necessary rather than desirable.

Full notification of any works will be given to the harbour authorities and relevant organisations so that all marine users are aware of increased traffic and vessels throughout the lifetime of the wind farm.

During operation the wind farm will be clearly marked with lights, foghorns and navigation buoys as required.

Proposed Scope of Assessment

Full and open discussion will continue with the Harbour Authority and other relevant consultees with regards to this project.

The Navigation markings, wind turbine positioning and the need for safety zones will be determined through consultations.

A radar study will be undertaken in accordance with the methodology outlined in Appendix F to assess the traffic and vessel movements in the area, such a study will be undertaken in consultation with the Maritime and Coastguard Agency (MCA).

The final ES will include information regarding:

The main shipping routes passing through or close to the proposed wind farm;

A review of the potential impacts the development could have on vessels, including effects on radar and communication systems;

The risk of a vessel collision with the wind farm and also vessel to vessel collision;

Recommendations to manage and mitigate risk and minimise disruption to shipping and navigation.





4.11 Aesthetic Impacts and Seascape

Introduction

Consideration of landscape, seascape and visual impacts from this wind farm development will form an integral part of the EIA process.

Baseline Overview

Likely key receptors in the vicinity of the wind farm include;

- Residents of the City of Aberdeen, Balmedie and Newburgh, and residents of smaller villages and isolated dwellings along the coast and inland.
- Recreational users of the foreshore and in particular Forvie NNR, Foveran Links SSSI and Balmedie Country Park
- The development is also likely to be visible from a number of key transport routes including, ferries to and from Aberdeen, certain air-routes into Aberdeen Airport, and roads such as the A90 running northwards along the coast.

There are no National Scenic Areas, Regional Scenic Areas, Scenic Coasts, Historic Gardens and Designed Landscapes or National Parks within 15 km of the development.

Preliminary Zones of Visual Influence (ZVI's) indicate potential visibility of the wind farm at a distance of 30 km from the centre of the wind farm (See Figure 5), these figures do not take into account features such as buildings, trees or sand dunes and show that due to the local topography and scale of the proposal, the wind farm theoretically could be visible over a wide distance. However from certain coastal settlements, the extensive sand dune system is likely to screen the development, for example from Newburgh. In more urban built up areas screening from buildings will significantly reduce the visibility of the proposal. As the development is in a coastal area it is likely that reduced visibility at certain time of the year will significantly reduce visibility of the wind turbines.

It should be noted that being visible does not necessarily make the proposal unacceptable. Public attitude surveys carried out near wind farms in Wales, Cornwall and Cumbria and the recent survey commissioned by the Scottish Executive suggest that the vast majority of people who live near wind farms, look favourably on the development post construction. It should also be remembered that the landscape and visual effects are reversible and short term in effect.

Potential Impacts

There are a number of aspects to the development that have the potential to cause an effect on the landscape, seascape or visual amenity of the area. Due to the proximity of the proposed site to the coast aesthetic impacts will form an integral part of the EIA.

Other impacts include activities associated with the construction phase, the presence of structures during the operational phase and the final decommissioning of the proposed site. Construction will involve concentrated activity within the proposed wind farm site and increased movement of supply and service vessels to and from the site, these effects will be temporary. Impacts during operation will be presence of the wind turbine structures and the traffic associated with maintenance. At the end of the lifetime of the wind farm it will be decommissioned, and the wind turbines themselves removed (some sub surface structures may remain).





Mitigation

The wind turbines that will be used for the wind farm will be horizontal axis machines, with three bladed rotors mounted on tubular towers. The structures will be simple and clean lined.

The wind turbines will be coloured pale grey with a semi matt finish to attenuate visibility. As the wind turbines will be seen mainly against the sky, pale grey is considered appropriate for the conditions in which the wind turbines will be visible. Navigation markings will be visible at night and during fog.

The wind turbines will be temporary in nature (due to an operational lifetime of approximately 25 years) with no visual effects upon decommissioning.

