MORAY FIRTH REGIONAL ADVISORY GROUP – MARINE MAMMALS SUBGROUP

PROTOCOL FOR MITIGATING THE RISK OF INSTANTANEOUS DEATH OR INJURY TO MARINE MAMMALS DURING PILING AT THE BOWL AND MORL WIND FARMS:

MFRAG-MM SUBGROUP ADVICE TO MARINE SCOTLAND LICENSING AND OPERATIONS TEAM (MS-LOT)

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1. INTRODUCTION

The purpose of this report is for Moray Offshore Renewables Limited (MORL) and Beatrice Offshore Windfarm Limited (BOWL), as secretariat for the Moray Firth Regional Advisory Group – Marine Mammals Subgroup (MFRAG-MM Subgroup), to provide MS-LOT with the Group's advice on the "Protocol for mitigating the risk of instantaneous death of injury to marine mammals during piling at the BOWL and MORL Wind Farms" (referred to here as the 'Piling Protocol') as requested by the MFRAG-MM Subgroup Chair on 26th October 2015.

On Monday 19th October member organisations of the MFRAG-MM Subgroup were invited to vote (yes/no/abstain) on whether MFRAG MM Subgroup should agree the document 'Protocol for mitigating the risk of instantaneous death or injury to marine mammals during piling at the BOWL and MORL Wind Farms', dated 2nd October 2015 (included in Appendix A) as the agreed position of MFRAG-MM Subgroup.

This report considers the consultation undertaken with the MFRAG-MM Subgroup in developing the Piling Protocol, consultation responses received, and the results of the recent vote undertaken.

2. RESULTS OF THE VOTING PROCESS

Given the different views received from MFRAG-MM Subgroup Members on the piling protocol, the Chair (Dr. Ian Davies) has requested that a vote take place on whether MFRAG MM Subgroup should agree the document 'Protocol for mitigating the risk of instantaneous death or injury to marine mammals during piling at the BOWL and MORL Wind Farms' (Appendix A) as the agreed position of MFRAG MM Subgroup and forwarded to MS-LOT for their consideration. The vote is in line with Clause 4 of the 'Terms of Membership' of the MFRAG-MM Subgroup Terms of Reference, ToR (Draft Terms of Reference v1.4) which states the following:

> *"4. Whenever a vote is required each organisation will have one vote. MS-LOT will not have a vote as the group's purpose is to advise the Scottish Ministers via MFRAG."*

And the recommendation formed will be sent to MS-LOT as ToR No.18 states:

> *"18. Recommendations of MFRAG-MM shall be reached, where possible, by consensus to advise the MFRAG. It is anticipated that any recommendations will be included within the Minute of the meeting. This will be agreed by all group members and then provided to MFRAG and MS-LOT by the secretariat within four weeks of the sub-group meeting. If consensus cannot be reached MS-LOT will be advised of the majority and minority views in a detailed report."*

The following seven MFRAG-MM Subgroup members were invited to vote:

- Marine Scotland Science (MSS)
- Scottish Natural Heritage (SNH)
- Joint Nature Conservation Committee (JNCC)
- Whale and Dolphin Conservation (WDC)
- Prof. Paul Thompson (Marine Mammal expert based at the University of Aberdeen)
- Beatrice Offshore Wind Ltd (BOWL)

- Moray Firth Offshore Renewables Ltd (MORL)

Votes were required by 16:00 on Friday the 23rd October 2015. Six out of the seven members have voted, and have voted yes to approving the Piling Protocol. Those who have voted yes are MSS, SNH, WDC, Prof. Thompson, BOWL and MORL (see MSS and WDC responses in Appendices D and E respectively). JNCC confirmed in an email dated 23rd October 2015 that they would not be responding regarding the request for a vote on the Piling Protocol

SNH have confirmed that their position on the implementation of the protocol was made clear in their response dated 7th August 2015 (as described in Section 4 below). SNH reiterated the comments they provided during the Piling Protocol consultation process and have again confirmed they are supportive of the Protocol.

3. MFRAG-MM SUBGROUP DISCUSSIONS ON THE PILING PROTOCOL

The text box below sets out how project developers and their advisors have developed the Piling Protocol in consultation with the MFRAG-MM Subgroup, including the outcomes of consultations and decisions made.

Key Consultations Undertaken on the Piling Protocol

30th March 2015 - MFRAG-MM Subgroup meeting

BOWL and MORL presented an outline of an early version of the piling protocol. Prof. Paul Thompson also provided outlined monitoring proposals within the construction MMMP.

The MFRAG-MM Subgroup agreed that alternative mitigation could be considered with further consultation in the MFRAG-MM Subgroup. It was agreed that a risk assessment should be undertaken by BOWL and MORL to understand the potential risks to different marine mammal species in the absence of any piling mitigation taking into account post consent changes in project design and construction programme when compared to the original worst case scenarios considered in the BOWL and MORL Environmental Statements.

7th May 2015 - Following the MFRAG-MM meeting on 30th March Prof. Paul Thompson produced the risk assessment and issued it to MSS, SNH and JNCC on 7th May

8th May 2015 - Prof. Paul Thompson met with MSS, JNCC and SNH to discuss the proposed risk assessment to support the adoption of the Piling Protocol. Consultees requested that BOWL and MORL develop and submit a written procedure to illustrate how this mitigation could be put into practice.

11th May 2015 - MFRAG Main Group meeting

BOWL and MORL provided a brief update on the Piling Protocol. It was agreed that a document outlining the guiding principles of mitigation during piling be prepared for discussion at the next MFRAG-MM meeting, setting out how mitigation would be applied in various construction

scenarios, as a basis for further discussions on the potential use of Acoustic Deterrent Devices (ADDs).

