

## ANNEX A

### Statutory nature conservation agency protocol for mitigation of wind farm piling noise at sea – March 2008

#### Introduction

This document, which has been produced by Natural England, the Countryside Council for Wales and the Joint Nature Conservation Committee, outlines a protocol for the mitigation of potential underwater noise impacts arising from pile driving during offshore wind farm construction.

The nature conservation agencies' policies support appropriately sited offshore energy developments because they can provide environmental benefits to species of conservation concern, including marine mammals, by reducing greenhouse gas emissions and mitigating adverse climate change impacts. However these developments can adversely affect species and features of conservation importance, including those protected by European and domestic law. Mitigation of such impacts forms an intrinsic part of the environmental impact assessment process required as part of the consenting process for offshore windfarms.

The installation of driven piles in the marine environment without mitigation is likely to produce noise levels in the near-field capable of inducing adverse avoidance reactions, injuries or even death in marine mammals<sup>1</sup>. Such effects, although incidental to consented activities, have the potential to conflict with legislative provisions and, in particular, with Regulation 39 of the Conservation (Natural Habitats &c.) Regulations 1994 (as amended), which applies to English and Welsh waters inside 12 nautical miles, and Regulation 39 of the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (which apply between 12 and 200 nm). These regulations make it an offence to:

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- deliberately capture, injure or kill any European Protected species of cetacean; or

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<sup>1</sup> For an assessment of noise levels and potential impacts please refer to COWRIE commissioned work including:

Literature review of potential impact of underwater noise and vibration

<http://www.offshorewind.co.uk/Research/ResearchAreas/SubSeaAcousticNoise.aspx>

Translation of Biola report on Effects of offshore windfarm noise on marine mammals and fish

<http://www.offshorewind.co.uk/KnowledgeBase/BIOLARepor6thJuly2006.aspx>

Various measurements of piling noise have been made at the Barrow, Burbo Bank, Kentish Flats, North Hoyle and Beatrice projects as well as a test pile at Lynn and Inner Dowsing. The Thames Developer Group has also commissioned work on potential noise impacts (Shepherd, B., Weir, C., Golightly, C., Holt, T., Gricks, N. (2006) Underwater noise impact assessment on marine mammals and fish during pile driving of proposed round 2 offshore wind farms in the Thames Estuary for CORE Limited On behalf of London Array Limited, Greater Gabbard Offshore Winds Limited and Thanet Offshore Wind Limited Report No. EOR0523)..

- deliberately disturb any European protected species of cetacean in such a way as to be likely significantly to affect,
  - (i) the ability of any significant group of cetaceans to survive, breed, or rear or nurture their young, or
  - (ii) the local distribution or abundance of cetaceans,

In association with DEFRA and the country agencies JNCC is producing guidance on the interpretation and implementation of these regulations. It is proposed that this protocol should form part of that guidance.

It should be remembered that cetaceans also have protection under other legislative provisions including the Wildlife and Countryside Act 1981 and the Countryside and Rights of Way Act 2000.

Additional, far-field, behavioural effects on marine mammals from piling noise may also occur (for example aversion reactions or population displacement). Impacts on fish and shellfish, include spawning processes, may also arise<sup>2</sup>. These, and potential longer-term, population level, impacts of pile driving over an extended period (for example arising from displacement over the course of construction activities which may continue for many months<sup>3</sup>), are outside of the scope of this document. Instead, the protocol aims to minimise potential risk of injury or death to marine mammals in close proximity to piling operations. The focus of the document is therefore on the mitigation of near-field effects (within 0-2 km) of piling noise on individuals and populations of marine mammals.

It should be noted that additional measures are likely to be required in areas where environmental impact assessment suggests that high marine mammal abundances or sensitivity may occur.

Scientific understanding of underwater noise and marine mammal distributions and behaviours and the interaction between the two is continually improving and therefore it is intended that statutory nature conservation agency advice on this topic will be regularly revised in accordance with the evidence base.

## **Evidence base**

It is important that agency advice on marine mammal issues is based on the best available scientific evidence. Our current understanding of both the physics of underwater noise and the biological and behavioural impacts on marine mammals is limited. Research within the UK wind farm sector is being primarily delivered by the Research Advisory Group (RAG, an inter-departmental initiative) and by COWRIE<sup>4</sup>. Two recent studies by COWRIE are of particular relevance to this paper:

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<sup>2</sup> See Biola report at 1 above

<sup>3</sup> e.g. see Thames Developer Report, above

<sup>4</sup> For information on COWRIE see [www.offshorewind.co.uk](http://www.offshorewind.co.uk)

Assessment of the potential for acoustic deterrents to mitigate the impact on marine mammals of underwater noise arising from the construction of offshore wind farms (COWRIE DETER-01-07).