Proposed Scope of Assessment

The assessment will be carried out using best practice guidance from SNH and will include reference to existing publications, for example, Guidelines for Landscape and Visual Assessment (second edition, 2002), Visual Assessment of Wind Farms; Best Practice (University of Newcastle, 2002, SNH Report, FO1AA3O3A) and the Countryside Council for Wales Guide to Best Practice in Seascape Assessment (2001).

The potential effects on visual amenity will be assessed from specific identified representative viewpoints. The viewpoints will be decided upon following consultation with Local Communities, SNH, Aberdeen City Council, Aberdeenshire Council and other interested parties. We welcome proposals on potential viewpoint locations as part of this scoping process.

The potential visual effects of the proposals final layout will be illustrated with reference to photographs and wireframes. In addition for all viewpoints within 15 km of the development photomontages will be prepared. The photomontages will be prepared in accordance with best practice guidelines issued by SNH. The photographs will be taken in clear weather conditions, using the recommended 35 mm format and a 50 mm focal length lens. Overlapping photographic images will be spliced together to form a composite panoramic image.

Zones of Visual Influence and Visibility Diagrams will illustrate and aid the assessment and will be produced out to a distance of 30 km from the proposal. Visibility Diagrams are similar to ZVI's but take into consideration landforms and if appropriate ground cover such as woodland, sand dunes, sea defences and buildings.

Consideration will be given to cumulative visual impacts with other wind farm developments within 30 km of this proposal that are either operational, consented or formally lodged in the planning/consent process. AOWL is currently aware of the following onshore sites within 30 km of this proposal, although it is likely that due to the distance of these projects form Aberdeen no significant cumulative landscape and visual effects are expected;

- Miekle Carewe, developed by RES, 10 X 1.75 MW,
- Mid Hill, developed by Natural Power Consultants, 25 X 2 MW,
- Stoney Hill, developed by Dudley Developments, 27 X 2MW.

4.12 Other Marine Users

Consideration will be given to the proposal's potential impact on recreational marine users, such as sea anglers, divers, sailors, kite surfers, wind surfers and surfers. Consideration of these users needs will be undertaken during the development process through an extensive program of consultation. Potential impacts include visual effects and loss of recreational area in the event that safety zones are proposed. Consideration will also be given to the needs of pipeline and cable operators in the area, the Ministry of Defence (who have practice and





exercise areas along the coast) and to other users who may be identified during the development process.

4.13 Acoustics and Vibration

Wind farms have the potential to create noise effects through aerodynamic noise and mechanically-generated noise. This noise can be propagated underwater. Noise predictions can be carried out to evaluate the likely impacts of both airborne and under water noise from the wind turbines and associated construction activities.

Proposed Scope of Assessment

Above sea level

The method used to predict noise from the wind turbines will be based on those described in the statutory order from the ministry of the environment number 304 (1991) on Noise From Windmills report. This method is proposed as there is no relevant British Standard. Methods for assessing the impacts of predicted noise from wind farms locally is described in The Assessment and Rating of Noise From Wind Turbines, ETSU –R-97 by the Working Group on Noise From Wind Turbines, final report, September, 1996.

These methods of noise prediction and impact assessment have been used successfully in nearly all UK wind turbine development impact assessments since their publication.

Below Sea Level

Below sea level the effect of noise and vibration will be assessed in relation to a review of published literature, primarily the ETSU report Assessment of the Effects of Noise and Vibration From Offshore Wind Farms on Marine Wildlife (Vella *et al* 2001). The findings of recent COWRIE research into the potential impacts of underwater noise and vibration (interim report, November 2004) will also inform the assessment.

4.14 Socio economics

Aberdeen City has aspirations to build on the success of the oil and gas industry to develop the city into the energy capital of Europe with renewable energy technologies playing a key role. Aberdeen is ideally placed both in terms of location and in terms of supply chain expertise to drive offshore renewable technologies forward particularly wind energy. As such as part of this project a socio-economic assessment will be undertaken.