1st June 2015 - MFRAG MM Subgroup

The draft 'Protocol for mitigating the risk of instantaneous death or injury to marine mammals during piling at the BOWL and MORL Wind Farms' was submitted to the MFRAG-MM Subgroup. The Piling protocol set out the proposed mitigation at the BOWL and MORL wind farms using ADDs and piling soft starts. BOWL and MORL requested that the MFRAG-MM Subgroup review the document and provide comments.

19th June 2015 - MFRAG-MM Subgroup meeting

The proposed Piling Protocol was discussed at the meeting. There was broad consensus within the Group that principles of the Piling Protocol were acceptable, although there was a difference in views on the need or not to employ additional mitigation measures alongside ADDs (see JNCC consultation response of the 9th September and minutes of the third MFRAG-MM Subgroup meeting).

31st July 2015 - BOWL and MORL issued the revised Piling protocol to the MFRAG-MM Subgroup members. The Piling Protocol was updated to incorporate the comments from the MFRAG-MM Subgroup highlighted at the meeting on 19th June.

7th August 2015 - Received written response from SNH on the Piling protocol issued via MFRAG (see enclosed with this letter).

9th September 2015 - Received written response from JNCC on the Piling protocol issued via MFRAG (see enclosed with this letter).

9th October 2015 - BOWL and MORL issued the final Piling Protocol with amendments proposed in responses from SNH and JNCC included.

4. OUTLINE OF MAJORITY AND MINORITY VIEWS

The vote (section 2 above) confirmed that there was not full consensus within MFRAG-MM Subgroup on the Piling Protocol. Although there were no "No" votes, the Chair considered that it was clear from discussions and correspondence that JNCC did not agree that the Protocol represented the agreed position of all members of MFRAG-MM Subgroup. He therefore concluded that majority (Yes) and minority (No/Abstain) views existed.

Majority view

The majority view is in support of the document 'Protocol for mitigating the risk of instantaneous death or injury to marine mammals during piling at the BOWL and MORL Wind Farms' (Appendix A) being forwarded to MS-LOT as the agreed position of MFRAG MM Subgroup and is supportive of the risk analysis and the mitigation strategy described within it. Examples of the majority position is expressed in the SNH and WDC comments as follows:

SNH in their response dated 7th August (see Appendix B for more detail) confirmed that the piling protocol had been updated in line with comments received at the MFRAG-MM meeting on 19th June in their statement; '*SNH has reviewed the updated protocol and can confirm that we are happy with the revisions: these reflect the discussion and agreement that was reached at the meeting held 19th June 2015*.' Further to this they confirmed their approval of the Piling Protocol in their statement; '*SNH is content that this updated mitigation protocol can be referred to, and used to inform, the BOWL and MORL piling strategies….. We are therefore content with ADD deployment during pre-piling for a period of not less than 10 minutes and not more than 15 minutes*.'

SNH suggested a minor amendment to the Piling Protocol and that the parameters used to calculate the size of the injury zone were revisited. These amendments were included in the final Piling Protocol submitted to the MFRAG-MM Subgroup by BOWL and MORL on 9th October.

On the 22nd October 2015 SNH, in response to the voting request (see section 2 above), have reiterated the comments previously submitted during the Piling Protocol consultation process and have again confirmed they are supportive of the protocol.

WDC stated the following when voting Yes; 'As previously reported, we have some concerns over the use of ADDs and no other monitoring/mitigation but we agree ('yes') that the document can be signed off' (see Appendix E).

Minority View

The minority view is held by JNCC. In discussions in the MFRAG-MM Subgroup, and subsequent responses received from JNCC on the Piling Protocol have explained their position. Their view is summarised here, and attached in full as Appendix C.

JNCC in their response dated 9th September (see Appendix C) did not confirm full support for the piling protocol as is set out in their statement; *' JNCC has reiterated throughout the MFRAG-MM sub group meetings that the full suite of mitigation measures (MMOs, PAM and ADDs) should be employed as part of the marine mammal mitigation protocol and JNCC remains confident that this would provide the most comprehensive, best available mitigation package, lowering the risk of hearing impairment for animals of all species likely to occur in the area…..The current proposal is to not employ MMOs/PAM.'*

Further to this however JNCC stated the following; *'…….Notwithstanding our concerns and recommendations for the implementation of the full JNCC piling protocol (i.e. MMOs, PAM and ADDs), if the Regulator allows, under an EPS licence, the use of ADDs as the main mitigation measure then JNCC do agree with the timing of ADD deployment as outlined in Figures 1 and 2……In addition, on reflection we consider it may be better to specify a set time rather than a range within Figure 1, Box 3a, and Figure 2, Box 4b (i), i.e. instead of deploy ADD for 10-15 minutes specify a deployment time of 15 minutes, as this would provide greater clarity for the ADD operator*'.

The Piling Protocol was subsequently amended to set a specific time of ADD deployment – i.e. ADDs will be deployed for 15 minutes prior to the soft-start commencing. This amendment was included in the final Piling Protocol submitted to the MFRAG-MM Subgroup by BOWL and MORL on 9th October.

5. CONCLUSIONS

Based on the votes and comments received, there remain majority and minority views. This report, as per the draft ToRs (ToR No 18 is particularly relevant) for the Subgroup is provided to MS-LOT for their consideration. The majority view of MFRAG-MM Subgroup member organisations are in favour of the document "Protocol for mitigating the risk of instantaneous death of injury to marine mammals during piling at the BOWL and MORL Wind Farms" as being the agreed position of the MFRAG-MM Subgroup. However, MS-LOT should note that JNCC is maintaining a minority position and does not support the protocol.

This detailed report and appended information advise MS-LOT of the majority and minority views.

