

**SeaScape
Energy**

Burbo Bank Offshore Wind Farm



Post-construction Year 1 Environmental Monitoring Report

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1 Executive Summary

This report presents results of the first year of post-construction environmental monitoring at Burbo offshore wind farm.

The environmental monitoring programme seeks to meet the conditions set out in a Food and Environment Act (FEPA) licence issued to the developer, SeaScape Energy, thereby ensuring that there have been no unforeseen environmental consequences of constructing and operating the wind farm. The programme includes a wide range of surveys, the results of those undertaken in the first year of wind farm operation are presented here.

No objects that could be considered obstructions to other marine users are believed to have been left on site following construction of the wind farm. A specialist 'Clearance Survey' was undertaken before wind farm construction and repeated after the wind farm opened; however, interpretation of the data was severely hampered by the dynamic nature of seabed sediments which periodically cover and uncover any items on the seabed.

In order to ensure that the wind farm is not threatened by excessive scour around the foundations of turbines, and to ensure that cables buried in the seabed are not exposed and cause a risk to other users of the marine environment, specialist cable burial surveys and seabed level (bathymetry) surveys have been undertaken. These show that the cables have been successfully buried and are not likely to become exposed due to changing seabed levels.

Invertebrates living in and on the seabed are important food resources for other marine life and have conservation value in their own right. The third annual benthic ecology survey is reported here and results suggest that natural variability in a dynamic environment is sufficient to explain the observed fluctuations in invertebrate populations. Similarly, monitoring of fish in and around the wind farm has shown that although numbers of fish are lower than in the during construction period they are similar to baseline conditions. The composition of fish communities has remained relatively stable too and although there is an indication that the wind farm may be acting to attract fish from adjacent areas no major effects are apparent.

A specialist study of electromagnetic fields (EMF) produced by power cables exporting electricity from the wind farm to shore has shown that the fields present are consistent with predicted levels. Monitoring of certain fish species, including rays and dogfish which are understood to be able to detect low level fields will continue.

The underwater noise produced by the operational wind farm has been considered by reviewing results of wind farm industry supported research at several other similar sites in the UK. This work shows clearly that operational noise is very low level and highly unlikely to be of any significance to marine fauna such as fish and marine mammals.

Birds present in and around the wind farm area have been surveyed at approximately monthly intervals before, during and after wind farm construction. Low numbers of

birds use the site and most records are of birds in the westerly reference area. This is consistent with the baseline surveys.

In conclusion, there have been no unexpected environmental impacts as a result of construction and initial operation of the wind farm.

2 Introduction

2.1 Burbo Bank Offshore Wind Farm

Burbo Offshore Wind Farm is a twenty-five turbine, 90MW development located in Liverpool Bay approximately 6km from the coastlines of Wirral and Liverpool (Figure 1).

Offshore construction work commenced in May 2006 and the wind farm was formally opened on 18 August 2007, although the first power was generated some weeks earlier in July. Certain 'construction' activities have continued into the operational phase of the wind farm; in particular, scour protection was placed at two turbines (BB13 and BB14 in the south-west of the array) in September 2008 after a damaged section of cable was changed.

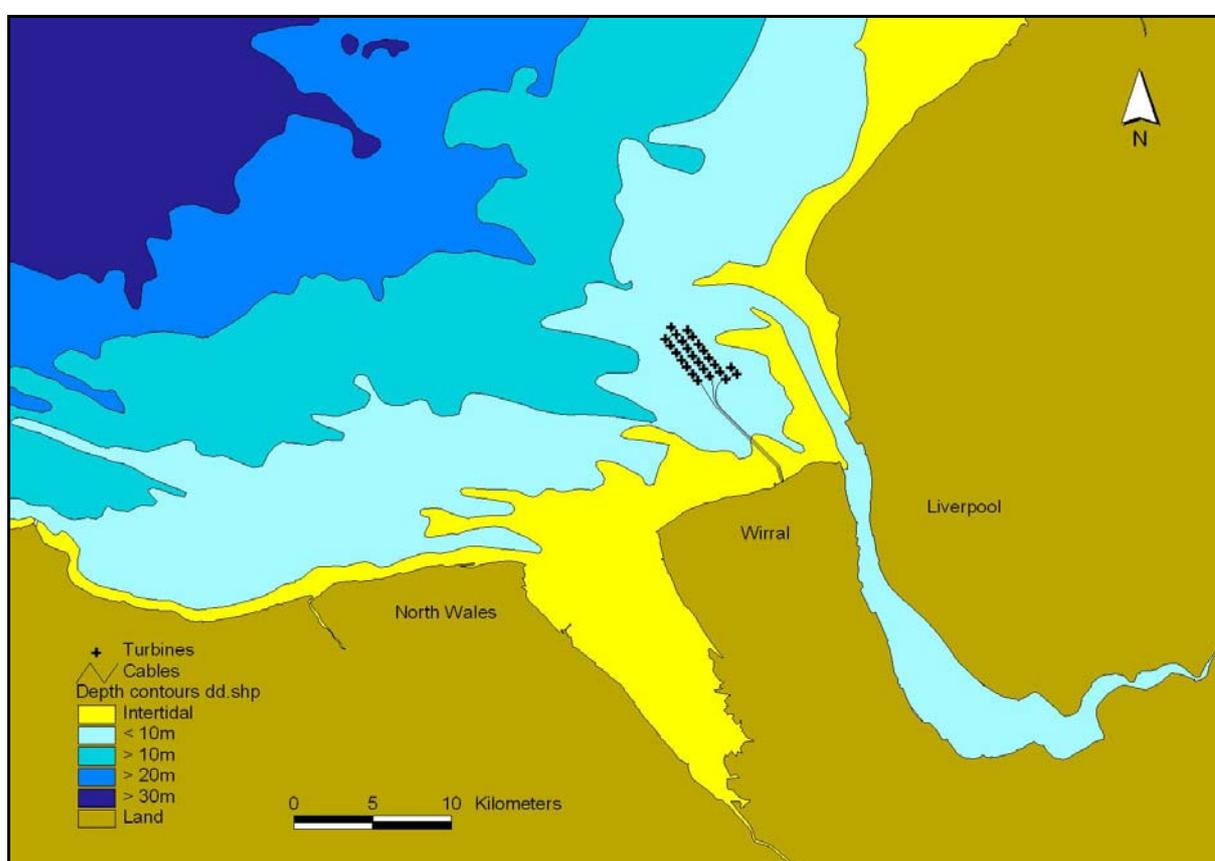


Figure 1 Burbo Offshore Wind Farm location map.

The twenty-five 3.6MW Siemens turbines at Burbo produce sufficient power to supply approximately 80,000 homes. This equates to a saving of approximately 6.4 million tons of carbon dioxide over the 20-year operating life of the wind farm.

2.2 Environmental Monitoring

Centre for Marine and Coastal Studies Ltd (CMACS) was appointed by SeaScape Energy Ltd in April 2005 to develop and undertake pre and during construction environmental monitoring to meet the requirements of the Food and Environment Protection Act (FEPA) licence issued to the wind farm developer. The current version of the FEPA licence is 31864/07/0 (Appendix 1).

A Method Statement has been developed which describes the surveys planned to meet FEPA licence conditions. This Statement is provided in Appendix 2, all surveys that were required to be undertaken in the first year of wind farm operation are summarised in this report. Detailed Technical Reports are provided in Appendix 3.

Table 1 provides a summary of progress with the environmental monitoring programme in relation to each main area of monitoring.

Table 1 Overview of Monitoring Programme.

Monitoring reports (in relation to FEPA Licence Sections)	Pre-constructi on	During constructi on	Post-constructi on	Post-constructi on	Post-constructi on
			Yr 1	Yr 2	Yr 3
Annex 1(1) Suspended Sediment Concentrations- SCC		■			
Annex 1(2) Seabed Morphology and Scour		■	●	◎	○
Annex 1(3) Contaminants	■				
Annex 1(4) Current monitoring					○
Annex 1(5) Benthic Organisms- Subtidal benthic organisms	■	■	●		○
Colonisation of monopiles/scour protection					○
Annex 1(5) Benthic Organisms- Intertidal Invertebrates	■	■			
Annex 1(6) Electromagnetic Fields		■	●		
Annex 1(7) Marine Fish- 4m Beam Trawls	■	■	●		○
Annex 1(7) Marine Fish- 2m Beam Trawls	■	■	●		○
Annex 1(8) Operational Noise and Vibration			●		
Annex 1(9) Numerical models					○
Annex 2 Ornithology	■	■	●	◎	

Grey text: completed programme.

■ = completed and reported activity; ● = work reported here; ◎ = programme commenced, report to follow in the future; ○ = scheduled or planned activity.

Monitoring Reports

SeaScape Energy (2006) Burbo Offshore Wind Farm. Year 1: Pre-construction Environmental Monitoring Report. Version 1.1 September 2006.

SeaScape Energy (2008) Burbo Construction Phase Environmental Monitoring Report. Version 3 April 2008.

This Report SeaScape Energy (2008) Burbo Post-construction Environmental Monitoring Report. Version 1 November 2008.

2.3 Reporting Structure

The purpose of this report is to bring together the various technical reports which present results of the different strands of the environmental monitoring. Detailed information and data are provided in the technical reports available in Appendix 3.

The following sections provide an overview of each aspect of the environmental monitoring. For each element the FEPA licence requirements are explained and relevant background information provided. Survey methods are then described and results presented with conclusions.

3 Environmental Monitoring

3.1 Clearance Survey

3.1.1 Requirements & Background

A primary purpose of the Food and Environment Protection Act (FEPA) is to regulate the deposition of objects onto the seabed with key objectives of reducing pollution, environmental damage and hazards to marine activities such as fishing and shipping.

To this end the wind farm developer (The FEPA Licence Holder) is authorised to deposit (i.e. install) only those items specified by the Licence; principally: steel wind turbine foundations and grouting material, rock/stone scour protection and cables. These items must be installed at specific locations specified in the Licence which provide a boundary to the wind farm.

In order to confirm that no obstructions to other marine users have been left on the sea bed Section 9.23 of the FEPA Licence requires that:

The Licence Holder must undertake a pre-construction bottom and side scan sonar survey in grid lines across the area of development (turbine array, cable route, and any vessel access routes from the local service port(s) to the construction site) following discussions with the Licensing Authority as to those parts of the operation for which this is deemed necessary. Local fishermen must be invited to send representatives to be present during the survey. All obstructions found on the seabed must be plotted. A post construction survey must be undertaken along the same grid lines (within operational and safety constraints), any new obstructions must be removed at the developers expense.

3.1.2 Methods

Osiris Projects were commissioned by DONG Energy (on behalf of SeaScape Energy) to carry out a detailed hydrographic and geophysical survey of the wind farm array area, export cable route and two separate vessel transit routes to the site from Mostyn Dock in North Wales.