The following table outlines the main broad types of socio-economic impact likely to be associated with the development, which will be examined;

 Table 5: Potential Socio-economic impacts

Type of Impacts:	Source
Potential Direct Impacts	
Construction	Electricity generated from renewable sources for Aberdeen and Aberdeenshire
Operation	Renewable energy generation for Aberdeen and Aberdeenshire
Post-Commissioning Operation	Expenditure & employment arising directly from the operation of the wind farm over its 25 year life span





Decommissioning	Expenditure & employment effects arising during the decommissioning/ repowering of the wind farm following the 25 year life span.		
Potential Indirect Impacts			
Supply Chain Effects	Additional economic activity & employment supported indirectly through the expenditure which is placed with suppliers during both the construction & operation of the wind farm		
Rental Income Effects	Additional economic activity arising from the payment of rental income to the crown estate		
Community Fund Effects	Additional economic activity arising from the payment by the owners of the wind farm into community trusts for the benefit of the local community will be considered should a community trust be proposed		
Induced Impacts			
Employment Income Multiplier Effects	A further economic stimulus arising from the expenditure of incomes by those whose jobs are supported directly or indirectly by the wind farm development		
Wider Impacts			
Uplift Effects	An uplift in economic activity as a consequence of a boost, probably in conjunction with other developments, to the local economy		

The assessment will set out the economic and policy context within which the development would be implemented, the contribution that it could be expected to make to the economic performance and prospects of the local area and the wider Scottish Economy. The assessment will examine direct impacts such as those which would arise from the construction of the wind farm and its subsequent operation, as well as indirect supply chain and multiplier effects. The assessment will also examine the wider range of economic, social and community effects which could potentially arise from the proposal. The approach to socio-economic will be based on the methodology that is widely accepted for infrastructure projects and has been used for larger wind farm developments before, drawing on the guidance in MH Treasury's Green Book.

4.15 Electromagnetic Interference

The experience of existing wind farms is that television reception and other communications can in some instances be affected by the rotation of the wind turbine blades. Initial





investigations undertaken into the Aberdeen site based on record held by the Radio Communications Agency and OFCOM indicate that this is unlikely to be the case for this site, however consultation will be undertaken with a number of companies who could operate links in the area such as the BBC, Emergency Services, Mobile phone companies and other television broadcasters.

Should the wind farm be shown to interfere with public or private communications services this would be mitigated against during the site design process or with the appropriate technology.

4.16 Aviation and MOD

Initial consultations have been held with Aberdeen International Airport, National Air Traffic Services (NATS), Civil Aviation Authority (CAA), and the Ministry of Defence. During these consultations a number of issues have been raised. As such an assessment will be undertaken to identify and assess relevant potential impacts of the proposal on;

- Airport operations and Air Traffic Control (ATC) procedures
- and, Aviation and Military Radar.

This assessment will be undertaken in close consultation with the bodies identified above and the Scottish Executive, Aberdeen City Council and Aberdeenshire Council. Where potential impacts are identified mitigation measures could include careful locating of wind turbines with respect to radar lines of sight, consideration of wind turbines height and the consideration of new operating procedures / different technologies.