APPENDIX A

Protocol for mitigating the risk of instantaneous death of injury to marine mammals during piling at the BOWL and MORL Wind Farms

Protocol for mitigating the risk of instantaneous death or injury to marine mammals during piling at the BOWL and MORL Wind Farms

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2nd October 2015

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Background: To date the consents issued to offshore wind farms have focused on the current JNCC guidelines to minimise the instantaneous near-field impacts of piling on marine mammals (JNCC, 2010). Nevertheless these guidelines remain untested and a number of studies have criticised the reliance on these guidelines with calls for more effective mitigation (see Annex 3). Recent studies provide evidence that acoustic deterrent devices (ADDs) can result in aversive responses by both seals and cetaceans over ranges which are at least in the order of magnitude greater than predicted zones for instantaneous death and injury (see Annex 2). This indicates that they could be integrated into piling procedures along with soft start to provide more effective mitigation and improve the protection of marine mammals. This document (including Annexes 1-3) provides the proposals for mitigating the risk of instantaneous death or injury to marine mammals during piling at the BOWL and MORL wind farms.

Aim: This document outlines a procedure for mitigating the risk of instantaneous death or injury to marine mammals during piling at the BOWL and MORL wind farms, with the aim of developing the *Best Available Technique* [1] for balancing the highest level of environmental protection against commercial affordability and practicality.

Specific Objectives: To develop mitigation measures that can be integrated into a predictable and efficient engineering process that:

- minimises the risk of instantaneous death or injury (physical or auditory) for marine mammals during piling operations as a result of single noise pulses at close range;
- allows piling to be initiated in darkness, in poor visibility or after breaks in engineering works;
- can be used safely in an offshore environment in all seasons; and
- minimises the duration of the overall construction period.

Approach:

1. ***Optimise hammer energies to balance environmental risk and engineering requirements.*** Use available geotechnical data to predict the hammer energies required through the piling sequence to minimise the risk of pile refusal. Optimise piling sequence at each site to avoid unnecessary activity at full hammer energy (to minimise impact zones for instantaneous death and injury) and optimise hammer energies throughout the piling process (to minimise cumulative noise exposure).

[1] As defined in 2010 JNCC piling mitigation guidance.

2. ***Identify impact zones***. Estimate the size of impact zones for instantaneous death and injury based upon available geotechnical data, final pile sizes and predicted hammer energies at the start of each piling sequence (see Annex 1).

3. ***Develop site specific protocol for initiating the sequence of piling at each turbine location.*** This should involve the key elements outlined in Figure 1 (see page 5). The piling protocol presents the different steps (a to d) throughout the piling sequence with a justification of how the detail has been determined in each step. In addition, the piling protocol presents an illustration of how far an animal may be deterred (indicative cumulative distance) at each step in order to demonstrate that the protocol is sufficiently conservative to allow marine mammals to avoid the injury zone during piling.

    a. Deploy acoustic deterrent device (ADD) at the piling site for a period of 15 minutes (as agreed with the MFRAG-MM Subgroup at the meeting of the 19/06/2015), to allow marine mammals to be displaced out of the impact zones. Duration of ADD use to be based upon estimates of the size of the impact zone and likely swimming speeds. Herschel et al. (2013) recommend that the duration of mitigation should be tailored to allow all animals to swim twice the distance of the injury zone. Selection of ADD to be based upon available evidence on effective displacement of key receptors for each site (see Annex 2).

    b. Soft start commences with positioning the piling hammer and making 5-6 single blows at a low rate (approximately 1 blow per 10 seconds) using as low an energy as practically possible to check hammer operation and embed the pile into the ground. Although the energy level cannot be specified accurately (as this depends on equipment capabilities) the energy will not exceed 300 kJ (threshold set on the basis of 12%[2] of the maximum hammer size[3] of 2,500 kJ that may be employed during construction).

    c. Soft start continues with an increased blow rate of approximately 1 blow per 2 seconds. The minimum duration of soft start will be 20 minutes, consistent with JNCC guidelines. During this time soft start energy will be as low as possible for as long as possible (following recommendations by Herschel et al.

[2] For each halving of hammer energy there is a 3 dB reduction in sound and the ORJIP report on acoustic deterrent devices (Herschel et al. 2014) suggests that a tenfold reduction in hammer energy may be appropriate for initiating soft start as this represents a potential 10 dB reduction in sound. Whilst it may be possible to achieve this in practice, the thresholds here must be set according to the hammer manufacturers' specifications, which for a 2,500 kJ hammer is given as 12% or 300 kJ. This also represents a considerable reduction in sound of >9dB.

[3] Maximum hammer size is to be distinguished from maximum consented hammer energy.

(2013)), starting at an energy no higher than 300 KJ and not exceeding 500 KJ in the latter part of the soft start.

d. Continue to ramp up hammer energy gradually to the levels required to maintain pile movement at approximately 2.5 cm/blow up to the energy required to drive the pile up to target depth.

4. ***Develop site specific protocol to be used in planned or unplanned breaks in the sequence of piling at each turbine location.*** This should involve the key elements outlined in Figure 2 (see page 6).

   a. In the event of breaks in piling of < 10 minutes no additional mitigation would be required (i.e. the piling may continue from the hammer energy and frequency last used). For breaks in piling > 10 minutes[4] there are two possible outcomes as described in 4b. and 4c. below.

   b. Where duration of break is either unknown, or known to be less than 2.5 hours[5]

      i. deploy ADD for the same pre-determined period (as specified in 3a and as agreed with the MFRAG-MM Subgroup at the meeting of the 19/06/2015) immediately prior to resuming piling,

      ii. initiate piling with approximately 5 - 6 single blows at low energy; and

      iii. continue to ramp up hammer energy to the levels required to maintain pile movement at approximately 2.5 cm/blow.

   c. If the break is greater than 2.5 hours, or if the break occurs during the soft start procedure described under 3 (b. and c.)), re-start procedure as outlined in 3.

