Beatrice Offshore Windfarm

Environmental Statement Addendum

Annex 9A Physical Processes

Consultation Marine Scotland Science

ABP Marine Environmental Research Ltd
Quayside Suite
Medina Chambers
Town Quay
Southampton SO14 2AQ

Tel: +44 (0)23 8071 1840
Fax: +44 (0)23 8071 1841

www.abpmer.co.uk

e-mail: enquiries@abpmer.co.uk

Our ref: R/3888/13/DOL

Marine Scotland Science,
C/O Beatrice Offshore Wind Ltd
SSE Renewables
1 Waterloo Street
Glasgow
G2 6AY

14 December 2012

Dear Sir or Madam,

BEATRICE OFFSHORE WIND FARM ENVIRONMENTAL STATEMENT: REPLY TO THE COMMENTS OF MARINE SCOTLAND SCIENCE

Please find attached our response to the comments provided by Marine Scotland Science (MSS) in relation to the Beatrice Offshore Wind Farm Environmental Statement.

Yours sincerely
for ABP Marine Environmental Research Ltd

David Lambkin
Coastal Processes Advisor.

dlambkin@abpmer.co.uk

MSS has provided a response (dated 2/7/12) in relation to the Beatrice Offshore Wind Farm Environmental Statement. The letter contains comments under the headings of each topic area. The following comments were received in relation to physical processes and geomorphology. No other comments were found under other topic headings that appear to relate to physical processes.

9 and 21 Physical processes and geomorphology

"Perhaps the most significant potential effects are related to the disturbance of seabed sediments. This is reflected in the ES with most of Section 9 focussing on these issues. Throughout the ES the level of impact and the sensitivity of the receptor in question are given, and a number of them repeated in Table 9.8. These assessments of the impact and sensitivity are considered to be appropriate throughout Section 9.

The good amount of attention paid to the potential cumulative effects was very welcome. The list of potential effects and reasoning behind the majority of them being scoped out early was good. The ES then focused on the developments occurring in and around the Moray Firth Round 3 site in an adequate level of detail.

The technical appendices submitted were all interesting, useful and extremely rigorous. They were very welcome as they helped explain some reasoning behind a number of the statements within the ES.

The multibeam echosounder data collected was processed into a bathymetry layer for the lease area. However, there is very little information presented on the survey method, standards and data processing. Also there is a reference to the collection of subsurface geophysical data recorded in section 9.2.5.2 para 20. Are these data included in the ES, does it include sub-bottom profiling information? This would be a very useful layer of information that would assist in the identification of the most appropriate foundation design for different parts of the lease area.

Can concerns over the potential for scour be taken into consideration at an engineering level i.e. factor in the extent of the predicted scour into the foundation design? What scour has been observed around the Beatrice wind turbines?"

MSS (2/7/12)

From these comments, there appear to be four distinct questions and responses required. These are addressed in turn below.

Question 1: ***Provide more information concerning the methodology, standards and data processing used in the geophysical survey (specifically in relation to the multibeam swath bathymetry and sub bottom geophysical data).***

As noted by MSS, a geophysical survey of the lease area was undertaken by Osiris in April and May 2010. The survey collected a standard range of parameter types to an industry standard specification, including:

- High resolution multibeam swath bathymetry (bathymetry);
- Side scan sonar data (seabed surface texture);
- Sub-bottom geophysical data (geological texture beneath the seabed surface); and
- Magnetometer data (to identify ferrous objects).

The survey methodology, standards, specifications and approach to data processing is described in the accompanying geophysical survey report. A copy of this report is provided with this letter.

We trust that the report provides the required level of information.

Question 2: ***Are (the sub-bottom geophysical) data included in the ES? (It is noted that) this would be a very useful layer of information that would assist in the identification of the most appropriate foundation design for different parts of the lease area.***

We confirm (as above) that sub-bottom geophysical data were collected. These data were also used to inform the ES. In relation to physical processes, the data were used to underpin the baseline characterisation, and also in the specification of the sediment plume modelling to obtain a realistic estimate of the proportion of different types of drill arisings (varying grain size composition) from the location of each foundation in the indicative layouts tested.

It is confirmed that (as with any offshore engineering project) the nature of the sub-seabed surface geology (which does vary across the lease area) will be an important consideration during foundation design. The ES baseline line description and the geophysical survey data will both inform the engineering design of the development.

Question 3: ***Can concerns over the potential for scour be taken into consideration at an engineering level i.e. factor in the extent of the predicted scour into the foundation design?***

Scour may affect the integrity and stability of a foundation, depending upon its design. For the purposes of EIA, the worst case scenario assessed with regards to scour is the absence of scour protection. The use of scour protection does however remain an engineering option, indeed, consideration of scour potential is a requirement of the relevant design codes. Therefore, the potential for scour will be included in the detailed engineering design of foundations.

Question 4: ***What scour has been observed around the Beatrice wind turbines?***

No specific monitoring data is available to date in relation to the Beatrice wind turbines (which are mounted upon jacket foundations in approximately 45m water depth).