- This work, delivered by SMRU<sup>5</sup>, concluded that there is uncertainty as to the efficacy of acoustic deterrents to minimise risk of injury to marine mammals during windfarm construction and recommended that further research was required.

Assessment and costing of potential engineering solutions for the mitigation of the impacts of underwater noise arising from the construction of offshore wind farms (COWRIE ENG-01-07).

- This work, which was carried out by Bioconsult SH<sup>6</sup>, concluded that engineering solutions could reduce the extent of piling noise at source, primarily through the use of insulated sleeves around piles. This work is discussed further below

COWRIE has also commissioned work on methodologies for measuring and assessing potential changes in marine mammal behaviour, abundance and distribution arising from the construction and operation of offshore windfarms. This work is due to be delivered in April 2008 and may assist with the environmental impact assessment of potential impacts of offshore wind projects on marine mammals. Further work from COWRIE on marine mammal issues is expected.

### **Risk management and the precautionary principle**

It should be acknowledged that it will not be possible to eliminate all risk to marine mammals from piling noise and therefore the aim of the protocol is, as discussed above, to *minimise* risk of near-field effects.

Risk management focuses on two main factors; risk of an effect occurring and the potential magnitude of such an effect. Because of the uncertainties relating to existing marine mammal distribution and of the effect of underwater noise on marine mammals it is not possible to quantify either of these factors. One approach to such uncertainty is to adopt the precautionary principle. European case law and guidance<sup>7</sup> applies the precautionary principle to environmental protection, including the conservation of biodiversity. The guidance states that there should be reasonable grounds to apply the precautionary principle based on scientific and objective information. Such objective information will be provided by the environmental impact assessment process and scientific studies, including those cited above.

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<sup>5</sup>

<http://www.offshorewind.co.uk/KnowledgeBase/AcousticDeterrentsToMitigateTheImpactOfUnderwater.aspx>

<sup>6</sup>

<http://www.offshorewind.co.uk/KnowledgeBase/PotentialEngineeringSolutionsToMitigateTheImpactsOfUnderwaterNoise.aspx>

<sup>7</sup> [http://eur-lex.europa.eu/LexUriServ/site/en/com/2000/com2000\\_0001en01.pdf](http://eur-lex.europa.eu/LexUriServ/site/en/com/2000/com2000_0001en01.pdf)

Given the strict protections afforded to species listed under Annex IV of the Directive the nature conservation agencies believe that it is appropriate to apply the precautionary approach in respect of potential impacts of noise on cetacea (whales, dolphins and porpoise).

It is important to note that where projects may impact upon the limited number of Special Areas of Conservation (SACs) designated for marine mammals then different procedures will apply. The “Appropriate Assessment” process under Article 6 of the Habitats Directive requires that projects not be consented unless it can be shown that there will be no significant adverse effect of activities on the relevant site. The approach of the Habitats Directive in this respect represents a robust interpretation of the precautionary principle.

## **Protocol**

Many of the techniques in the protocol outlined below are drawn from the JNCC guidelines for minimising acoustic disturbance to marine mammals from seismic surveys<sup>8</sup>. Levels of noise associated with seismic survey are similar to those likely to arise from piling operations. The guidelines have been adopted by regulators and industry as being “best practice” for minimisation of risk. Additionally, many of the elements of the protocol have also been incorporated as FEPA licence conditions for Round 1 and 2 offshore windfarms following advice provided by the statutory nature conservation agencies.

### **1. Developer to show that Best Available Technique (BAT) is being used**

BAT, formerly BATNEEC (Best Available Technique Not Entailing Excessive Cost) is an established approach in environmental management. It seeks to balance the highest level of environmental protection against commercial affordability and practicality.

The use of BAT may require developers to submit commercially sensitive information to the agencies. For example, the costing of different pile construction techniques is likely to be confidential. There may, understandably, be concerns about this process and, in such cases, the agencies will agree an approach with developers and the regulators (currently BERR / MFA) to regulate this process.