Data acquisition was undertaken by Osiris Projects using Ocean Marines custom-built shallow-drafted vessel, MV 'Barinthus'. The vessel was equipped with single beam echo sounder, side scan sonar, and marine magnetometer systems. The side scan sonar equipment is able to detect certain physical features on the seabed which are seen as 'anomalies' within surrounding seabed sediments. Magnetometers detect metallic objects that create localised disturbances to the natural magnetic field of the earth. Whilst side scan sonar can detect a wider range of materials than magnetometers the technique has limited ability to detect items buried by sediments, unless they cause disturbances at the surface of the seabed.

The survey took place between May and June 2008 and was a repeat of a pre-construction (baseline) survey by OSIRIS Projects in 2006. Analysis comprised a comparison of the pre- and post-construction survey data with the aim of identifying targets (i.e. objects on the seabed) present post-construction that were not present before. This is a challenging task since the naturally mobile ground conditions can periodically uncover then recover any object on the seabed. The results are summarised below, the technical report is provided as Appendix 3A.1.

3.1.3 Results and Conclusions

The contractors who built the wind farm were required to report any items lost overboard and, if appropriate, recover such materials. As a result, an anchor which was dropped onto the seabed on 29 August 2006 had to be recovered from site by the contractors (the anchor, from the Construction Vessel 'Marlene' was reported recovered on 9 October 2006).

During the pre-lay grapnel run (PLGR) a single fluke was lost from the grapnel at two locations, one on the central export cable route and one in the wind farm array. The position of the fluke on the export cable route is believed to be approximately half way along the route; that in the array is between the two south-western most turbines. It would not be possible to detect the flukes using magnetometry as the cables would produce a much greater magnetic anomaly and the flukes are too small to be detected by sidescan sonar. Neither is considered to pose any risk to other marine users.

No other items were believed to have been dropped by construction contractors or other vessels, including environmental survey deployments of grab and trawl equipment.

OSIRIS Projects reported 112 sonar contacts within the wind farm, 70-80 immediately outside and 37 within the export cable corridor. Most of these were small

(1 to 5m long) but they also included three potential shipwrecks within the turbine array area. A further 44 side scan sonar contacts were found within the two transit route corridors.

A very large number of magnetometer contacts were found; however, many of these are believed to be due to the legitimate presence of buried power cables which have copper conducting cores that make detection of other (isolated) metallic objects difficult within the turbine array and close to the export cable route.

In a spatial comparison of pre- and post-construction side scan sonar targets from the wind farm array, export cable and transit routes OSIRIS Projects identified only 18 that were present during both pre- and post-construction surveys. Only a few of these were tentatively identified as the same feature. This is from a total of more than 260 targets, many more than could possibly have been inadvertently left by wind farm construction and other local marine activities in such a short space of time.

A large number of the side scan sonar contacts are believed to be boulders which are natural features of post-glacial environments such as this. Some of these boulders have suspected debris nearby which is quite likely to be entangled fishing gear.

The main reason for the large number of anomalies between the two surveys is believed to be a combination of the mobile nature of the seabed sediments and the frequently high-energy environmental conditions at the site. The mobility of the upper sediments would ensure that any potential target is likely to go through intermittent periods of burial and exposure, so that any targets seen in the post-construction survey have not necessarily been deposited on site since the 2006 pre-construction survey period.

Certain bottom contacts were tentatively identified as possible cable exposures. Other cable burial surveys (see Section 3.2) have suggested that cable burial was very successful but these areas will be investigated carefully in future cable burial surveys.

The conclusion has to be that in areas such as Burbo Bank which have seen significant maritime activities over centuries, but are also areas with mobile upper sea bed sediments, clearance surveys such as this are of very limited use. Good construction practices, including open reporting of any objects inadvertently dropped overboard, are of much greater value than surveys such as this which would have real value only in targeting further searches for known lost items.

3.2 Annex 1(2) Seabed Morphology and Scour

3.2.1 Requirements & Background

Offshore construction of the wind farm commenced with placement of a stone filter layer at the position of all twenty-five monopiles during May 2006. This comprised an approximately 25m diameter ring of cobble-sized slate which was laid to stabilise sediments ahead of piling and prevent development of scour which might undermine the turbine foundations. A second layer of larger slate pieces was laid as ‘rock armour’ over the first, also ahead of piling.

Three submarine power ‘export’ cables were installed from the wind farm to shore between July and August 2006. Array cables were laid between August 2006 and May 2007. The target burial depth in all cases was 3m; this is designed to ensure that there is little risk of the cables becoming exposed in future if seabed levels change. A vertical injector (Figure 2) was used to install the cable. Burial of submarine cables by this method leaves 5-8m of cable unburied at the departing end and approximately 40m unburied at the end of each run. These lengths, including where the cable crossed rock armour, were buried later by placement of additional rock armour or using the air-lift method.



Figure 2 Cable Installation Tool.

Supplementary Conditions 9.17 to 9.19 of the FEPA Licence outline the specific requirements for monitoring of seabed morphology and scour.

9.17 The Licence Holder must undertake a bathymetric survey around a sample of adjacent turbines (minimum of 4) within 3 months of completion of the construction of the windfarm to assess changes in the bathymetry within the array. The number of turbines selected for these works should be sufficient so as to be representative of the different sediment types present at the site (e.g. cohesive, mobile etc). The survey is to be undertaken immediately after construction is complete and repeated at 6 monthly intervals for a period of 3 years. This shall specifically address the need for (additional) scour protection around the turbine pylons. The Licence Holder must submit the data in the form of a report to the Licensing Authority, including proposals for scour protection measures.

9.18 To ensure the integrity of the windfarm infrastructure and minimise hazards to mariners this 6 monthly monitoring should also investigate the cable route to ensure that the cable remains buried (such monitoring would need to continue throughout the lifetime of the windfarm although the frequency must be reviewed in discussions with

the Licensing Authority at the end of the 3 year monitoring programme).

9.19 The area for the windfarm and cable route is very dynamic therefore all of the associated cabling should be buried both to minimise the risk of emergence and reduce the potential effects of electromagnetic fields. Where practicable, the Licence Holder must ensure that the cable is buried to a depth of 3 metres.

3.2.2 Methods

Cable Burial

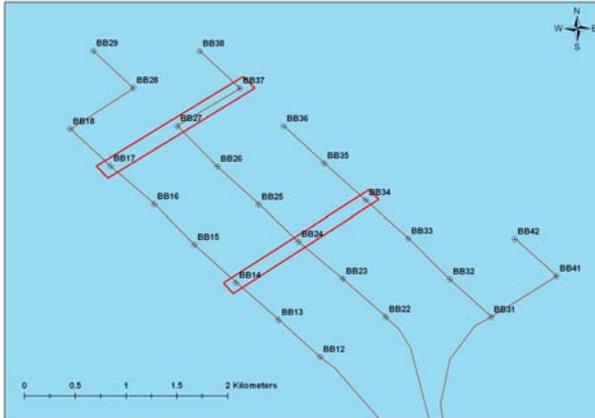
A post-lay cable burial survey was undertaken by CT Offshore between May and June 2007 (Appendix 3A.2). The survey covered all inter-array and export cables to ascertain whether the necessary degree of protection afforded to the cables by a 3m burial depth had been achieved. These works were undertaken using the survey vessel MS 'Sander', which was mobilised with a remote operated vehicle (ROV) and an active tone detecting system, TSS 350 Cable and Pipe, able to track and log burial depth of the cables down to 5-6m below the seabed. This requires a tone to be 'injected' into the cable system from a wind turbine tower and the subsequent detection of this tone by ROV allows cable burial depth to be determined.

The CT Offshore survey provides a benchmark of cable burial depth immediately after the end of the construction period. Following discussions with the Licence Authority it was agreed that for ongoing monitoring of cable burial it would suffice to show that cable was not exposed at the surface and seabed levels were not so variable as to threaten exposure. This is pursued through a combination of sidescan sonar survey to detect any cable present on the surface of the seabed and detailed bathymetric survey, described below. Surveys are undertaken by Pelorus Surveys at approximately 6 month intervals and will continue until spring 2010 to provide several years of information post-construction.

Bathymetry

In November 2006, within 3 months of installation of the final turbine monopile foundations, a survey was undertaken by OSIRIS Projects (under contract to Ocean Marine Research Ltd on behalf of Peter Madsen Rederi A/S) to assess the effectiveness of rock dumping around all turbines (Appendix 3A.3 and see Section 3.2.1). Seabed levels in 75m square boxes centred around each of the monopiles were mapped using a high frequency (240kHz) GeoAcoustics Geoswath interferometric swath bathymetry echo sounder. Although the focus of the survey was to determine the post-lay position of rock armour any early development of scour was also noted.

The swath bathymetric survey, together with information collected by CMACS on seabed sediment characteristics, was used to inform the development of ongoing monitoring at a representative selection of turbines. The monitoring approach is summarised below, and detailed in Appendix 3A.4.



Two survey boxes, encompassing six turbines were selected. These provide coverage of the siltier central part of the wind farm as well as sandy sediments typical of northern and southern parts of the array. Scour was noted at four of the turbines (27, 37, 14 and 24), although this was only a few tens of cm deep. Sidescan sonar and swath bathymetry surveys focus on the red line areas (Figure 3).

Figure 3 Geophysical survey focus areas.

Table 2 provides an overview of completed and planned bathymetry and cable burial surveys. Results of surveys up to and including May 2008 are presented in this report.

Table 2 Summary schedule for post-construction scour and cable burial surveys.

	Nov 2006	May 2007	Feb 2008	May 2008	Autumn 2008	Spring 2009	Autumn 2009	Spring 2010
Scour (geoswath)	● 1		● 2	● 3	● 4	○ 5	○ 6	
Cable burial (sidescan)		● 1		● 2*	● 3	○ 4	○ 5	○ 6

Survey status at time of reporting shown: filled circle, completed; outline circle, planned.

* May 2008 sidescan sonar survey was completed by OSIRIS Projects during the post-construction debris clearance survey.

3.2.3 Results and Conclusions

Cable Burial

CT Offshore found that all cable sections were at the target burial depth and that no sections of cable were unexpectedly shallow.

The survey proved that at least 95% of the cables had been correctly buried. Only minimal distances of cable were observed at reduced burial depth, and all these sections were found as expected in close vicinity to the turbine towers where the cable cannot be buried initially but must be installed by an air lift method and either covered by armouring or buried in a later operation, e.g. by diver-assisted jetting. No cable sections with imperfect burial were observed more than 40m from the turbines, including the whole length of the three export to shore cables.

At the time of survey cables close to turbines were being buried using the air lift method. This technique opens up a trench in the seabed into which the cable is positioned. The trench is then allowed to fill in through natural re-establishment of the seabed. These areas were observed as deep (2-3m) trenches with the cable in shallow burial (c 1m or less) in the bottom. Provided these trenches re-fill the cable will ultimately end up at or above the target burial depth of 3m.

CT Offshore also commented that they observed no signs of scour along the cable routes. This was subject to more detailed investigation in the bathymetric surveys, below which are also capable of detecting open trenches, should these have not filled in as expected.

Ongoing cable burial checks comprise sidescan sonar survey to check that no cable is unexpectedly exposed supported by bathymetric monitoring (below) to confirm that seabed levels have not varied sufficiently to threaten exposure.