5. **Monitoring and Audit.** Establish an agreed monitoring system and an audit trail to demonstrate that:

   a. The ADD is operating according to specifications during all operations.

   b. Hammer energies remain within agreed limits within soft start periods.

   The detailed monitoring and reporting procedures can be integrated within each of the projects' Environmental Management Plans (EMPs) and Project Environmental Monitoring Programmes (PEMPs).

[4] JNCC guidelines state that if there is a pause of greater than 10 minutes, then the pre-piling search and soft-start procedure should be repeated (Section 2.5 in JNCC, 2010).

[5] Based on the deterrence time (total duration that animals are deterred from a disturbed area) of harbour porpoise estimated for the DEPONS model (van Beest et al. 2015) using the life-history parameters and fine-scale movement behaviour as described in model developed by Nabe-Neilson et al., (2014).

6. **Risk assessment.** Recognising that this protocol represents a change in procedures used for piling mitigation, and the efficacy of this protocol cannot be robustly demonstrated within appropriate timescales, undertake a risk assessment to assess the impact on protected marine mammal populations should key receptors not respond to the chosen ADD as expected. This risk-based approach should be used to place any risk from ineffective mitigation in the context of related impacts from piling noise (i.e. cumulative noise exposure and behavioural disturbance) that have previously been considered in the Environmental Statements (ES) and Habitats Regulations Assessment (HRA). A risk assessment has been undertaken for the BOWL and MORL sites, demonstrating that adoption of these new mitigation procedures should present negligible additional risk to the key receptor population in the Moray Firth (see Annex 3).

Figure 1. Schematic providing an example of a piling mitigation procedure based on the general guidelines outlined in section 3.

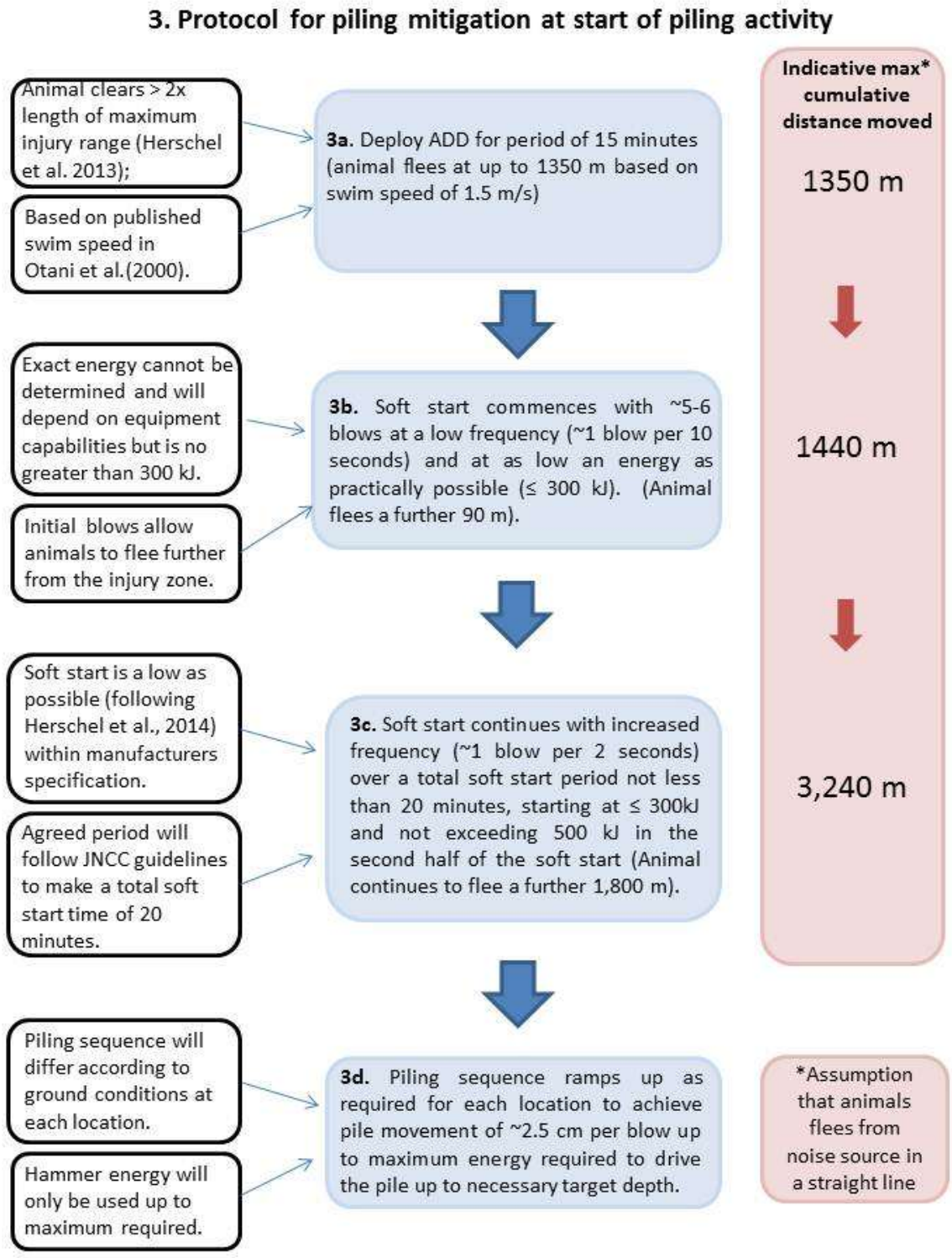
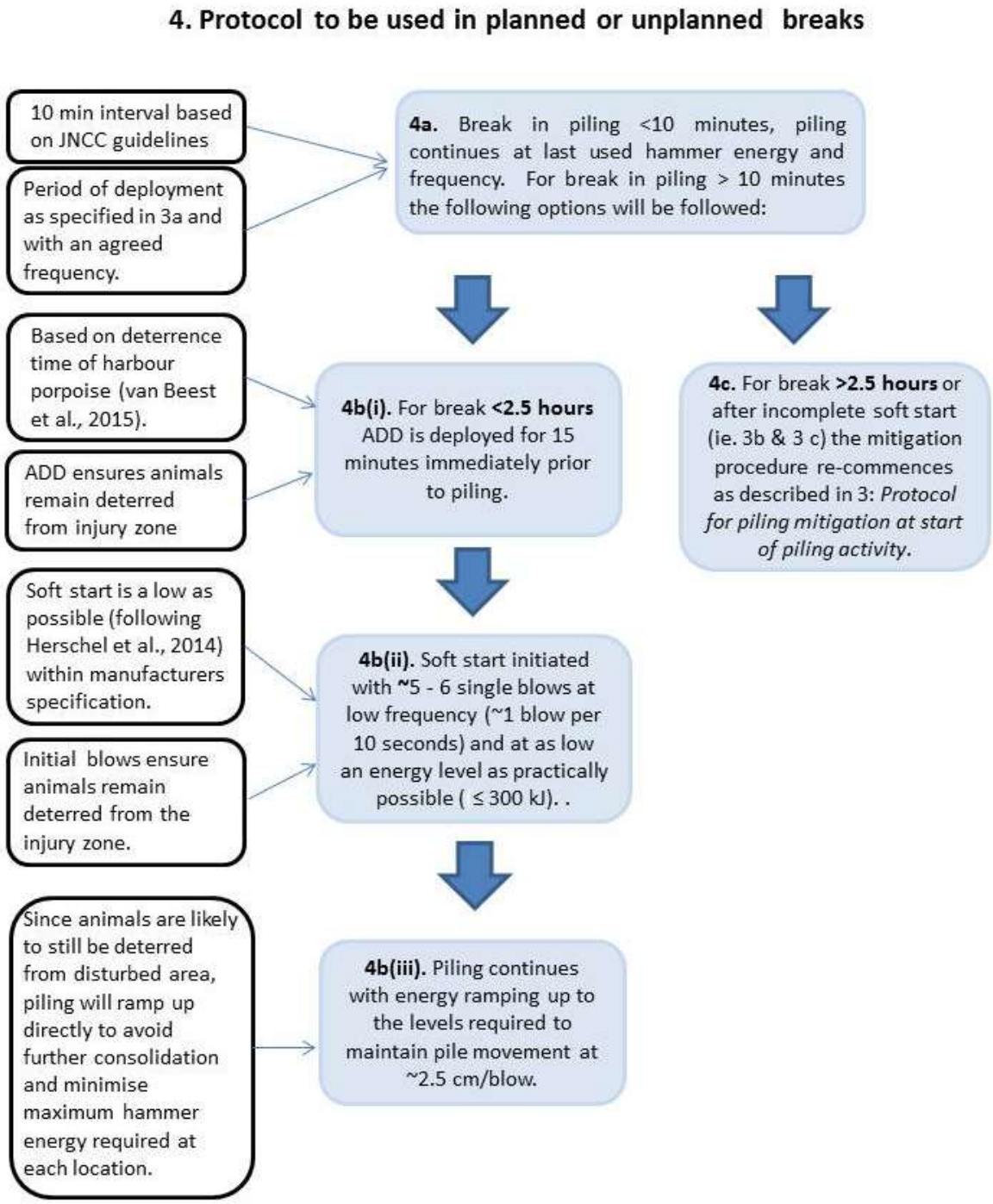