In particular, the developer may be required to show (by means of a detailed business case involving analysis of cost and impact on margins) that various approaches do not amount to BAT. The COWRIE / Bioconsult SH work referred to above lists techniques such as hammer modifications, sleeving or muffling, the use of vibratory hammers and gravity based piling which may reduce noise levels.

The use of gravity base piles is particularly notable here because potential impacts from noise are likely to be much reduced and such foundations have been successfully

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<sup>8</sup> See [http://www.jncc.gov.uk/pdf/Seismic\\_survey\\_guidelines\\_200404.pdf](http://www.jncc.gov.uk/pdf/Seismic_survey_guidelines_200404.pdf)

deployed at Nysted. It should be noted, however, that increased impacts on benthos are likely to arise from gravity piling and such impacts, particularly on sensitive habitats, should be considered.

The COWRIE work has concluded that the use of unenclosed bubble curtains, bubble trees<sup>9</sup> or enclosure coffer dams<sup>10</sup> would be ineffective or uneconomical.

Because of the potential for the introduction of extremely loud noise levels into the marine environment the use of explosives (for example in rocky environments) is generally discouraged by the statutory nature conservation agencies and is therefore outside of the scope of this paper. The one-off use of explosives for oil field well abandonment operations (which is strictly regulated and requires the deployment of marine mammal observers and acoustic monitoring) does not provide a useful analogy as these are single, one-off, events rather than part of on-going construction processes.

## **2. In the absence of technical solutions for BAT then the following protocol should be recommended to developers as a minimum level of good practice mitigation of potential “nearfield” impacts**

Establishment of a “monitored zone” (MZ) of a pre-agreed radius around piling site prior to piling. The area of this zone will be determined by factors such as pile diameter, water depth, the nature of the activities (for example whether drilling will also take place) and the effect of substrate on noise transmission. It should in any event be no less than 500m in radius.

MZ to be monitoring visually by marine mammal observers<sup>11</sup> (MMOs) and acoustically (by passive acoustic monitoring, PAM<sup>12</sup>) for agreed period prior to proposed commencement of piling (minimum 30 minutes<sup>13</sup> once the MMO(s) confirms that equipment and observers are deployed and functioning).

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- Piling not to commence if marine mammals detected within monitored zone or until 30 minutes<sup>14</sup> after last visual or acoustic detection
- Commencement of piling at night-time or poor visibility (over sea state 4<sup>15</sup> or in fog) not to occur (because risk of failure to detect presence is

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<sup>9</sup> Bubble curtains and bubble trees release streams of bubbles into the water column – because of tidal flows such bubbles are likely to dissipate in the environments associated with offshore wind farms.

<sup>10</sup> Uncommercial because of the time taken to install them, particularly in the offshore environment

<sup>11</sup> Marine Mammal Observers should have suitable qualifications / training and be present in sufficient numbers to ensure that monitoring activities are not compromised by fatigue etc. JNCC can provide further advice on relevant standards etc.

<sup>12</sup> Deployment of Passive Acoustic Monitoring equipment will also necessitate the use of trained personnel to interpret acoustic signals

<sup>13</sup> This thirty minute period is used in the JNCC seismic survey guidance

<sup>14</sup> A twenty minute period is adopted by the JNCC seismic survey guidance. Issues of swimming speed and noise “dosage” are considered in the Thames Developer report – it is considered that thirty minutes is a sufficient period of time to allow individuals to be at a distance where risk of injury or death is minor.

<sup>15</sup> Detection of marine mammals, particularly porpoises, will decrease as sea-state increases. While ideally sea-states of less than force 2 are required for optimal visual detection the risks of not detecting individuals within the MZ is reduced by the combined use of visual monitoring and PAM.

greater). Variations to this restriction on commercial grounds are discussed at section 3 below.

- Piling to commence with “soft start” – ramping up pile power incrementally over an agreed period of not less than 30 minutes<sup>16</sup>. Soft-start noise levels will vary according to hammer and pile design and should be assessed as part of the environmental impact assessment process and should be agreed with the relevant agency and regulator.
- if a marine mammal enters the MZ during soft start then, where possible, piling operation to cease or, in any event, power not to be increased, until the MZ is clear and no detection for 30 minutes. The feasibility of this approach should be agreed with the relevant agency and regulator as part of the condition approval process it is recognised that the ability to cease operations may be constrained by substrate type or pile design.
- When piling at full power no requirement to cease or reduce power of piling if marine mammal detected within MZ (deemed to have entered “voluntarily”<sup>17</sup>). It should be noted that this will only apply if the piling operation is continuous and with relatively short duration (less than five minutes) between hammer strikes. Should piling be paused for a period of greater than ten minutes then the monitoring / soft start procedure would need to be re-initiated before piling at full power could recommence.
- Formal chain of command and communication channel from MMO to piling master to be established<sup>18</sup>.
- Evidence on the efficacy of acoustic deterrents such as “scrammers” or “pingers” is limited and therefore the COWRIE/ SMRU work referred to above has concluded that they should not be deployed without further study. Because of the uncertainties surrounding their use (efficacy, deliberate disturbance, and habituation) and their limited range acoustic deterrents do not provide a full alternative to the risk minimisation procedures outlined above and their use is therefore not