Bathymetry

Three bathymetric surveys have been undertaken using geoswath to provide high resolution depth information. The OSIRIS projects survey in November 2006 is reported first (Technical Report as Appendix 3A.3). The results of follow up surveys by Pelorus around a sub-set of six turbines are then presented- Technical Reports are provided as Appendix 3A.5 (January 2008 survey) and 3A.6 (May 2008 survey).

The OSIRIS survey covered all twenty-five turbines. Possible scour (depression features near the base of rock armour) was described at 14 of the 25 turbines. All scour noted was very limited in depth (at most a few tens of cm) although, clearly, there had been limited time for scour to develop (and no over-winter period when storms might exacerbate scour effects).

The turbines where low level incipient scour was detected tended to be located in the northern half of the array, either toward the centre or eastern edge of the wind farm

(Figure 4). There was no obvious relationship with time since construction as some of the turbines where scour was noted were amongst the last to be installed in late July 2006 (e.g. turbines 25-27 and 35-37) whilst those in the southern part of the array were installed first. Surficial sediment conditions at scour locations were typically moderately to well sorted fine sands (seabed sediment character is also described in Figure 4). Poorly sorted silt was more common at sites located within the southern end of the array and this substrate appeared less susceptible to scour activity, presumably because of relatively high cohesion compared to the sandier areas (though caution is needed as scour identification is tentative, as noted above).

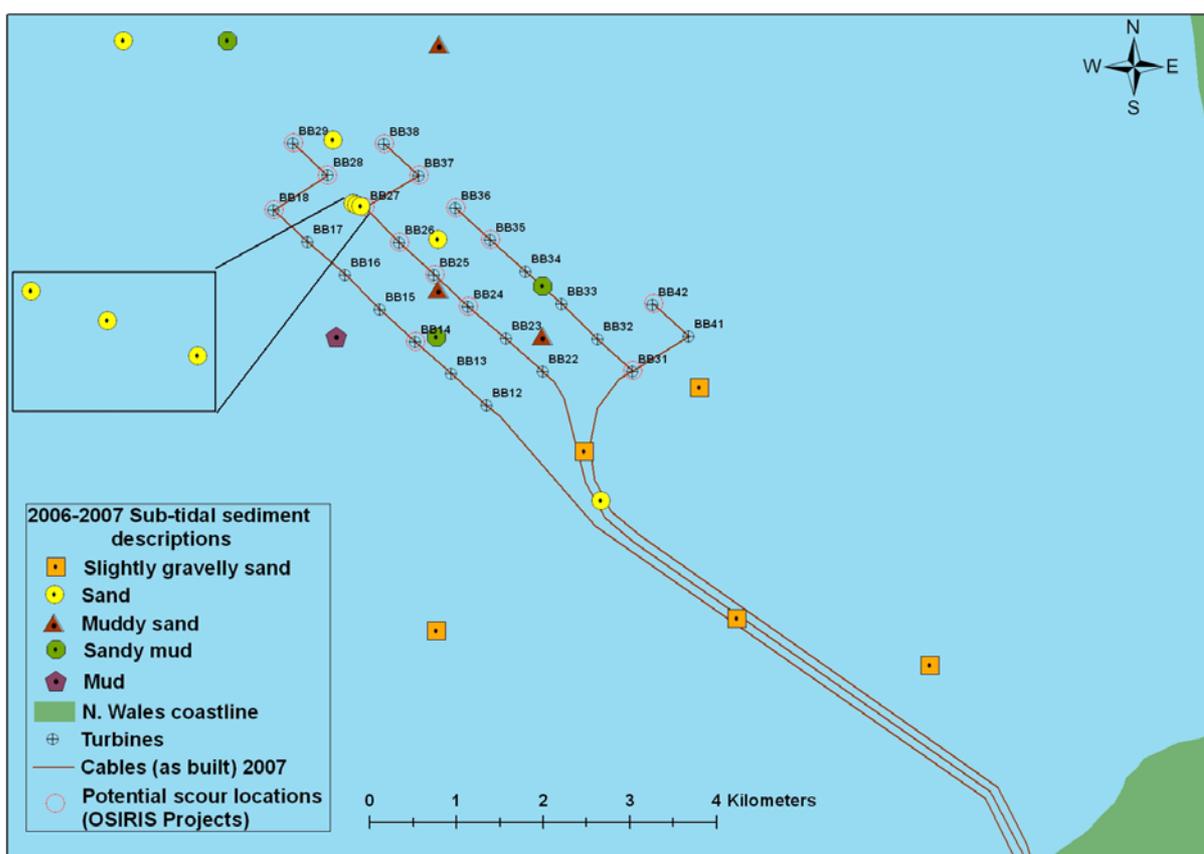


Figure 4 Turbines showing incipient low level scour (red circles) and sediment character.

A typical bathymetry chart showing low level scour at Turbine 42 (southeast of array) is provided in Figure 5. The scour here is only 20 – 30cm deep and typical of that found elsewhere.

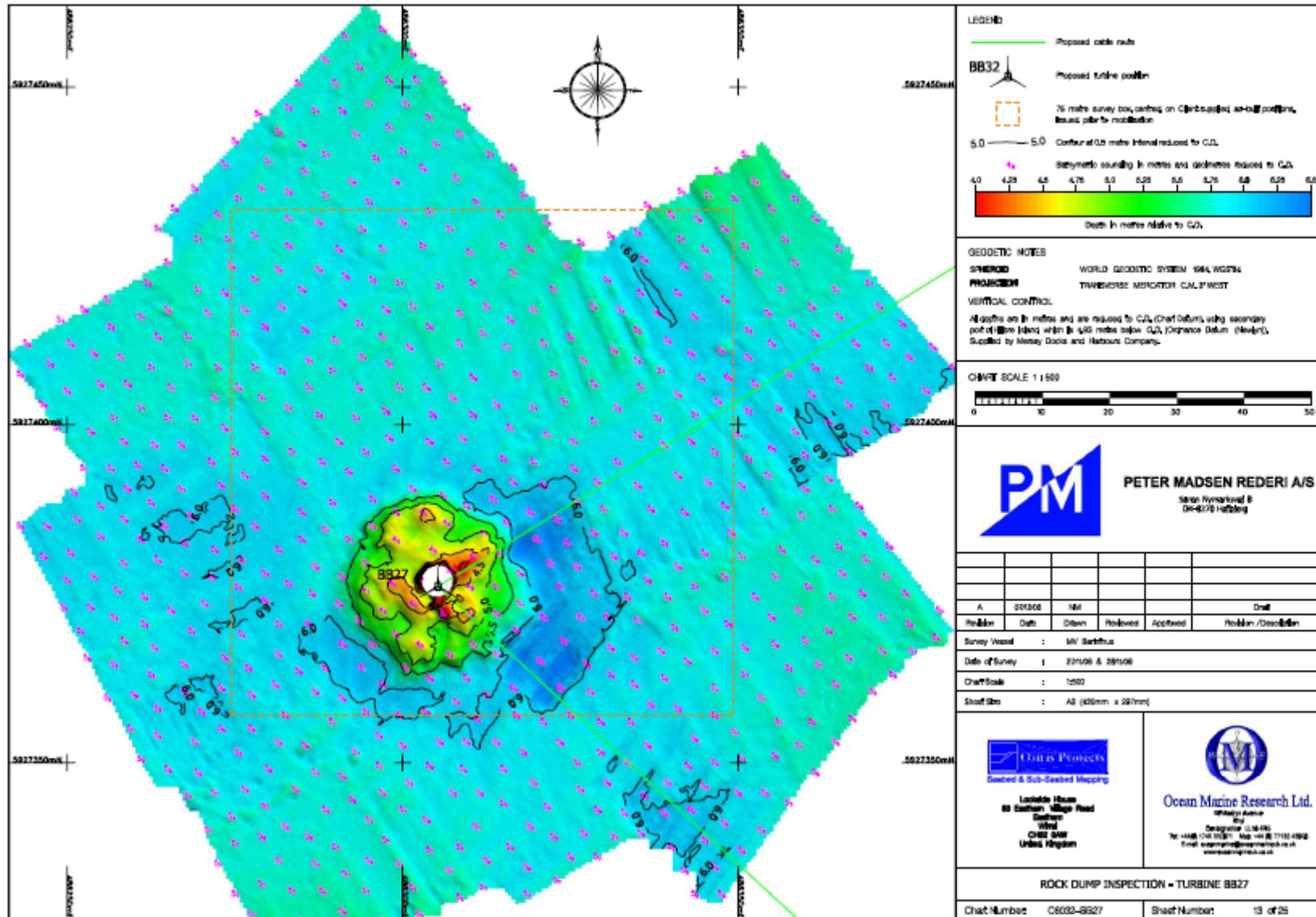


Figure 5 Turbine 27 showing incipient low level scour to the east of the turbine (November 2006).

Pelorus have repeated the geoswath surveys at the six turbines indicated in Figure 3. The two surveys reported here were undertaken some three months apart in February and May 2008. This is shorter than the 6 month interval planned because the first survey was delayed until survey methods were finalised and then because of poor weather on site over winter. The surveys nonetheless provide a very interesting comparison of short term variability in seabed levels which is discussed below.

The surveys show seabed levels approximately 18 months after the first scour survey and two years after the turbines were installed. Scour is still present only at very low levels and it is clear that the level of scour present, still a few tens of cm, represents no threat to the integrity of the wind farm. Figure 6 displays results for Turbine 27 for direct comparison with the November 2006 survey (Figure 5).