Figure 2. Mitigation protocol to be used in a planned or unplanned break from piling with distinction made between longer breaks and short breaks up to 2.5 hours.



References:

Herschel, A., Stephenson, S., Sparling, C., Sams, C., Monnington, J. (2013). Use of Deterrent Devices and Improvements to Standard Mitigation during Piling. ORJIP Project 4, Phase 1. Xodus Group Ltd. Document L-300100-S00-REPT-002.

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van Beest, F.M, Nabe-Nielsen, J., Carstensen, J., Teilmann, J. & Tougaard, J. 2015: Disturbance Effects on the Harbour Porpoise Population in the North Sea (DEPONS): Status report on model development. Aarhus University, DCE – Danish Centre for Environment and Energy, 43 pp. Scientific Report from DCE – Danish Centre for Environment and Energy No. 140 (http://dce2.au.dk/pub/SR140.pdf).

Annex 1.

Identification of impact zones

The following criteria should be used to identify the noise levels likely to cause instantaneous death or injury around piling operations using different pile sizes and hammer energies (eg. MORL ES Section 4.2.2 Technical Appendix 3.6A).

Death – may occur where peak-peak levels exceed 240 dB re 1 µPa

Injury (physical or auditory) - may occur where peak-peak levels exceed 220 dB re 1 µPa

In addition instantaneous auditory injury thresholds have been defined based upon Southall et al's (2007) single pulse PTS thresholds, expressed either in terms of a peak pressure level or an M weighted sound exposure level (SEL). More recent studies of harbour porpoise TTS thresholds (Lucke et al. 2009) have led to proposals for a revised single pulse PTS threshold for these high frequency cetaceans (ORJIP Project 4 Phase 1 Report p 139).