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Glossary



Abundance	Number of animals present per unit area.
ADCP	Acoustic Doppler Current Profiler
AGDS	Acoustic ground discrimination survey
Aggregate	Sand, gravel and rock suitable for use in the construction industry.
Amphipod	Small shrimp like crustaceans.
Anthropogenic	Made by people or resulting from human activity
AOWL	Aberdeen Offshore Wind Farm Limited
AREG	Aberdeen Renewable Energy Group
ASL	Above sea level
BBC	British Broadcasting Corporation
Benthic	Relating to the sea-bed.
Benthos	Animals living in or on the sea-bed.
BGS	British Geological Survey
Biomass	The weight of animal flesh or plant material, excluding shells.
Biosphere	Protected areas representing significant examples of biomes (terrestrial and coastal environments)
Biotope	A particular type of habitat and species mix
BODC	British Oceanographic Data Centre
вто	British Trust for Ornithology
BWEA	British Wind Energy Association
CAA	Civil Aviation Authority
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
Cetacean	Whales, dolphins and porpoises.
CO ₂	Carbon Dioxide
Community	A collection of animals which are persistently associated with a particular habitat type.
COWRIE	Collaborative Offshore Wind Farm Research into the Environment
CPUE	Catch per unit effort
Crustacea	Phylum encompassing crustaceans (crabs, shrimps, prawns etc.).
cSAC	Candidate Special Area of Conservation
DGPS	Differential Global Positioning System
Diversity	The variety of animals (usually species) inhabiting a locality.





DP	Dynamic Positioning
DTI	Department of Trade and Industry
EA	Environment Agency
EC	European Community
EIA	Environmental Impact Assessment
EMF	Electro-magnetic field
EMI	Electro-Magnetic Interference
Epibenthic	Relating to the surface of the seabed.
Epifauna	Animals living on the surface of the seabed.
ES	Environmental Statement
ESAS	European Seabirds at Sea
ETSU	Energy Technology Support Unit
EU	European Union
FAD	Fish aggregation device
FEPA	Food and Environment Protection Act
Fines	The clay and silt component of rejected or overflowing dredge material released into the water column.
GIS	Geographical Information System
GPS	Global positioning system
GW	Gigawatt (1000MW)
HAT	Highest Astronomical Tide
HSE	Health and Safety Executive
HV	High Voltage
IALA	International Association of Lighthouse Authorities
ICES	International Council for the Exploration of the Seas
Infauna	Animals living just below the surface of the sea-bed.
Intertidal	Shoreline areas between the high water spring tide mark and the low water spring tide mark.
ISM	International Safety Management Code
ITC	Independent Television Commission
JNCC	Joint Nature Conservation Committee
km	Kilometre
Landscape designation	Area of land given designated status by a local authority or government due to its perceived particular landscape qualities such as scenic value or landscape character
Landscape effect	Change in the fabric, character and quality of the landscape as a result of the proposed development
Landscape or seascape	A geographic area with a distinctive, consistent and identifiable pattern of landscape elements





character area	identifiable pattern of landscape elements
LAT	Lowest Astronomical Tide
LMIU	Lloyd's Marine Intelligence Unit
LVA	Landscape and Visual Assessment
Macrofauna	Animals that are retained on a 1mm sieve.
MARPOL	Regulations set under the Marine Pollution Convention
MCA	Maritime and Coastguard Agency
MOD	Ministry of Defence
MW	Megawatt (one million watts)
MSL	Mean sea level
NATS	National Air Traffic Services LTD
Nm	Nautical mile (1nm = 1,852 metres)
NNR	National Nature Reserve
Photomontage	Computer generated images of wind farm accurately located and overlaid onto scanned photographs of existing view, used to illustrate predicted view of proposed development
Phytoplankton	The plant constituent of plankton.
Phytoplankton bloom	Sudden increase in growth of phytoplankton in response to raised light levels, temperature and nutrient availability.
Plankton / planktonic	Floating in the water column – the movements of planktonic plants / animals are almost entirely dictated by water currents.
Primary production	The synthesis of complex organic molecules from simple inorganic compounds.
RAMSAR site	Wetland site of international importance for the conservation of birds
Receptors	Landscape or seascape resource or type of viewer(s) that will experience an effect on the landscape or the viewer(s)' visual amenity arising from the proposed development
RNLI	Royal National Lifeboat Institution
RO	Renewables Obligation
RSPB	Royal Society for the Protection of Birds
RYA	Royal Yachting Association
SAC	Special Area of Conservation
SCANS	Small cetacean abundance in the North Sea
SEA	Strategic environmental assessment
seabird	Bird which only comes to shore to breed
SNH	Scottish Natural Heritage