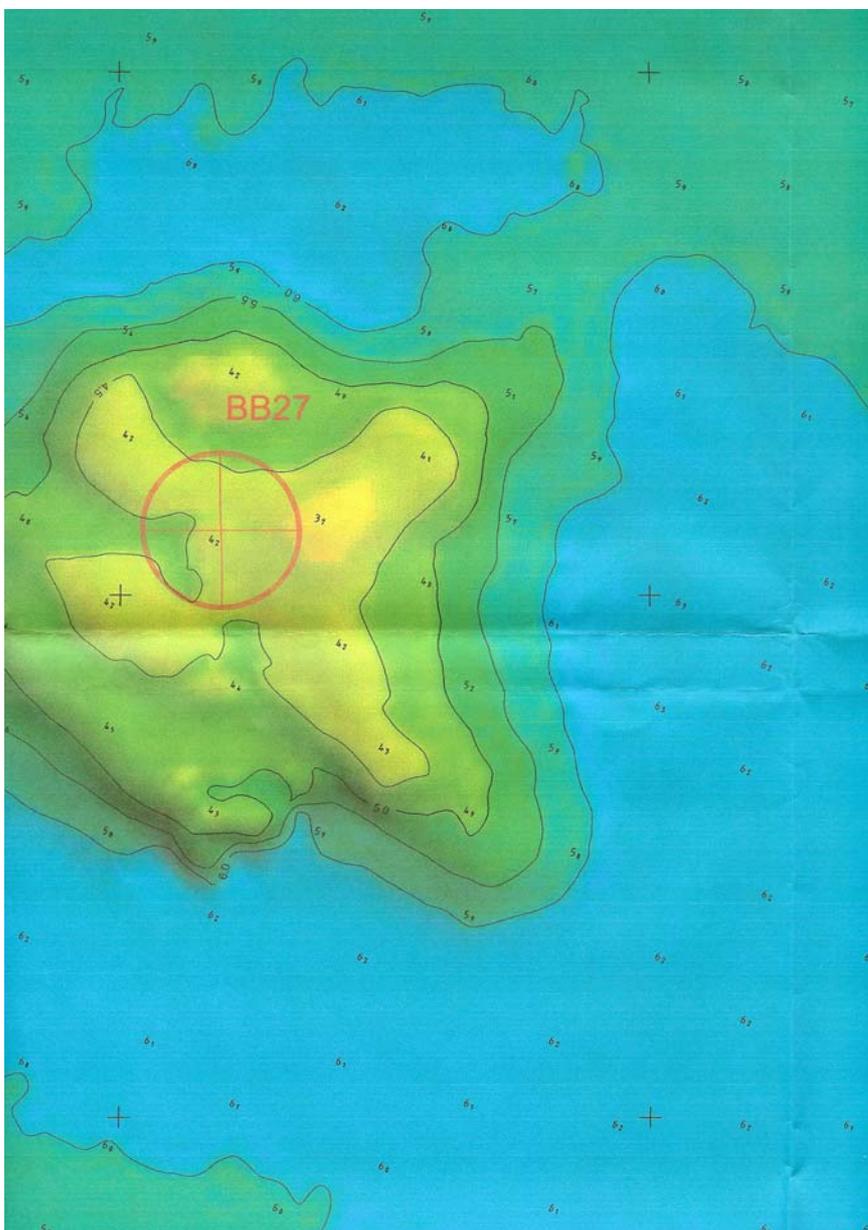


Figure 6 Shallow scour depression at Turbine 27 (May 2008).

As noted above, the two recent bathymetric surveys have provided useful information on short term variability in seabed levels. Figure 7, below, is a plot of the difference in seabed level between February and May 2008. Blue areas show increases in depth, yellow areas are decreases. The picture that emerges is not scour induced by presence of the wind farm but patchy erosion and accretion right across Burbo Bank. There are many patches of 30-40cm erosion and accretion throughout the survey area and this is believed to represent the result of natural sediment movements in what is clearly a dynamic environment.

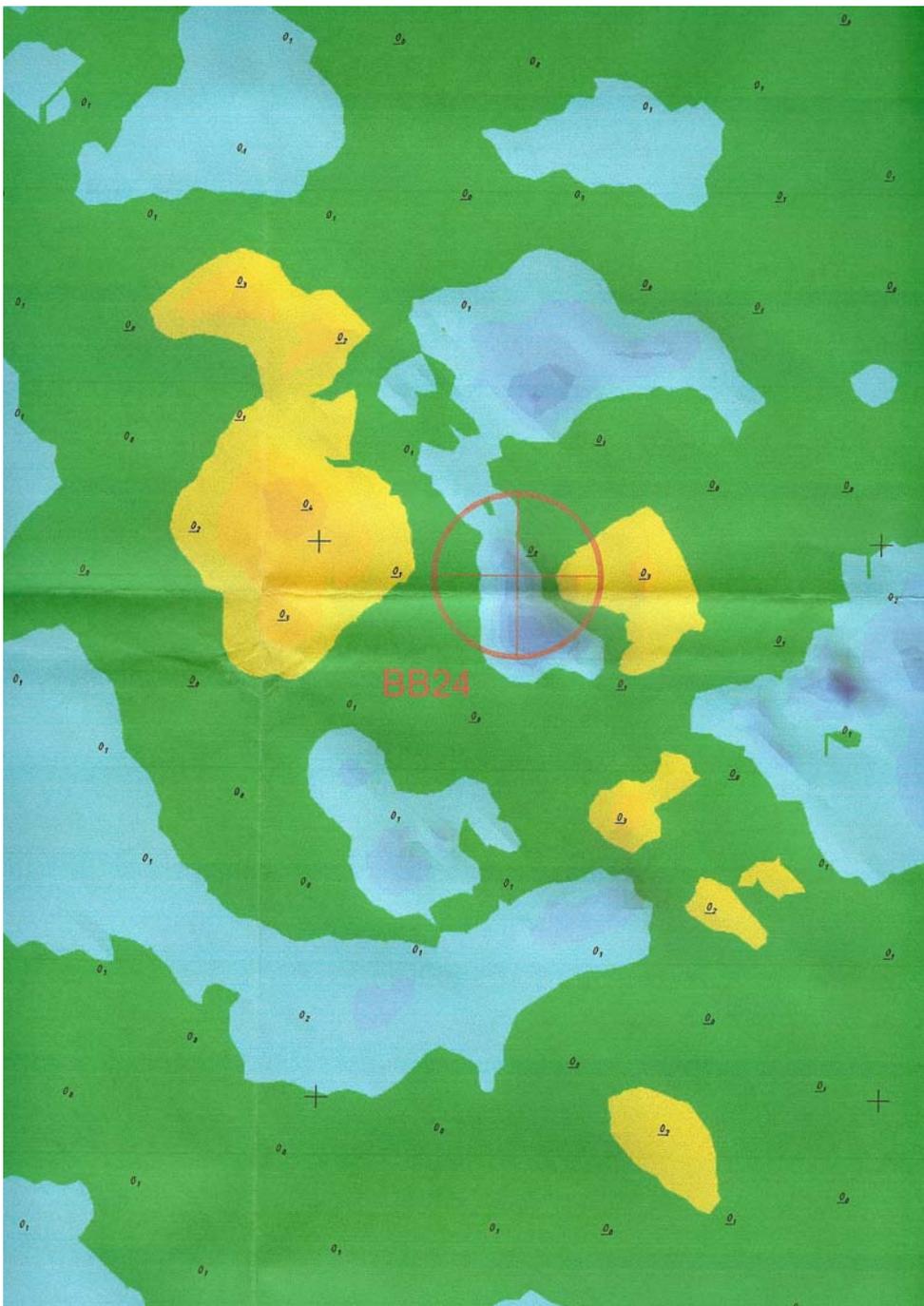


Figure 7 Comparison in seabed levels between February and May 2008.

Overall, the results of bathymetric monitoring suggest that cables buried close to turbines by the air lift method are now fully buried (since no trench features are apparent) and that seabed level changes, although naturally occurring across the site, are not of a magnitude to threaten cable exposure.

3.3 Annex 1(5) Benthic Organisms (Subtidal Benthic Ecology)

3.3.1 Requirements & Background

Benthic organisms are monitored primarily because they are an important component of the marine ecosystem, notably as food for fish and birds, and good indicators of locally induced environmental change (Boyd 2002). Certain individual species may also be important, for example if they are rare. At Burbo a nationally scarce species, the thumbnail crab *Thia scutellata* is found and surveys are carried out to check that this species, and wider benthic ecology, have not been adversely affected by construction of the wind farm. Seabed sediments are also sampled because change to benthic communities cannot be fully understood without knowledge of associated seabed sediments.

The FEPA licence calls for annual benthic surveys, starting with a pre-construction (baseline) in late summer/autumn 2005 with subsequent surveys at approximately the same time of year to provide information through construction and the first few years of wind farm operation. The FEPA Licence provides the following specific guidance on the design of the subtidal benthic surveys (summarised, full text in Appendix 1):

Sample locations for ongoing monitoring must be determined by factors such as precise monopile locations, location of cables etc. Sample locations must also take full account of factors such as sensitive areas, coastal processes modelling outputs (for sediment transport/deposition information) and geophysical surveys (to ensure adequate coverage of seabed habitats). ...samples should be taken to adequately cover the extent and direction of the full tidal excursion. ... The survey should be designed in line with the approach described in the CEFAS publication 'Guidelines for the conduct of benthic studies at aggregate dredging sites, May 2002'.

NB. The sedimentary and benthic data sets must be closely related and the resultant reports should include quality assurance, statistical analyses and full species lists.

3.3.2 Methods

Twenty grab sample stations are established in and around the wind farm and at a more distant reference site (Figure 9). These sites were selected to provide representative samples from the range of habitats known to be present following extensive surveys during the environmental impact assessment (SeaScape 2002).

Triplicate samples were obtained from each station in September 2007, several months after completion of final array cable installations and more than a year after other seabed works such as rock armour placement and monopile installations. A 'Day Grab' was deployed from 'Aquadynamic', a purpose built coastal survey vessel (Figure 8). Immediately after the grab survey a 2m beam trawl was deployed to sample demersal fish; this also provides qualitative information on epibenthic

invertebrates and, to a lesser extent, infauna. Further information on this survey is provided in Section 3.5.



Figure 8 SV Aquadynamic.

The grab is deployed from the stern of the vessel using a hydraulically operated A-Frame and winch. The grab jaws close on the seabed to capture a sediment sample approximately 20cm deep and 0.1m². All samples are processed in a laboratory to identify and enumerate invertebrates and provide data on particle size characteristics such as the relative proportions of sand and silt.

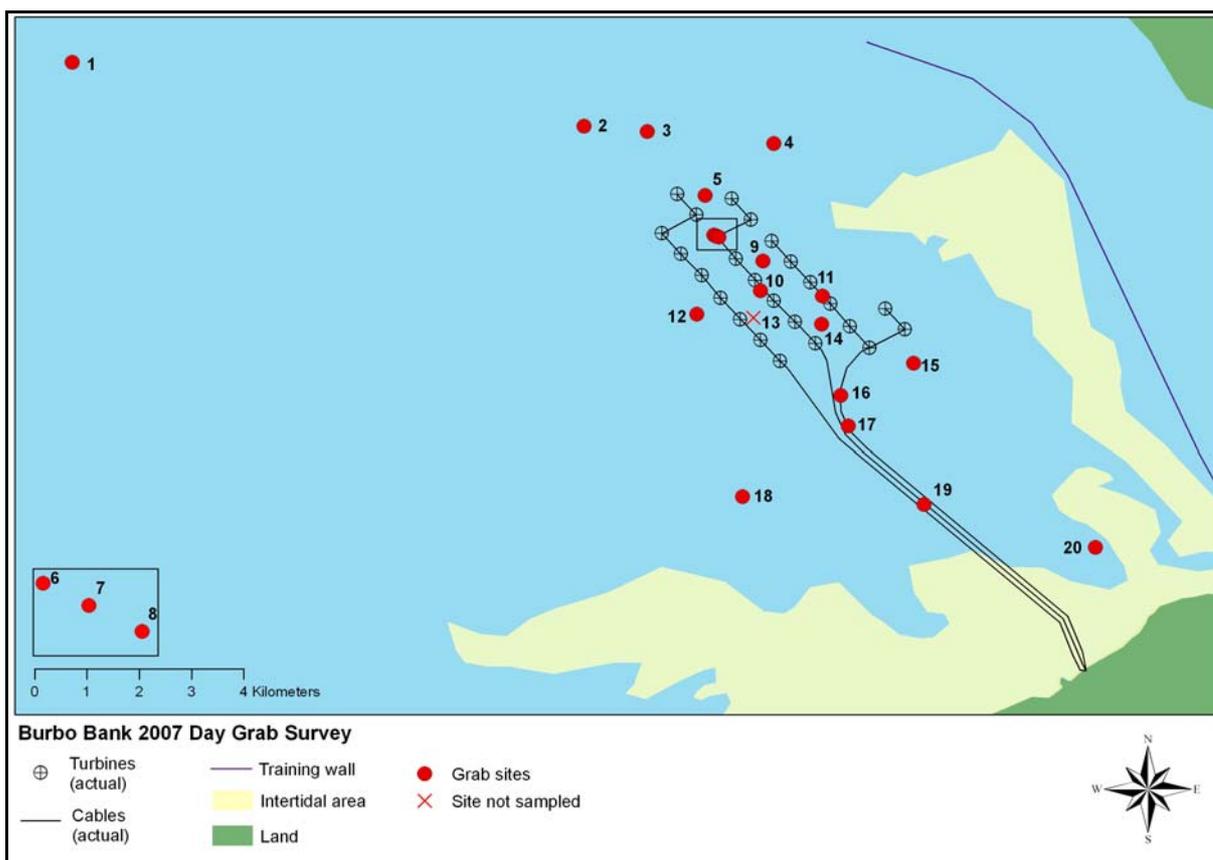


Figure 9 Benthic monitoring stations. Inset shows sites 6-8, which were located circa 150, 100 and 50 metres from a turbine, in line with ebb tidal flows. Site 13 was not sampled due to ongoing maintenance diving close by and the presence of vessel anchors at the site.