Species	Single pulse PTS Thresholds	
	SEL	Unweighted peak pressure
High-Frequency Cetacean (Southall et al. 2007)	M-weighted 198 dB re 1 µPa^{2}s	200 dB re 1 µPa
Mid-Frequency Cetacean (Southall et al. 2007)	M-weighted 198 dB re 1 µPa^{2}s	230 dB re 1 µPa
Low-Frequency Cetacean (Southall et al. 2007)	M-weighted 198 dB re 1 µPa^{2}s	230 dB re 1 µPa
High-Frequency Cetacean (based on Lucke et al. 2009)	Unweighted 179 dB re 1 µPa^{2}s	200 dB re 1 µPa
Pinniped (Southall et al. 2007)	M-weighted 186 dB re 1 µPa^{2}s	218 dB re 1 µPa

In the BOWL and MORL ES's the risk of instantaneous death was estimated to occur only at extremely short distances and the risk of instantaneous injury at less than 38 m.

For this assessment, CEFAS conducted additional modelling to provide a conservative estimate of impact ranges for a 300 kJ initial hammer energy. This assumed an energy conversion efficiency of 1%, which is at the upper limit of field observations (Ainslie et al. 2012; Dahl et al. (2015). This 300 kJ strike equates to 205.6 dB of acoustic energy as a single pulse SEL (de Jong & Ainslie 2008). A propagation loss of 15*log(R) was assumed due to cyclindrical spreading in these relatively shallow waters, where R is range from the source,

and an unweighted threshold of 179 dB re 1 μPa^2s (Lucke et al. 2009) was used to safeguard the most sensitive of marine mammals, including harbour porpoise. This suggests that the maximum range at which instantaneous injury might occur is <60m.

Estimating the time required for marine mammals to be displaced from injury zones

Following recommendations in the ORJIP Project 4 Phase 1 Report (p 142), ADD should be deployed for long enough for animals to swim twice the radius of the appropriate injury zone. The Piling Mitigation Protocol provides for marine mammals to clear an area an order of magnitude greater than this.

Following the approach taken in the ORJIP Project 4 Phase 1 Report (p141) these calculations should assume a minimum swimming speed of 1.5 m/s (Otani et al. 2000).

References:

Ainslie, M. A., de Jong, C. A., Robinson, S. P., & Lepper, P. A. (2012). What is the source level of pile-driving noise in water? In: The Effects of Noise on Aquatic Life (pp. 445-448). Springer New York.

Dahl, P.H., de Jong, C.A.F. & Popper, A. (2015). The underwater sound field from impact pile driving and its potential effects on marine life. Acoustics Today, 11, 18-25.

De Jong, C. A. F., & Ainslie, M. A. (2008). Underwater radiated noise due to the piling for the Q7 Offshore Wind Park. J Acoust Soc Am 123: 2987.

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Otani,S., Naito,Y., Kato,A., Kawamura,A. (2000) Diving behaviour and swimming speed of a free-ranging harbor porpoise, *Phocoena Phocoena*. Marine Mammal Science 16: 811-814.

Lucke K, Siebert U, Lepper PA, Blanchet MA (2009) Temporary shift in masked hearing thresholds in a harbor porpoise (*Phocoena phocoena*) after exposure to seismic airgun stimuli. J Acoust Soc Am 125: 4060–4070

Southall B.L., Bowles A.E., Ellison W.T., Finneran J.J., Gentry R.L., Jr C.R.G., Kastak D., Ketten D.R., Miller J.H., Nachtigall P.E., et al. 2007 Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals 33: 411-521.

Annex 2. Deployment of acoustic deterrent devices.

Choice of ADD. Selection of ADD devices should be based upon the available evidence at the time of procurement given the suite of key receptors at a particular site. Based upon the current literature and the ORJIP review of available devices, it is anticipated that this could be a Lofitech Seal Scarer. A review of available literature on the performance of this device can be found on p 149 of the ORJIP Project 4 Phase 1 Report (Herschel et al. 2013).

In summary, marine mammals with both high frequency (harbour porpoise) and low frequency (harbour seal) have been shown to respond to the Lofitech Seal Scarer. Of particular relevance to the Moray Firth developments are the studies of harbour porpoises in the Danish Baltic Sea, where the use of the Lofitech Seal Scarer decreased sighting rates within 1 km to only 1% of baseline (see Figure 4 and Brandt et al. 2013a). Similarly, in the German North Sea waters, deployment of the Lofitech Seal Scarer resulted in significant decrease in harbour porpoise click activity (recorded using C-PODs) at 750 m and at 3,000 m from the source (Brandt et al. 2013b). Notably, at 750 m recovery was found to be gradual with a significant deterrence effect lasting up to 4 to 6 hours after the Lofitech Seal Scarer was turned off, suggesting that effects are likely to last no longer than 6 hours at this distance (Brandt et al. 2013b).