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<sup>16</sup> The details of soft-start will vary according to substrate type, pile design and the hammer utilised. Measurements from the Lynn and Inner Dowsing test pile suggest that while “soft start” levels are considerably lower than those occur during full power piling they are still capable of giving rise to injury. Details of the soft-start procedure should be obtained for each project (see draft FEPA conditions below).

<sup>17</sup> Please note that there is no scientific evidence for this “voluntary” hypothesis, instead it is based on a common sense approach. Note, however, that other factors, such as food availability, may result in marine mammals approaching piling operations. In particular the availability of prey species stunned by loud underwater noise may attract seals into the vicinity of piling operations. For engineering reasons it may often not be possible to stop piling at full power until the pile is in final position however, where environmental impact assessment indicates the risk of large groups of marine mammals entering the MZ, alternative approaches may need to be considered.

<sup>18</sup> This is important because construction contractors, working to a tight timetable, may not fully appreciate the importance of MMO requests. Having the development company “buy in” to the protocol assists with enforcing these provisions (see below).

recommended without further research. Additionally their use in association with the monitoring of an MZ would constitute deliberate disturbance and would, therefore, need to be licensed under legislation such as Regulation 49 of the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 and regulation 44 of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)<sup>19</sup>.

- In addition to the above requirements, seasonal restrictions on piling operations may be necessary where particular sensitivities are identified in the environmental impact assessment process. This may apply to periods of seal pupping, cetacean calving etc where there is clear seasonal demarcation of such activities and it is capable of practical application<sup>20</sup>. The interaction with other restrictions on construction times (for example in spring to mitigate impacts on commercial fish spawning or during winter to reduce impacts on certain seabirds) would need to be considered to ensure that nature conservation agency advice was capable of practical implementation.

### 3. Variation of draft protocol

The above mitigation protocol represents current best practice for a typical windfarm site. However, generally the specific proposals for mitigation should come from the developer in the form of a projects' environmental management plan (or similar). Developers may feel that the mitigation protocol is unduly restrictive, particularly in respect of restrictions on night-time / low visibility piling. In these cases the burden of proving that efficient mitigation can be delivered should be placed on the developer.

A distinction should be made here between piling which commences during times of good daytime visibility (and subject to the above provisions) which progresses continuously into poor visibility / night-time conditions and the commencement of piling operations during times of poor visibility / night-time. Assuming that the operations are continuous the first scenario would not need additional mitigation. The second, however, would require an enhanced package of mitigation measures to be provided, for example a developer wishing to commence piling at night might need to show that:

- Such piling is essential for commercial viability.
- the soft-start protocol is effective in day light hours before permitting use at night
- the developer will provide enhanced detection (e.g. increased number of PAM buoys) for commencement of piling during night-time.

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<sup>19</sup> The COWRIE/SMRU work discusses the legal issues associated with the deployment of these devices.

<sup>20</sup> "Seasonal" restrictions which would restrict piling for large parts of the year and which might therefore make a project uneconomic may not be appropriate. In such events where there is evidence for significant adverse effect on marine mammal populations it may be more appropriate for the statutory nature conservation agency that consent should not be granted for the project or that, alternatively, other mitigation be considered such as the use of gravity piles.

Each request for variations from the protocol should be considered on its own merits and, to ensure consistency across projects and other marine industries, in close liaison with JNCC and other agency colleagues.