The 2007 survey was the third annual survey and a repeat of the previous baseline (2005) and during-construction (2006) surveys. Data were analysed using a range of

statistical and mapping approaches to identify changes in the composition and distribution of invertebrate communities with a view to identifying any significant impacts of construction and operation of the wind farm on seabed sediments and/or benthic invertebrates.

3.3.3 Results and Conclusions

Full results are presented in the Technical Report (Appendix 3B) and summarised below.

After the during-construction (2006) survey it was concluded that there had been no immediate major impacts on benthic invertebrate communities but it was cautioned that effects could take a while to become manifest. The 2007 benthic ecology survey was undertaken sufficiently long after major wind farm construction activities for invertebrates to have responded to major environmental change.

Benthic fauna have shown considerable inter-annual fluctuations. For example, there were marked reductions in numbers of many of the more abundant species in 2006 but strong recovery in 2007, often to levels at or above those of the 2005 baseline survey (Figure 10). This trend was also reflected in faunal richness (the number of species recorded).

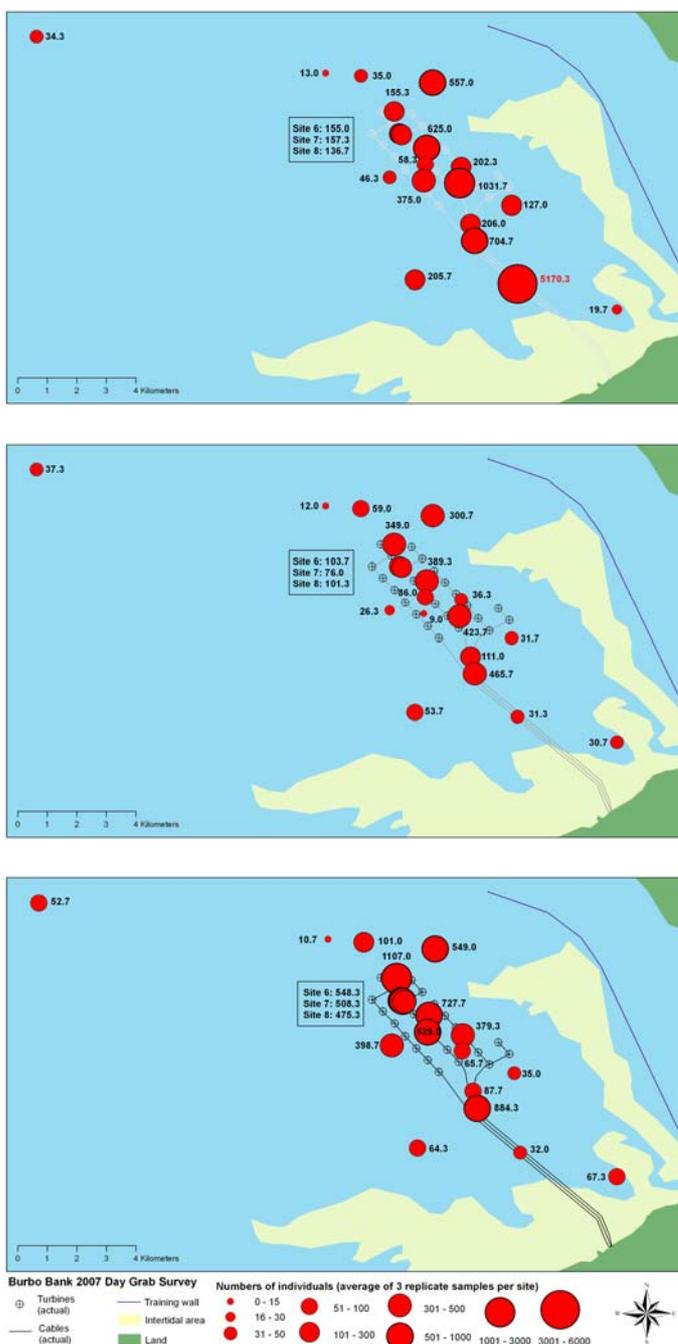


Figure 10 Average number of individuals per site: top, 2005; middle, 2006; bottom, 2007.

The available evidence suggests that natural variability in what is a dynamic environment is sufficient to explain the recorded fluctuations. This is consistent with historic understanding of conditions at the site where research has revealed that large fluctuations in the most abundant species are common (see Technical Report, Appendix 3B). There is also evidence from bathymetric monitoring (Section 3.2.3) that there is patchy accretion and erosion of sediments throughout the wind farm, especially in the central area where fluctuations have been most marked, which is widespread and not just associated with turbine or cable burial locations. Such

sediment mobility would be expected to lead to variability in invertebrate populations of the nature observed during the monitoring.

The thumbnail crab *Thia scutellata* has only ever been recorded sporadically on and around Burbo Bank but continues to be found now that the wind farm is operational; importantly, its preferred habitat of well sorted medium sands is still present. Together with the continuing presence of invertebrate community assemblages recognised as important food resources for flatfish species these results support the conclusion that construction and operation of the wind farm has not had a significant effect on communities within the areas covered by the survey which includes all areas beyond the perimeter of scour protection.

Investigations of colonisation of scour protection and wind turbine monopiles are planned and will be reported in future. In addition, a fourth subtidal benthic ecology grab survey will be undertaken in September 2009 and will conclude this aspect of the environmental monitoring provided no unexpected adverse impacts are identified.

3.4 Annex 1(6) Electromagnetic Fields

3.4.1 Requirements & Background

Anthropogenic (i.e. human produced) electromagnetic fields (EMF) are of interest in the marine environment since a relatively large number of marine species are sensitive to magnetic and/or electric fields and adapted to utilise naturally occurring fields as environmental cues. If artificial fields are present and detected by marine organisms there is potential for adverse interactions which, if serious, could lead to significant impacts. Concerns include that electric fields in excess of 100 μ V/m could repel elasmobranchs (sharks, skates and rays) while smaller fields might attract these species if the field was mistaken for the bioelectric field of prey species. Many elasmobranch stocks, particularly rays, are commercial fisheries species with threatened stock levels following severe declines of up to 95% of the total population in recent years (Myers & Worm 2003). Whilst population reductions have been linked to overfishing (Myers *et al.* 2007) it has also been suggested that habitat degradation through anthropogenic electric fields from sources such as offshore power transmission cables could contribute (Gill & Kimber 2005).

Although research has recently demonstrated that several elasmobranch species are able to detect 50Hz AC electrical fields of a magnitude associated with offshore wind farm cabling (Gill *et al.* 2008) it is not clear what the ecological significance of this effect is. Because of the above concerns the Licence Authority requires information on EMF and the FEPA licence, Annex 1(6) contains the following:

The Licence Holder must provide the Licensing Authority with information on attenuation of field strengths associated with the cables, shielding and burial....Should this study show that the field strengths associated with the cables are sufficient to have potential detrimental effect on electrosensitive species, further biological monitoring ... may be required.

Information to meet the above requirements was provided in a technical report submitted with the During-construction Monitoring Report. Based on information from modelling of generic wind farm power cabling it was predicted that the maximum induced electrical field would be above $0.5\mu\text{V}/\text{m}$ but below $100\mu\text{V}/\text{m}$, in line with predictions made in the project Environmental Statement (SeaScape Energy 2002). Recently, additional information has become available to support the prediction that induced electrical fields are below $100\mu\text{V}/\text{m}$. This work is described below.

3.4.2 Methods

As part of the COWRIE Study a number of visits were made to the shore landfall site on the Wirral in February 2008 and measurements of actual magnetic and electric fields made.



Figure 11 Measuring EMF on the shore.

A team from CMACS and University of Liverpool detected the export cables below the surface of the beach using a hand held GPS and magnetometer. Measurements were then made with a data logging device and hand held probe (left) which recorded electric fields over several minutes. The measured electric fields were related to wind farm generating status to calculate the maximum electric field on the seabed at peak power production.

3.4.3 Results and Conclusions

The maximum electric field measured at Burbo was $40\mu\text{V}/\text{m}$ when the wind farm was generating at approximately 60% capacity. This equates to a maximum electric field in the marine environment of $83\mu\text{V}/\text{m}$ when the wind farm generates at full capacity, in line with previous predictions.

These are extremely small electric fields ($1\mu\text{V}$ is 1 millionth of a Volt) but of a magnitude that has been demonstrated to influence elasmobranch behaviour and, therefore, with potential to cause an environmental impact (though such an impact has never been demonstrated). Although the new measurements support the original project environmental impact assessment SeaScape have adopted a precautionary approach and other elements of the monitoring programme have been developed to identify any significant effects. This is developed further in Section 3.5.

3.5 Annex 1(7) Marine Fish

3.5.1 Requirements & Background

A focus of the environmental impact assessment of the wind farm was the potential for effects on local fish populations. Although no significant adverse impacts were anticipated the FEPA licence contains conditions which require SeaScape Energy to undertake surveys to acquire further information on fish populations:

FEPA Licence, Supplementary Condition 9.6

Since very little is known about the potential effect of windfarms in terms of enhancing or aggregating fish populations, the Licence Holder must produce proposals for adequate pre-construction baseline and post-construction surveys of fish populations in the area of the windfarm giving strong consideration to non-destructive methods of monitoring.

FEPA Licence, Annex 1(7)

The Environmental Impact Assessment observed electrosensitive species (e.g. Thornback Ray) in this area of Liverpool Bay and in the vicinity of the Burbo site.... In the absence of any evidence that electromagnetic fields do not pose a risk to such organisms, monitoring work is required to determine the numbers and distribution of such species in the vicinity of the Burbo offshore windfarm (this should include the establishment of a baseline and the use of adequate controls).