SMP	Shoreline Management Plans
SMRU	Sea mammal research unit
SPA	Special Protection Area
SQG	Sediment Quality Guideline
SSC	Suspended sediment concentration
SSSI	Site of Special Scientific Interest
TWA	Transport and Works Act
UK	United Kingdom
UKBAP	United Kingdom Biodiversity Action Plan
UKHO	United Kingdom Hydrographic Office
UKMO/UK Met Office	United Kingdom Meteorological Office
Wireframe	Computer generated perspectives of the topography and proposed development to illustrate the predicted views from each viewpoint
Zone of Visual Influence	Extent of visibility to or from the proposed development
Zooplankton	The animal / faunal part of the plankton.





6 APPENDICES

Draft Survey Method Statements

Appendix A	Geophysical/Oceanographic Survey Method Statement
Appendix B	Benthic Ecology Method Statement
Appendix C	Ornithological Method Statement
Appendix D	Marine Archaeological Method Statement
Appendix E	Shipping Method Statement





A. Geophysical/Oceanographic Survey Method Statement

Aims

To obtain bathymetric, seabed and sub-bottom data. This will be used to establish seabed and sub-seabed characteristics and will inform baseline engineering work and mast installation, as well as the archaeological and coastal processes sections of the Environmental Statement.

Methodology

A coarse grid geophysical survey will be undertaken over the whole site. The data collected will include:

- Dual frequency, single beam echo sounder (bathymetry);
- side scan sonar;
- sub-bottom profiling data;
- magnetometer data.
- Oceanographic data will also be collected in relation to waves, current, temperature, salinity.





B. Benthic Ecology Survey Method Statement

Aims

- To establish habitat type and community structure in the area within which the wind turbines will be placed and within such wider area as may be affected by the development;
- To provide data on numbers of animals and species present;
- To provide comparable control data;

Methodology

Acoustic Ground Discrimination (AGDS)

Acoustic ground Discrimination studies will be undertaken as part of the Geophysical surveys in order to establish the nature of the benthos. If AGDS identifies any sensitive structures (e.g. reefs) then the need for grad samples will be re-assessed.

Grab Sampling

As part of the marine ecological assessment, a benthic survey will be undertaken.

The sampling grid will be designed to cover the wind farm area and its likely area of effect (covering the extent of one spring tidal cycle), taking far-field effects into account, plus a selection of control sites. The informing of the study and locations for grab samples may be done by remote sensing techniques such as acoustic ground discrimination (AGDS).

The site is thought to comprise fine to coarse sand with a fauna dominated by bivalves and polychaetes and so a Hamon grab is the most likely sampling tool.

Material from the surface layers of a grab sample from each site will be retained for particle size analysis. To ensure that surface material is being collected, sediment samples will be collected from grab samples which are full and within which material has remained coherent. Samples from this grab will also be collected for the analysis of sediment metals.

Notes will be made on the volume of each sample collected, the depth of water from which the sample was taken and the type of material collected, e.g. gravelly sand.

Photographs of each grab sample will be taken.

At each site, the grab will be deployed at a chosen waypoint and a fix taken the moment the grab makes contact with the seabed. Actual and proposed site positions can then be compared to assess positioning accuracy.

Samples retained for benthic analysis will be sieved through a 1 mm mesh and stored in buffered formaldehyde solution. Particle size samples will be collected in plastic bags and stored in a cool box.

On return to the laboratory, one replicate from each site will be processed. Where grabs from a particular site contain very different sediment types, replicates from each of the different sediment types will be processed.