#### **4. Securing of mitigation package through FEPA conditions and Environmental Management Plan**

Under current arrangements the mitigation package is likely to be secured under FEPA conditions rather than under the s.36 consent. Such drafting is likely to vary according to project specific issues and will evolve as our understanding of the issues improves. Conditions imposed by MFA (formerly MCEU Defra) in respect of the Thames windfarms are set out below as an example of possible consent requirements:

*9.20 Conditions 9.20 to 9.22 shall only apply where driven or drilled pile foundations are to be installed.*

*9.21 Construction activities shall not commence until the Licence Holder has agreed with the Licensing Authority and [insert relevant nature conservation agency name] a scheme for the mitigation of potential impacts on marine mammals. The scheme must be submitted to the Licensing Authority by the date specified in the timetable required under condition 9.35. Such a scheme shall include, inter alia:*

- A requirement on the Licence Holder to ensure that suitably qualified and experienced Marine Mammal Observers are appointed and [insert relevant nature conservation agency name(s)] notified of their identity and credentials before any construction work commences.*
- A requirement on the Licence holder must ensure that piling activities do not commence until half an hour has elapsed during which marine mammals have not been detected in or around the site. The monitoring should be undertaken both visually (by Marine Mammal Observers) and acoustically appropriate passive acoustic monitoring equipment. Both the observers and equipment must be deployed at a reasonable time before piling is due to commence.*
- A requirement on the Licence Holder to ensure that at times of poor visibility (night-time, foggy conditions, sea state greater than that associated with force 4 winds, etc.) enhanced acoustic monitoring<sup>21</sup> of the zone is carried out prior to commencement of relevant construction activity.*

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<sup>21</sup> The details of any enhanced acoustic monitoring scheme would need to be agreed in advance with the regulator as advised by the relevant nature conservation agency however they might include the provision of additional hydrophones and/or T-Pods together with extra PAM operators

- *A requirement that piling may only commence using an agreed soft start procedure. The duration and nature of this procedure must be discussed and agreed prior to commencement of operations.*<sup>22</sup>
- *A requirement that the Licence Holder must make provision for a reporting methodology to be in place before works commence to enable efficient communication between the MMOs and the skipper of the piling vessel.*

*9.22 Piling activities shall not take place other than in accordance with the scheme agreed at 9.21 above*

In addition to agreeing the above scheme it is likely that statutory nature conservation agencies will want to check that a project’s environmental management plan (PEMP) contains various protocols relating to pile driving operations such as how MMOs interact with the piling crew. Drafting of a potential template condition requiring DEFRA approval of the PEMP following consultation with the agencies is set out below:

*9.x The Licence Holder must submit a copy of a Project Environmental Management Plan for the approval of the Licensing Authority, in consultation with CEFAS, and the [insert relevant nature conservation agency name(s)] at least 4 months prior to the proposed commencement of construction work to ensure that satisfactory arrangements are in place for liaison on environmental issues. Construction shall not commence until such time as the Project Environmental Management Plan has been agreed with the Licensing Authority*

*9.y The Licence Holder must ensure that a suitably qualified and experienced liaison officer or officers are appointed (for fisheries and environmental liaison) and the Licensing Authority notified of their identity and credentials before any construction work commences, to establish and maintain effective communications between the Licence Holder, contractors, fishermen, conservation groups and other users of the sea during the project.*

*9.z The Licence Holder must ensure that the liaison officer’s environmental remit includes:*

- *Monitoring compliance with the commitments made in the Environmental Statement and the Environmental Management*

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<sup>22</sup> As discussed at footnote 12 above there is potential for “soft start” levels to be of a sufficient volume to give rise to injury or significant disturbance. Information on possible noise levels will therefore need to be provided as part of the EIA and the process will need to be agreed with the regulator as advised by the relevant nature conservation agency. An excessive level for soft-start procedures might be that capable of giving rise to TTS to an individual in close proximity (metres) to the piling operation

- Plan (as agreed under condition 9.y above).*
- *Providing a central point of contact for the Monitoring Programme and Ornithological Monitoring Programmes required under conditions [ j and k]*
  - *Liaison with fishermen, conservation groups and other users of the sea concerning any amendments to the method statement and site environmental procedures.*
  - *Inducting site personnel on site / works environmental policy and procedures.*

## **5. Monitoring.**

It should be noted that monitoring of impacts does not constitute mitigation. The two issues have been confused in recent offshore wind farm environmental impact assessments. A discussion of monitoring procedures associated with marine mammals and noise is outside the scope of this paper but such issues should be appropriately addressed as part of the EIA process.

## **6 Review of protocol**

As discussed above, scientific understanding of the issues discussed in this paper is incomplete but improving. It is therefore important to note that the protocol is not considered to be a static policy but that, instead, it will be subject to regular and frequent update and revision.