Before wind farm construction commenced discussions were held with CEFAS and agreement reached on a set of surveys to acquire fish population information with a view to investigating the effect of construction and operation of the wind farm.

3.5.2 Methods

Two marine fish surveys are undertaken annually. A scientific (2m wide) beam trawl survey is carried out in autumn immediately after the benthic grab survey to provide information on epibenthic invertebrate communities and smaller demersal fish. A 4m wide beam trawl using commercial fishing gear is undertaken in spring to survey larger benthic fish species and to provide information on elasmobranch foraging in and around the wind farm. Pre and during-construction surveys have been reported previously; the first post-construction 2m and 4m trawl surveys were completed in September/early October 2007 and May 2008 respectively and are reported here. Detailed Technical Reports are provided in Appendix 3 (3C.1, 2m beam trawl; 3C.2, 4m trawl).



Figure 12 Scientific trawl before deployment.

The 2m beam trawl (left) has a cod-end (bag at end of net) with 4mm square mesh and a mouth held open by the bars and protected from debris by the chain matrix visible here. The gear is deployed from the survey vessel (Aquadynamic) using a hydraulic winch and towed along the seabed at approximately 2 knots for a distance of 300m.

Catches (see below) are sorted and identified on board. The technique is not fully quantitative but provides a good indication of populations of smaller bottom-dwelling fish (e.g. flatfish such as plaice and flounder) and invertebrate species living on the seabed.



Figure 13 Admiral Grenville.



Figure 14 Commercial (4m) beam trawl.

The larger (4m) commercial fish trawl (above, right) has 80mm mesh in the cod-end and is deployed from the fishing vessel ‘Admiral Grenville’ (above, left). Trawls are carried out for a distance of approximately 2km at 3 knots, covering more ground than the smaller trawls and capturing a wider range of fish, including larger species.

Both surveys are undertaken at a series of established sites (trawl ‘stations’), encompassing locations within and adjacent to the wind farm and at increasing distance away (west) from the wind farm up to beyond the point at which any effects would reasonably be expected where there is a reference station. The stations are shown in Figure 15, below. 4m trawl stations 7&8 were combined in the first survey year to keep both within the wind farm.

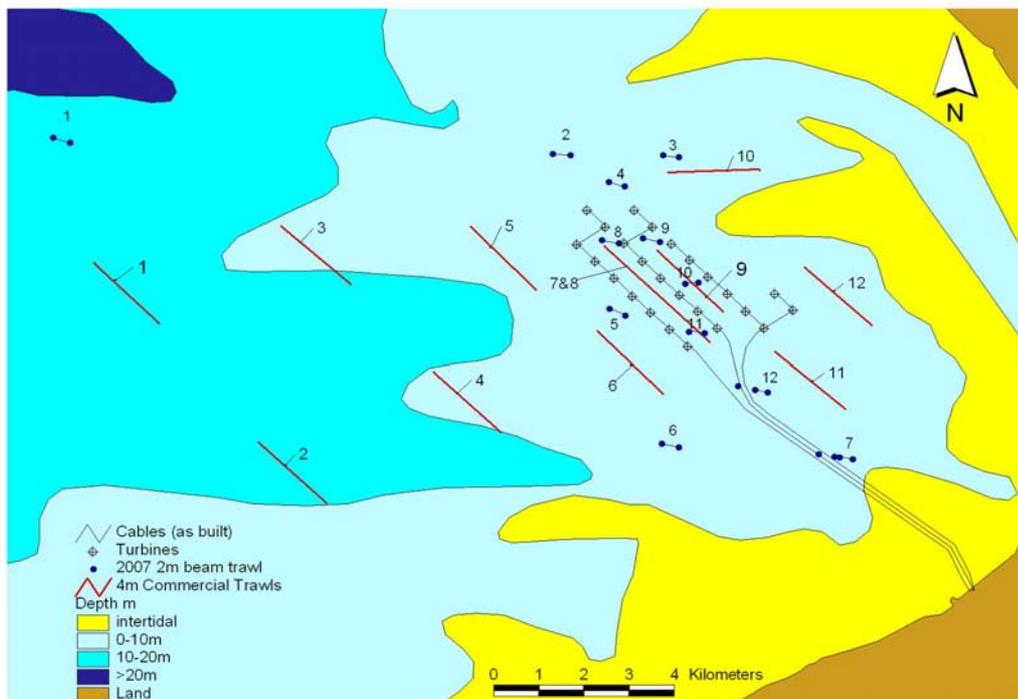


Figure 15 Trawl survey stations.

As far as possible the trawl positions are repeated each year; however, in 2007 2m trawl stations 7 and 12 on the cable route had to be moved slightly eastwards to avoid trawling directly over cables as it could not be guaranteed at that time that no damage would be done to the cabling. The old and new positions can be seen in Figure 15.

Survey results are analysed using a combination of visual plotting of data and statistical analyses with a focus on comparing data from different survey years to identify any changes that might be associated with construction or operation of the wind farm.

3.5.3 Results and Conclusions

2m Beam Trawls

Good numbers of fish were captured in the survey, typical hauls are shown in Figure 16, below. The total number of fish, and species diversity, were both comparable to the baseline (pre-construction) survey and somewhat higher than the previous year's during-construction survey. Fish were most abundant in the southern part of the wind farm and at a site close to the export cable to the south of the wind farm (Trawl Stations 11 and 12 respectively). Relatively small numbers of fish were recorded from other sites, including the reference station and other stations in and around the wind farm.



Figure 16 Typical 2m trawl catches, including: left, various flatfish, small roundfish such as poor cod, a thornback ray (top left of photo) and invertebrates (starfish and brittlestars); right, lesser spotted dogfish, flatfish and brittlestars.

Statistical analysis showed that there was a relatively high degree of similarity between sites year on year, suggesting no major change in fish community composition as a result of wind farm construction and initial operation.

Small numbers of two elasmobranch species, thornback ray and lesser spotted dogfish were captured, both in the array and adjacent to it. These species have been recorded in similar numbers previously and their presence while power was being generated demonstrates at least that they have not been excluded from the area of the wind farm.

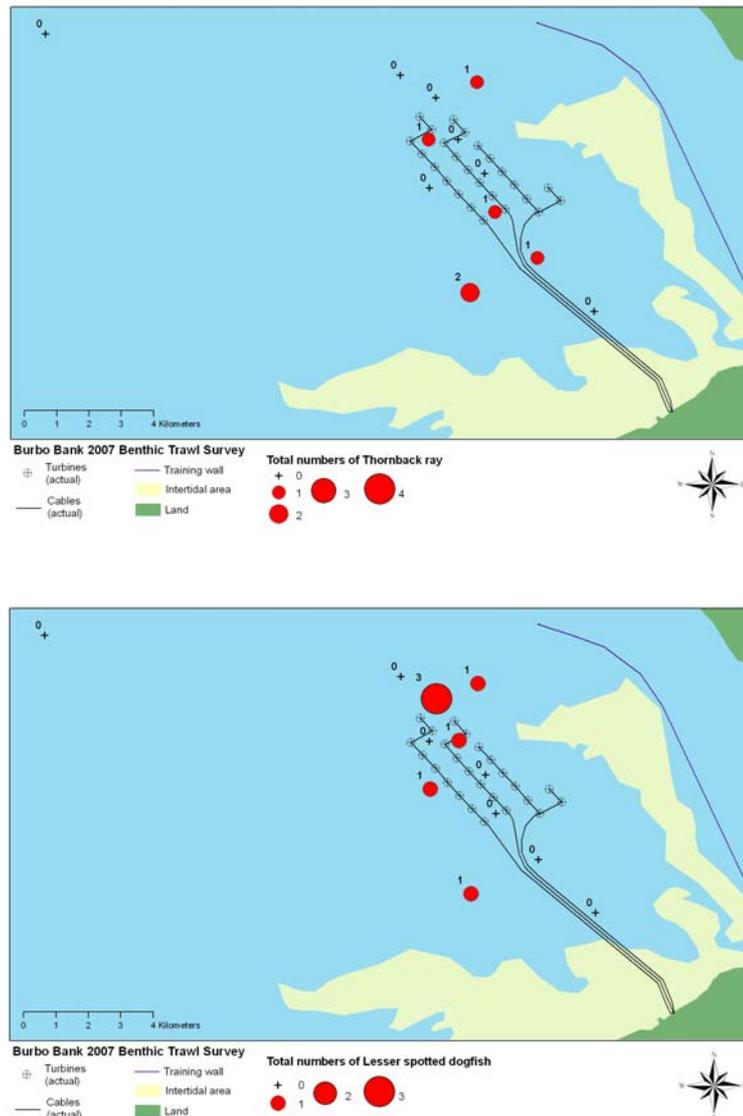


Figure 17 Numbers of thornback ray (upper) and lesser spotted dogfish (lower) in 2m trawls.

4m Beam Trawls

The fish assemblage sampled by 4m trawls has also been stable from year to year and certain species have been consistently dominant in Trawls (Table 3).

Table 3 Total numbers of the most common fish taxa recorded in 2006, 2007 and 2008.

2006	Total	2007	Total	2008	Total
Dab	4092	Dab	9016	Dab	3751
Plaice	563	Plaice	1537	Plaice	852
Solenette	420	Flounder	824	Solenette	829
Flounder	363	Thornback ray	328	Flounder	701
Dover sole	294	Dover sole	208	Whiting	301
Thornback ray	206	Whiting	202	Dover sole	209
				<i>Thornback ray</i>	<i>100</i>
Total (top 5)	5938		12115		6643
Total (all species)	6410		12666		7002

Based on numbers of fish per hour to equalise survey effort and allow direct comparison.

Statistical analyses showed that there were strong similarities between sites, regardless of location or survey year. Importantly, the fish assemblage at sites within and close to the wind farm did not differ markedly either with far field or reference sites. This suggests that construction and operation of the wind farm has not had a major impact on fish assemblages. There are, however, some suggestions of a fish aggregation effect. Overall numbers of fish in 2008 (adjusted for survey effort) were very similar to the baseline year (2006) but substantially lower than in 2007 (during-construction) when total numbers were at least 80% higher than in the other two years (see Table 3). Fish numbers within the boundaries of the wind farm remained high (compared to the baseline year); much of the total decline was due to decreased fish abundance at the two far-field stations (3 and 4). This could simply represent small-scale spatial variability in fish density; however, the distribution is consistent with the theory that the turbine foundations, and wind farm as a whole, could act as Fish Aggregating Devices (FADs) by attracting fish into and close to the wind farm without changing the overall population.

Three elasmobranch species have been found consistently throughout the surveys: thornback ray, lesser spotted dogfish and starry smooth hound. Starry smooth hound have been recorded in low abundance at limited numbers of sites while thornback ray and lesser spotted dogfish have been relatively common across the survey area; further consideration of these species is of interest as there may be sufficient numbers for future statistical analyses to detect any major influence of wind farm operation on their distribution. Figures Figure 18 and Figure 19 summarise effort-adjusted catches of lesser spotted dogfish and thornback ray throughout the surveys to date.