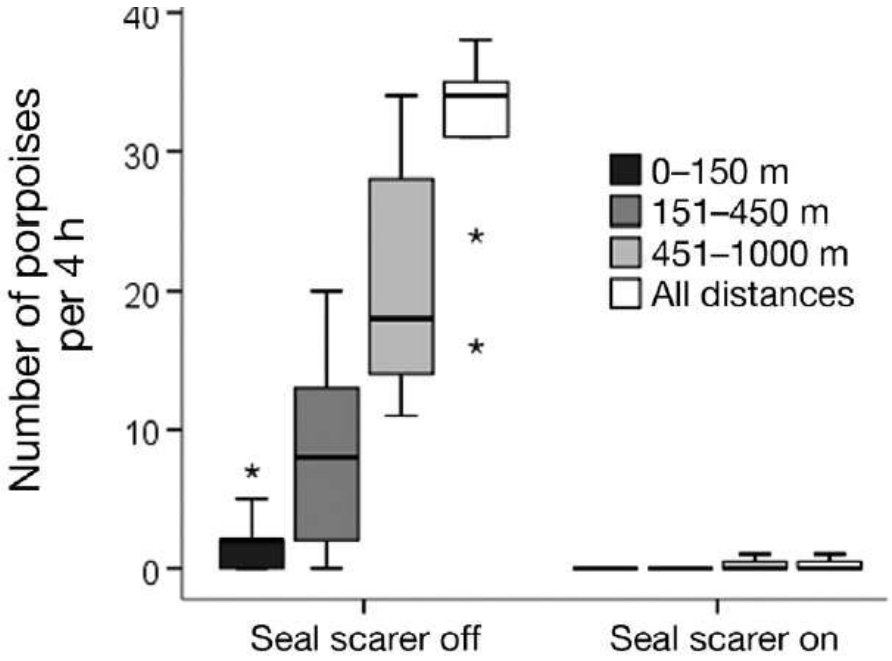

Fig 4 from Brandt et al. (2013) showing variation in sightings rate during observation periods when the Lofitech Seal Scarer was turned on compared to when the Lofitech Seal Scarer was turned off.

Further studies of responses of Moray Firth harbour seals to this device have been conducted both in river systems (Graham et al. 2009) and open water (SMRU Unpublished data). Graham et al's (2009) study showed that use of the device reduced upstream movements of seals by 50%, even though seals are likely to have been strongly motivated to travel upstream to forage on salmonids. Studies conducted for Marine Scotland by SMRU indicate that in open water a behavioural response was observed for all 38 controlled exposure experiments for which a tagged harbour seal was within 1 km of the source, and responses were recorded to a maximum range of > 3km.

Methods for deployment of ADD. A single device should be deployed as close as possible to the piling site, ideally so that the deployment is fully integrated with the engineering process (eg. through remote operation of a device deployed from the piling vessel).

Timing of deployment of ADD. Decisions over the duration of ADD use should seek to balance the key objective of dispersing animals from the injury zone against any risks of habituation to the ADD source, cumulative noise exposure to the ADD source or broader scale disturbance.

Following ORJIP recommendations (Herschel et al. 2013), the duration of deployment at start of piling sequence should be sufficient to allow individuals to travel 2x the distance of the injury zone at a cruising speed of 1.5m/sec.

- Eg. for a 60m injury zone, ADD deployment of just 1.5 minutes would permit animals to swim beyond the required 120 m.

To minimise excessive disturbance and habituation, whilst also ensuring sufficient time for animals to clear the injury zone there should be an agreed duration for each ADD deployment. Following submission of a draft of this Piling Mitigation Protocol, this was discussed with the SNCBs, and the duration for ADD deployment was agreed as 15 minutes.

References:

Brandt, M. J., C. Höschle, A. Diederichs, K. Betke, R. Matuschek, and G. Nehls. 2013a. Seal scarers as a tool to deter harbour porpoises from offshore construction sites. Marine Ecology Progress series 475: 291-302.

Brandt MJ, Höschle C, Diederichs A, Betke K, Nehls G (2013b) Far reaching effects of a seal scarer on harbour porpoises, *Phocoena phocoena*. Aquat Conserv: Mar Freshw Ecosyst 23: 222-232.

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Annex 3. Framework for a risk-based assessment to underpin the adoption of alternative mitigation measures during piling at the BOWL and MORL Offshore Wind Farms

Paul Thompson, 28th September 2015

Overview

There is widespread interest in the use of Acoustic Deterrent Devices (ADDs) as an alternative to Marine Mammal Observers (MMO) and Passive Acoustic Monitoring (PAM) when mitigating the risk of death or injury to marine mammals during offshore piling. However, decisions on the most appropriate mitigation during construction of the Moray Firth developments remain constrained by stakeholder concerns over the relative efficacy of ADDs and the current JNCC guidelines.

To inform decisions about the potential risk of using these alternative piling mitigation measures, an assessment of the potential risk to different marine mammal species in the absence of ***any*** piling mitigation has been developed. To place this risk in the broader population context considered within the original Environmental Statements (ES) and Habitats Regulations Assessments (HRA), the Moray Firth Harbour Seal Assessment Framework has been used to re-assess the long-term population consequences for this key receptor species. In doing so, the effects of post-consent changes in the project design and construction programme have been explored, comparing the original worst case ES scenarios with new worst case scenarios for BOWL and MORL together based on the current design layout. In addition, the potential risk of injury from scenarios in which piling occurred only within the BOWL or the MORL wind farms were developed to support individual EPS Licence applications.

Current JNCC guidelines are assumed to reduce the potential risk of injury or death to negligible levels. The analyses presented here suggest that, in the absence of any piling mitigation, the risk of marine mammals being within sufficiently close range to result in instantaneous death or injury is also negligible even when considering effects from both BOWL and MORL developments together. Thus, the adoption of alternative mitigation measures using ADD should either equal or exceed the level of protection assumed to result from the current JNCC guidelines.

Background

The key impacts of wind farms on marine mammal populations that are likely to result from pile-driving during construction [1] are:

(1) Instantaneous death or injury (physical or auditory) from single noise pulses at close range
(2) Auditory damage from accumulated noise doses
(3) Behavioural disturbance

In the Environmental Statements (ES) for the Moray Firth developments, the distances at which each of these effects might occur were based upon best available scientific evidence from noise propagation modelling and published marine mammal noise exposure criteria [2]. These data indicated that instantaneous death or traumatic injury should occur only at distances of < 40m (see Table 1). In contrast, behavioural disturbance and the impacts of cumulative noise exposure were predicted to occur at much greater distances. For example, piling noise exposure amongst harbour seals could exceed Southall et al.'s (2007) Permanent Threshold Shift (PTS) threshold for auditory damage [2] at distances of > 10-15km.