Benthic samples will be elutriated in water to remove formalin. Animals will then be removed from the samples, identified and enumerated. Both the part of the sample containing animals and the sediment residue will be retained for approximately 6 months. Samples retained for particle size analysis will be analysed initially by wet splitting to separate the <63 μ m fraction. The >63 μ m fraction will then be analysed using dry sieving (6 fractions). Where the sample comprises more than 10% <63 μ m fraction, this fraction will be analysed using laser diffraction techniques.





In order to ensure high quality results, the laboratory contracted to carry out benthic processing will be a member of the NMBAQC (National Marine Biological Analytical Quality Control) scheme or equivalent and a Statement of Performance from the laboratory will be provided to the Scottish Executive and SNH. Internal quality control checks will also be required. These will include cross-checking of 10% of all samples by a second analyst and verification that the Bray-Curtis similarity coefficient for both sets of results is greater than 90%.

The data collected will be used to provide a baseline description of the site. Classification and ordination techniques, available in PRIMER or similar multivariate analysis tools, will be utilised with variations in community composition across the site related to changes in physical parameters, e.g. sediment type and depth.

Scientific Trawl Sampling

Scientific trawl samples will be collected along transects within the wind farm area and its likely area of effect (covering the extent of one spring tidal cycle), taking far-field effects into account, plus a selection of control sites.

Sampling will be carried out using a modified 2 m beam trawl with a 4 mm mesh liner inside the net. Each tow will last 5 minutes with three replicate tows at each sampling station, incorporating both directions. The speed of the ship and deployment times will be recorded. Contents of each beam trawl will be washed over a 5 mm square mesh sieve and epifauna and fish species identified and enumerated on board. Colonial species, e.g. hydroids, will be recorded as present or absent. Samples which cannot be identified in the field will be retained for examination in the laboratory.





C. Ornithological Survey Method Statement

Aims

- To establish the number of birds present in areas within which wind turbines will be placed;
- To provide data on numbers of birds present nearby;
- To provide comparable control data;
- To provide data on nationally and internationally important bird species
- To provide data on the relative use of the site by feeding / moulting birds

Methodology

Survey Programme

Preliminary discussions with SNH and RSPB have taken place; a survey programme of 2 years commenced in March 2005.

Shore-Based Surveys

Four vantage points have been identified along the coast parallel to the proposed wind farm site, these vantage point have been selected to give a thorough coverage of the development area, most of the wind farm would be visible from each vantage point.

Watches will be undertaken for duration of two hours from each vantage point twice per month, between the hours of 0900 and 2000 in conditions of good visibility, a single observer with binoculars will record all bird activity within the site.

Weather conditions, including wind direction, and sea state will also be recorded for each of the surveys. Maps of the proposed wind farm will be provided and bird data relating to position will be recorded on these maps for later plotting in GIS.

Other interesting features will be recorded also.

Surveys will take account of variables including state of tide, weather, season and diurnal rhythms by varying the time and location of the start of the surveys or by randomly selecting which vantage point to start from.

During key migration periods for target species for example autumn and spring for pink footed geese one extra watch may be undertaken at either dawn or dusk in order to establish migratory activity within the development area.

Boat Based Surveys

Boat based surveys will take place at key times of the year specifically spring and autumn migration. They will take place at the same time as a land based survey for comparison. A survey route is yet to be agreed upon. It is proposed that there be 1 survey per month during the months of April, May, September and October, approximately mid month.

Aerial Surveys

After careful consideration aerial surveys are considered inappropriate for this development due to the sites proximity to land.





Survey Methods

The draft survey method statements given below for boat-based surveys are derived from the requirements of the Collaborative Offshore Wind Farm Research Into the Environment (COWRIE) report - 'Camphuysen *et al* (April 2004), Towards Standardised Seabirds 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. COWRIE-BAM-01-2002 – Final Version April 2004.