Lesser spotted dogfish were relatively more abundant in the during-construction year survey (2007) than in the other two years. Although catches were lower in the post-construction survey than in the during-construction year lesser spotted dogfish were

almost three times more common in hauls than in the baseline survey year (total effort adjusted catch 23 in 2006 and 60 in 2008). Interestingly, 30% of all fish were caught at Site 7&8 within the wind farm, an area where this species had previously been recorded relatively rarely (only 3% of lesser spotted dogfish were caught at the two wind farm sites in both previous years combined) and so this represents a marked change in distribution.

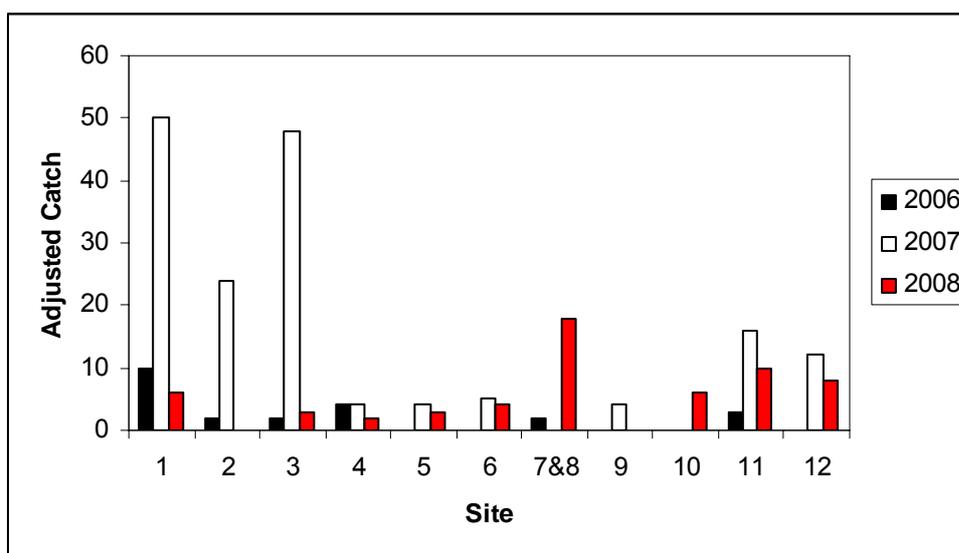


Figure 18 Comparison of catches of lesser spotted dogfish.

Thornback ray numbers in 2008 were the lowest in the three survey years (adjusted totals: 206 in 2006; 328 in 2007 and 100 in 2008). In the 2007 survey this species was relatively abundant at all shallower inshore sites, including those in the wind farm during the construction period. While numbers at most sites were lower in 2008, at Site 11 (inshore of the wind farm and east of the export cable route) they have remained consistent. Many individuals here were juveniles and this area has retained its importance as a nursery area for this species.

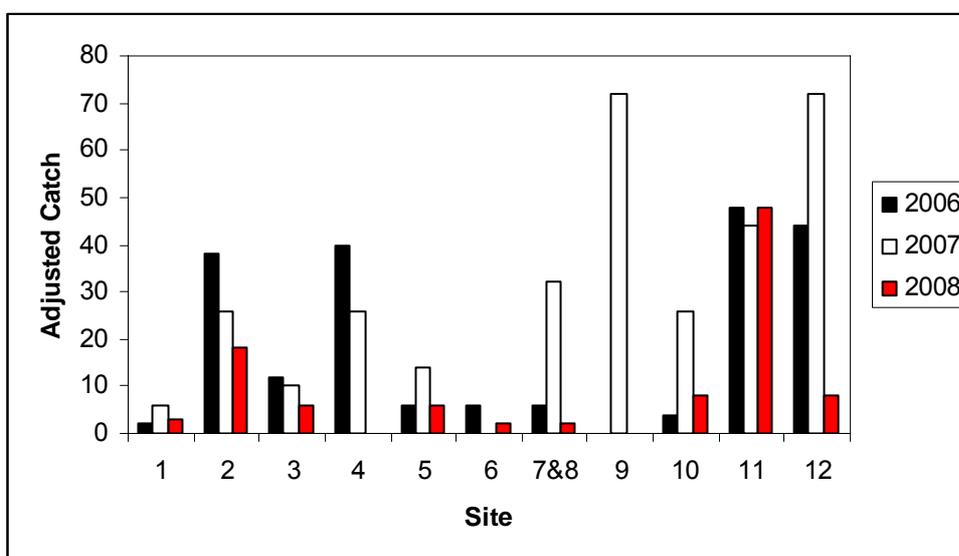


Figure 19 Comparison of catches of thornback ray.

The presence of elasmobranchs, particularly relatively large numbers of lesser spotted dogfish, in the operational wind farm is interesting but it must be noted that weather conditions during survey were relatively calm and the wind farm would have been generating little or no power. The relatively high number of dogfish in the wind farm is consistent with a general attraction to low level electric fields but may also result from improved foraging opportunities for this species which predates on small fish and invertebrates (cf. FAD effects discussed above).

The commercial trawl survey took place more than 9 months after the wind farm first produced power and almost two years after the start of construction when rock armour was placed on the seabed and turbine foundations installed. In this time it can reasonably be expected that fish communities will have responded to the presence of the wind farm; however, in order to ensure that there are no longer term impacts a further survey is planned for spring 2010 which, in the absence of major effects from wind farm operation, will be the final survey. Results will be considered together with additional information from a final 2m trawl survey planned for autumn 2009.

3.6 Annex 1(8) Operational Noise and Vibration

3.6.1 Requirements & Background

In the Environmental Statement (SeaScape Energy 2002) noise and vibration from the operational wind farm was predicted to be similar in magnitude to offshore oil and gas platforms and considerably lower than noise produced by most ships. The ES provided a specific prediction that the noise produced by operational (2.5MW) turbines would be 98-130dB re 1 μ Pa at frequencies between 25 and 400Hz. It was predicted that when the wind farm 'started up' (under conditions of increasing wind strength) this level of noise would be likely to induce a startle response in fish species with good hearing capabilities such as whiting, this could be accompanied by short-term avoidance followed by general habituation to the continuous noise generated by operation. No significant impacts were anticipated.

After the ES was prepared the number of turbines planned and ultimately installed was reduced from thirty to twenty-five through the procurements of larger (3.6MW) machines. It was not considered likely that this would significantly affect the level of noise produced by the operational wind farm.

Annex 1(8) of the FEPA licence states that:

Detailed post construction data must be collected on the frequency and magnitude of underwater noise produced by the Burbo offshore windfarm. The choice of sites for installing monitoring equipment should reflect the different conditions such as sediment type, water depth and pile type. This data is required for a variety of purposes, including:

In combination with the biological aspects of the monitoring programme proposed in Annexes 1 and 2, the data would help to elucidate any interactions between noise generation and the provision of new habitat and fish aggregation effects of the turbine support structures.

Determining the effects of distance depth and background sources on noise propagation.

Supplementary Condition 9.5 acknowledges that 'collaborative studies' could be an acceptable means of fulfilling this condition. As the wind farm industry have supported measurements of operational noise at a number of sites through the COWRIE programme it was agreed with the licence authority that the results of this work should be presented to discharge the licence condition at Burbo.

3.6.2 Methods

The COWRIE study was undertaken by Subacoustech Ltd who have presented results of operational noise measurements made at four wind farms: North Hoyle, Scroby Sands, Kentish Flats and Barrow (Nedwell *et al*, 2007). Underwater noise levels across a broad frequency range of 1 Hz to 120 kHz, covering the entire frequency range over which fish and marine mammals can hear, were measured using a high sensitivity hydrophone.

The hydrophone was deployed from a vessel whose systems were shut down during measurements to avoid contaminating the signal. Noise levels were recorded both inside and outside the wind farms, the latter typically more than 1km from the turbines. Measurements were made over a range of conditions, including relatively calm periods (little wind turbine noise anticipated due to limited movement of the turbines but lower levels of natural background noise also) to moderately windy conditions (up to around 10m/s wind speed) when turbines were generating higher levels of power and therefore potentially noisier but with higher levels of natural background noise making this more difficult to detect.

3.6.3 Results and Conclusions

Very low level noise was recorded from the four operational wind farms. Wind farm noise could be detected because of characteristic tonal qualities caused by mechanical movement of the turbine parts and its decay with increasing distance from the wind farm. Wind farm noise was only dominant over background noise in a limited number of frequency bands and then by only a few decibels (dB). Where shipping activity was present this tended to swamp the wind farm noise

At North Hoyle wind farm, some 15km west of Burbo, noise levels inside and outside the wind farm were relatively constant, suggesting that the wind farm was not a dominant source of noise. Subacoustech reported that the unweighted noise level within North Hoyle wind farm (128dB re 1 μ Pa) was only 8dB noisier than outside the wind farm. When wind farm noise was related to the hearing capabilities of various fish and marine mammal species it was concluded that fish, largely sensitive to lower frequency noise associated with the wind farm, would experience a slightly 'noisier' environment in and immediately around the wind farm than marine mammals (9.4dB and 6.3dB respectively); however, this level of increase was noted as similar to natural variability under increasing sea state conditions and considered very unlikely to have any ecological significance.

The turbines at North Hoyle are smaller than at Burbo (2MW versus 3.6MW); it is conceivable that larger turbines and associated larger support piles could have different acoustic characteristics, however, noise monitoring at the other sites, including 3MW turbines at Kentish Flats and Barrow suggest no dramatic scaling up of noise. In fact, across the four wind farms, Subacoustech concluded that the level of noise created by operational wind farms was, on average, only around 2dB noisier for fish and no noisier for marine mammals (taking account of their specific hearing abilities) than the surrounding area. Again, this was considered to be within the natural variability which might be encountered by both fish and marine mammals.

Table 4 provides a comparison of the four sites in relation to unweighted noise and selected fauna, including the most noise sensitive fish and mammal species analysed. This highlights the relatively small contribution to underwater noise the presence of each wind farm makes.

Table 4 Overview of Monitoring Programme (from Nedwell *et al.*, 2007).

	N. Hoyle		Scroby		Kentish Flats		Barrow	
	In	Out	In	Out	In	Out	In	Out
Turbine Rating (MW) (Burbo = 3.6)	2		2		3		3	
Monopile Diameter (m) (Burbo = 4.7)	4		4.2		4.3		4.7	
Unweighted Noise (dB)	128	120	130	132	114	113	124	122
Herring (dB _{ht})	41	35	50	51	34	31	43	42
Harbour Porpoise (dB _{ht})	55	48	56	56	48	50	49	47
Average Fish (dB _{ht})	9.4		-1.0		3.0		1.0	
Av. Marine Mammal (dB _{ht})	6.3		-1.0		2.3		2.0	

dB_{ht} is an approach to estimate the effects of noise, taking into account the hearing sensitivity of different species and the characteristics of the noise. Subacoustech who developed the metric suggest that 90dB_{ht} is a threshold above which almost all individuals of a species will react.