A summary of monitoring and scour depths observed around wind farm foundations (typically monopiles) in other UK wind farms is, however, provided in:

- HR Wallingford, Cefas and ABPmer, 2007. Dynamics of scour pits and scour protection - Synthesis report and recommendations. (Sed02). For DTI. November 2007.

The report provides a summary figure (Figure 1) of the observed individual depths of scour. It is noted that the values shown are from wind farms in the UK which:

- Do not use scour protection;
- Have used relatively slender (approximately 4 to 5m diameter) monopile foundations;
- Are in relatively shallower water depths (typically less than 10mLAT, up to 25 mLAT) compared to the Beatrice lease area (35 to 55 mLAT) and so are potentially more exposed to wave action.

All sites are assumed to experience a degree of tidal forcing that would lead to near equilibrium depths of scour, however, scour depth is known to vary between the 'equilibrium' (maximum) and lesser levels with time.

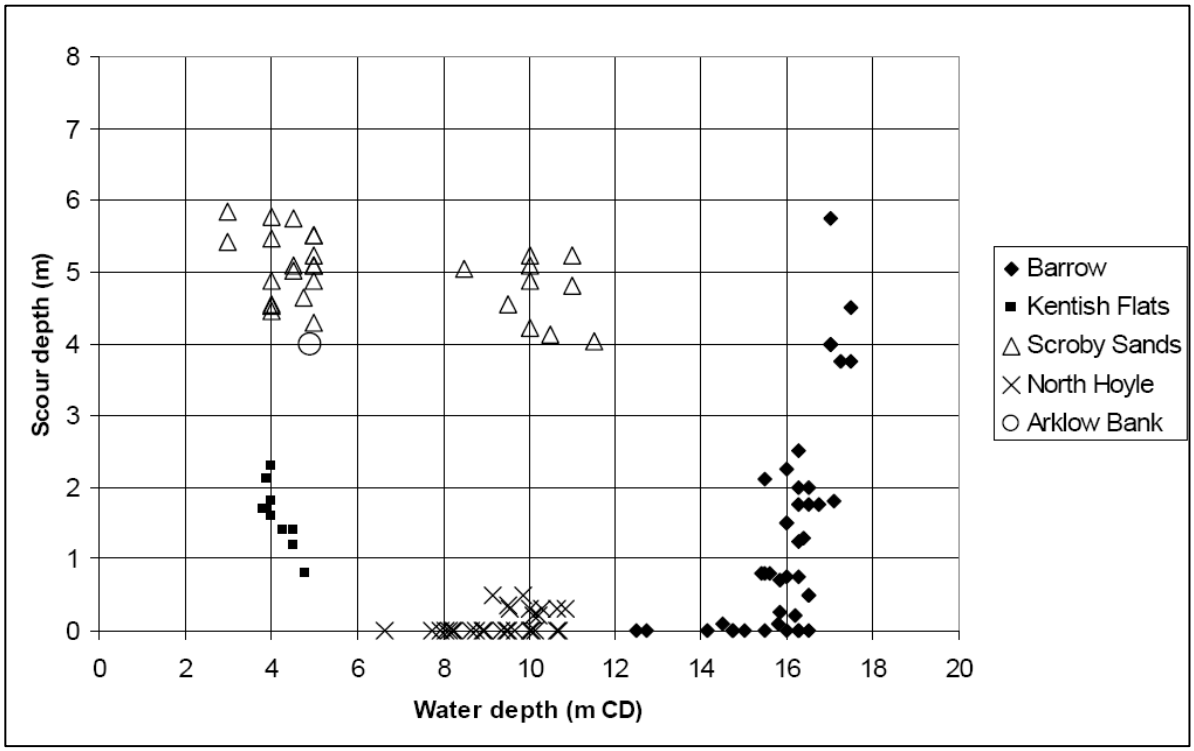

Figure 1. Scour Data for Wind Farms with No Scour Protection. From HR Wallingford *et al.* (2007).

Figure 1 indicates a wide degree of variability in the observed scour depth, both between and within sites. The maximum depth observed is however less than the maximum predicted depth (approximately 1.3 times the monopile diameter, as used in the present study). Local scour depths around the relatively smaller diameter corner posts of jacket foundations (e.g. the Beatrice Demonstrator) are estimated on

the same basis as monopile foundations and so are expected to be smaller than the range shown above.

Differences in scour depth are primarily attributable to differences in seabed type. The seabed in North Hoyle and parts of Barrow wind farms appear more erosion resistant with little or no mobile sediment veneer. Kentish Flats and other parts of Barrow wind farm have an intermediate erosion resistance (or thickness of mobile sediment present. Scroby Sands and Arklow Bank wind farms are located in mobile sand bank environments and so exhibit the larger depths of scour.

Figure 1 shows that, in practice, scour depths are limited by the presence of erosion resistant soils (e.g. gravels, or consolidated clays) at some depth below the mobile sediment surface, the depth of scour being essentially limited to the thickness of the mobile sediment veneer. As such, a spatially varying limitation on scour depth (for unprotected foundations) would also be expected in parts of the Beatrice offshore wind farm due to the presence of erosion resistant tills in close proximity (within 0.5 m) to the seabed surface.