Boat-Based Surveys

- Boat based surveys undertaken over two seasons during daylight hours;
- Methods to follow recommendations from the COWRIE report;
- Survey area to cover an area of around 1.5 2 times the size of the wind farm areas, including reference areas (grid line spacings to be agreed);
- Method to comprise 300 m band line-transect surveys using the snapshot technique, i.e. continuous scanning to count birds on the water and snapshot counts of flying birds;
- Numbers of birds within each of 0-50 50-100 100-200 200-300 and 300+m bands from the boat recorded (using the calliper method on a pole) and specific distance correction factors developed to allow for reduced detectability over distance from the boat;
- Preferred ship type is a motor vessel with forward viewing height possibilities at 10 m above sea level (range 5-25 m);
- No observations in sea state 5 or more to be used in data analysis for seabirds; data not usable for mammals above sea state 3;
- Preferred ship speed of 10 knots;
- Two skilled observers per observation platform;
- Surveys to incorporate marine mammal and shipping observations in order to support other work;
- Data collected in the following order of priority:
 - 1. numbers, and species or taxon,
 - 2. distance from ship,
 - 3. flight height,
 - 4. behaviour (including whether feeding),
 - 5. flight direction,
 - 6. age,
 - 7. sex of obviously dimorphic species,
 - 8. moult status,
 - 9. plumage,
 - 10. hydrographic and biological data (e.g. depth).

Radar Surveys

Radar provides a way of assessing bird movement and behaviour during the hours of darkness and in adverse weather conditions. In order to obtain baseline data during these periods, radar appears to be the most suitable option. A preliminary desk study is being





conducted into the use of radar techniques for ornithological observations in relation to offshore wind farms and findings will be discussed with SNH and RSPB as and when more information becomes available. At this stage it is proposed that radar studies be undertaken for the Aberdeen Bay project during the Autumn of 2005 and the Spring of 2006, for a period of one week, in order to establish the use and movement through the site of migrant species such as Pink footed geese.





D. Marine Archaeological Survey Method Statement

Aims

To identify the presence of unknown and additional submerged or buried archaeological remains or landscapes in the vicinity of the site;

To assess the potential for findings;

To advise the relevant procedures.

Methodology

The coarse grid geophysical data are available across the site, which will be analysed for potential archaeological remains.

Resulting analyses will be presented in the Environmental Statement.

Archaeological data will also be collected during the geotechnical surveys planned postconsent. Data collected will inform the Known Artefact Protocol to be adopted during construction works.





E. Shipping Survey Method Statement

The shipping and navigation study will aim to assess the navigational impact and associated risk of the Aberdeen Offshore Wind Farm through consultation, desk study and quantitative modelling. The exact methods employed for the study will be agreed based on consultation with Aberdeen Harbour Authority, local shipping organisations, the Northern Light House Board, the Maritime and Coastguard Agency (MCA).

The basis of analysis work carried out in the modelling component of this study is the guidance issued within the Coast Protection Act for the installation of offshore installations (DFT, 1949) and guidance issued by the MCA on assessing the navigational impact of offshore wind farms (MCA 2002), and further guidance as it is developed.

Aims

To assess the marine traffic in the vicinity of the wind farm, including merchant shipping, fishing vessel, recreational vessel and dredger activity in order to identify any potential conflicts.

Methodology

Collation and review of existing baseline information on shipping movements in the area, for example from the Harbour Authority information and the ShipRoutes system a UK Shipping database (Anatec 2004). This information is considered relevant up to a distance of 10nm radius from the site. Consultation will be undertaken with relevant interested parties in order to establish the baseline situation in the area with regards to recreational activity.

Land based radar surveys will be undertaken for appropriate periods at certain times of the year in order to establish and confirm vessel movements within the vicinity of the site.

The assessment methodology will be discussed with and scoped out in collaboration with the appropriate interested parties.

Risk modelling will be undertaken using methods similar to those used in EIAs for existing and consented offshore wind farms in UK waters. It will be based on current data collected through radar studies and anticipated shipping activity based on consultation. Collision risk will be assessed with regards to ship / wind farm collision, ship to ship collision, and drifting vessel collision assuming a vessel loses power in the area.







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