The turbines at Burbo have a slightly higher rated capacity than the four sites included in the COWRIE study but results are believed to be comparable and unlikely to underestimate noise magnitude and significance at Burbo for a number of reasons:

- All sites, including Burbo, are coastal (5-10km offshore) and in shallow or moderate water depths (range 0.5 - 24m depth). There are no differences in bathymetry or seabed character that would be expected to significantly influence the results.
- Background sea noise measurements at Burbo during construction works (also by Nedwell *et al.* 2007) indicated a mean ambient sea noise level (10Hz to 150Hz) of 140dB re 1µPa; this is relatively noisy (cf. unweighted noise in Table 4) and thus likely to swamp turbine noise.
- The Burbo site is near a busy shipping route into and out of Liverpool and shipping noise is highly likely to exceed wind farm noise in magnitude.

In conclusion, the COWRIE study, undertaken at a number of sites with similar characteristics to Burbo, suggest strongly that underwater noise produced by the operation of offshore wind farms is of negligible consequence for marine fauna such as fish and mammals.

3.7 Annex 2 Ornithology

3.7.1 Requirements & Background

The wind farm is adjacent to several important sites for birds. The two nearby estuaries, the Mersey and the Dee, are both designated Special Protection Areas (SPAs) for internationally important numbers of wintering waterfowl and for breeding tern populations (Dee only). The Mersey Narrows and North Wirral Foreshore SSSI is a candidate SPA, also for wetland bird species. In addition, parts of Liverpool Bay itself may in future become an SPA for red-throated diver and common scoter.

Potential impacts to birds were therefore of primary importance in the environmental impact assessment (SeaScape Energy, 2002). Although no significant impacts on bird populations within, or passing through, Liverpool Bay were predicted a programme of monitoring was called for by the FEPA Licence:

FEPA Licence, Annex 2

Monitoring will commence with at least a year of baseline, pre-construction data gathering and monitoring during the year of construction. Post-construction monitoring will be undertaken annually for three years. The level of subsequent monitoring, during the lifetime of the windfarm's operation, will be determined, in agreement with English Nature, by the magnitude of change in bird populations observed in the initial monitoring period. The ornithological monitoring programme may have to be adapted and amended as new technologies and research findings become available.

Monitoring should be linked, where appropriate, with the benthic monitoring. Monitoring reports will be provided to English Nature annually, or more frequently where the results of the data may trigger further monitoring work.

Monitoring of an agreed reference site will also be carried out in parallel to the windfarm site.

Monitoring will need to fulfil the following objectives:

To be developed in consultation with EN.

3.7.2 Methods

As detailed in previous reports (SeaScape Energy, 2006), ornithological survey methods were agreed in consultation with key stakeholders: English Nature (now Natural England); Countryside Council for Wales; Royal Society for the Protection of Birds; and Lancashire Wildlife Trust.

Surveys were undertaken by two experienced ornithologists from a vessel (Halcyon Days) at approximately monthly intervals over the first year of operation of the wind farm. Each survey encompassed the whole of the wind farm site, buffer areas either side and an adjacent reference site. The survey transects are shown in Figure 8.

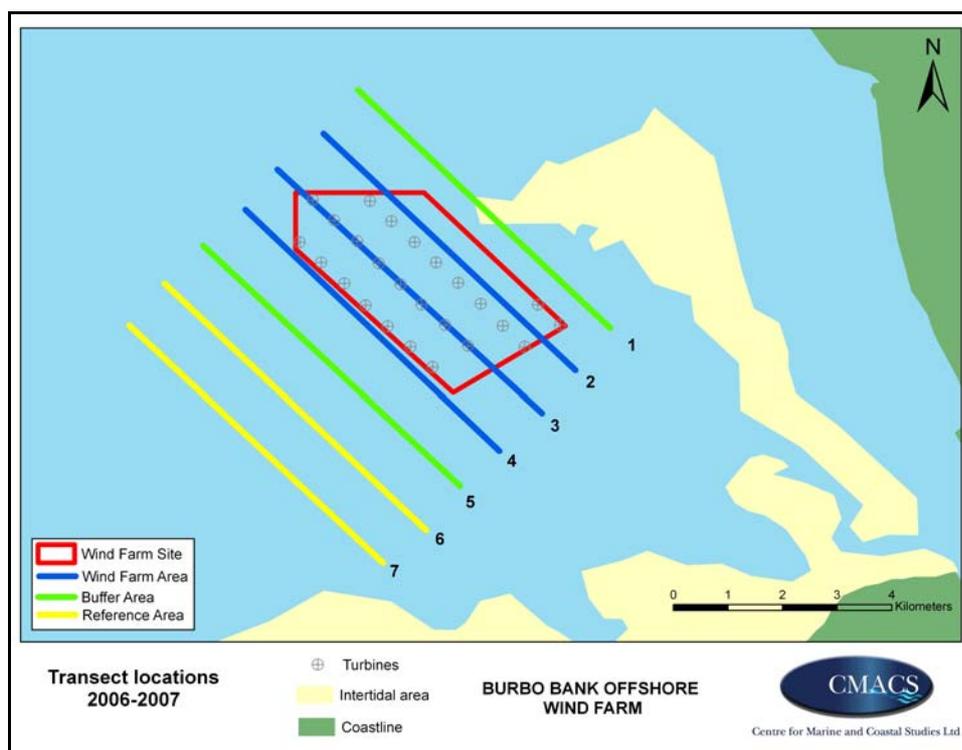


Figure 20 Ornithology Survey Transects

The methods of Camphuysen *et al.*, (2004) were followed during field surveys. Positioning and chronological data were logged at commencement, during and on completion of each transect. The ship traversed the transects as close to the preferred speed of 10 knots as possible. The two ornithologists viewed from either sides of the vessel and scanned the area perpendicular to the boat using binoculars. All observations were logged using dictaphones, noting the time, position and band location and, wherever possible, age, sex and activity. For birds recorded only in flight, approximate height and direction were also recorded.

Although all species (other than the commoner gull species), including marine mammals (seals and cetaceans) were recorded, analysis was focused on four target species: common scoter; red-throated diver; cormorant and common tern. These species are important to local internationally designated conservation sites.

Results are summarised below (detailed in Appendix 3D).

3.7.3 Results and Conclusions

From the baseline year, through the period of wind farm construction and into the operational phase the ornithological surveys at Burbo have consistently recorded low numbers of birds throughout the survey area. The wind farm area itself, and the easterly buffer transect, have consistently yielded fewer bird sightings than the westerly reference area which, as noted in previous reports, is more distant from the busy Queens Channel shipping lane.

Cormorant take advantage of opportunities to perch on the wind turbine foundations and so have been found in relatively high numbers within the wind farm post-construction.

Numbers of common scoter and red-throated divers recorded were low, suggesting that the survey area is of lower value than other parts of Liverpool Bay. Records of both these species, along with those for auks, showed some distribution bias towards the reference area and, in the case of red-throated diver and scoter, the seaward (northern) end of the transects (see Figure 21). This has been noted previously (i.e. before wind farm construction) and rather than being linked to any disturbance from the wind farm it seems likely that this simply reflects their distribution in the face of existing disturbance, particularly from shipping, close to the eastern edge of the survey area. The presence of the wind farm appears not to have exacerbated this situation.

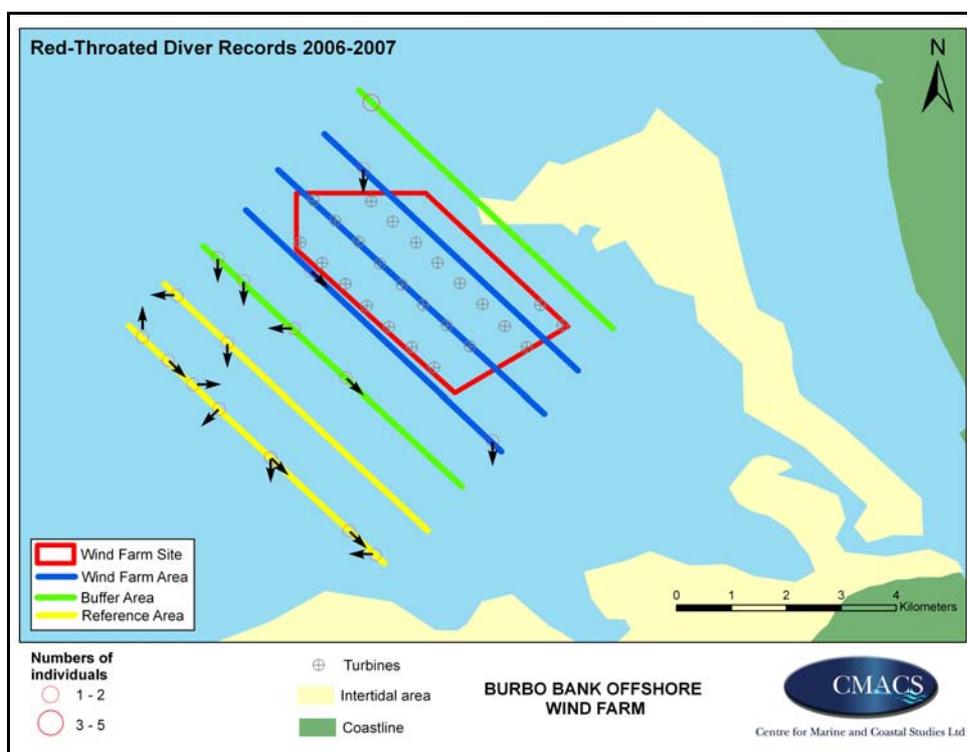


Figure 21 Red-throated diver sightings (arrows indicate direction of flight)

Numbers of common terns recorded were very low, with birds showing a preference for the reference area and very rare activity within the wind farm itself.

Numbers of waders recorded were also very low. No evidence of regular commuting across the site was discovered; given the numbers of birds wintering on the nearby Mersey and Dee SPAs it is considered reasonable to assume that wader flights across the wind farm site are infrequent.

Overall it was concluded that there is no evidence that construction and initial operation of the wind farm has had any significant adverse impact on local seabird use of the area.

The first two years of ornithological monitoring data were presented to stakeholders (Natural England and RSPB in attendance, other organisations invited) at a meeting on 8th July 2008. The first year post-construction monitoring reported formally here was also discussed.

As a result of the meeting it was agreed that the survey period for ornithological monitoring could be reduced to September - April to cover the main periods for species of interest (notably scoter and tern), with one survey in mid-September and one in mid-April and three surveys evenly distributed between mid-September and mid-April.

It was agreed that Year 2 post-construction monitoring would proceed on these lines and that the monitoring would be reviewed again after April 2009 when two seasons of post-construction data will be available. Pending results of that work it is hoped that a proposal can be made to end the monitoring at that time; all agreed that there are presently no reasons why this should not be possible.

MFA confirmed on 23 July 2008 that they were satisfied with these proposals.

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Appendix 1 FEPA Licence

Provided separately in electronic versions of the report.

Appendix 2 Environmental Monitoring Methods

Provided separately in electronic versions of the report.



Appendix 3 Technical Reports

Technical Reports are provided individually in the electronic version of this document.