In 2010, building on related guidelines for seismic surveys [3], guidance was produced by JNCC to mitigate injuries that might result from pile-driving activity. These require the use of Marine Mammal Observers (MMOs) and Passive Acoustic Monitoring (PAM) to minimise the likelihood that a piling sequence is initiated when marine mammals are within a 500m mitigation zone. When assessing the population consequences of piling activity within the Moray Firth developments, it was assumed that close range impacts resulting in instantaneous death or injury would be avoided through adoption of the 2010 JNCC guidelines [4]. Given that cumulative noise exposure may lead to PTS over ranges in excess of 10km, JNCC guidelines clearly provide negligible protection against the effects of any far field auditory damage resulting from cumulative noise exposure, or indeed for behavioural disturbance. The population effects of these other unmitigated residual impacts were assessed in the ES as resulting in no significant long term effects, and the Habitats Regulations Assessment (HRA) concluded that they did not affect the long term conservation status. Efforts have been made to further reduce any of these longer range impacts through post-consent changes in the design layout. Furthermore, post-consent geotechnical investigations are currently underpinning the development of strategies that aim to minimise the cumulative energy required to drive each pile into the seabed. The requirement for mitigation at the start of each piling process is therefore to reduce the risk of instantaneous death or traumatic injury to negligible levels at the start of each of these piling sequences.

The need for alternative mitigation measures

Although a pragmatic first step towards minimising the impacts of noise on marine mammals, the 2010 JNCC guidelines remain untested. Reliance on the guidelines has subsequently received criticism in the scientific literature, with calls for more effective mitigation [5]. In particular, it is recognised that the probability of visually detecting marine mammals at sea is extremely low [6]. Furthermore, the probability of detection by Passive Acoustic Monitoring (PAM) systems is known to be zero for some key receptors such as harbour seals, and is uncertain for all other species [7].

Recognising these issues, there is widespread agreement over the need for more effective measures to mitigate the risk of instantaneous death or injury at close range. Recent studies provide evidence that at least one commercially available Acoustic Deterrent Device (ADD) can result in behavioural responses by both seals and cetaceans over ranges which are at least an order of magnitude greater than predicted zones for instantaneous death and injury [8, 9]. This suggests that ADDs may be a more effective tool than MMOs and PAM where mitigation aims to maximise the likelihood that animals are outside predicted impact zones at the start of piling.

Consequently, ADDs and soft start piling could be integrated into new procedures for offshore piling that should provide more effective mitigation and improve the protection of marine mammals. This approach would also provide greater certainty in engineering timelines, avoiding delays due to the onset of night time, poor weather and MMO detections. This would have three additional benefits:

1) Greater economic certainty for overall construction plans. This would increase the likelihood of individual developments going forward and contributing to the UK's efforts to meet current climate change targets.
2) Greater certainty in timelines for individual piling events. This would improve the optimisation of piling events within predicted weather windows and reduce HSE risks.
3) Overall reduction in the construction period. This would reduce broader scale disturbance from vessel activity. A shorter construction period would likely also have wider environmental benefits by reducing impacts on other receptors and producing less carbon.

Whilst ADDs have been used in conjunction with MMOs under JNCC guidelines in some regions, discussion within the Offshore Renewables Joint Industry Programme (ORJIP) has highlighted that there are strong stakeholder concerns over the adoption of ADDs as an alternative to the temporal restrictions which would result from the use of MMOs and PAM. Most critically, Statutory Nature Conservation Bodies (SNCBs) are currently requesting scientific evidence that ADDs are more effective than current JNCC guidelines before agreeing to their use as an alternative mitigation measure. This raises two key challenges for regulators and the industry:

1) Given there has been no assessment of the efficacy of current JNCC guidelines, it is unclear how proposed studies might demonstrate that ADDs are more effective than this unknown baseline.
2) Given the global experience of previous behavioural response studies, it is unclear whether a viable experiment can be designed to provide the expected level of confidence in the effectiveness of ADDs as an alternative mitigation measure.

BOWL and MORL are currently developing piling strategies that must be economically viable and accepted by key stakeholders. Critically, project milestones dictated by DECC mean that this process must be completed in Q4 2015. In contrast, even if suitable research projects could be designed and commissioned through ORJIP, results would not be available for at least 2 years, well beyond the timescales required for approval of the projects' piling strategies. Decisions on the potential use of ADDs within the BOWL and MORL piling strategies must therefore be made on the existing evidence

base. Currently, however, these decisions are constrained because of SNCB and Regulator concern that the adoption of alternative mitigation measures using ADD may result in unacceptable risks.

Aims

This document develops a framework that aims to allow regulators to assess whether the risk of using ADDs as an alternative form of piling mitigation is acceptable.

Given the challenges outlined above, the proposed approach involves assessing the consequences of a complete failure in the efficacy of ***any*** of the potential mitigation measures.

If it can be demonstrated that there is negligible additional risk to these populations in the absence of any effective mitigation for near-field impacts, then the use of (potentially more effective) alternative mitigation measures using ADDs should either equal or exceed the level of protection assumed to result from the current JNCC guidelines.

Framework overview

The general approach used in this risk assessment was to use site specific density data to estimate the likelihood that randomly distributed individuals may be close enough to a pile to be killed or injured at the start of a single piling sequence. The BOWL Wind Farm layout includes 84 turbines, two offshore transformer modules (OTMs), and two spare locations, each requiring four piles with a maximum diameter of 2.2m. The first phase of the MORL development (Project 1) will not exceed 100 turbines, with a maximum of 4 piles per turbine, and up to 16 piles for each of the up to two Offshore Substation Platforms (OSPs). This information was used to estimate the likelihood of an individual being killed or injured at the start of the resulting maximum number of piling events during the construction period for each scenario. This maximum number was 784 piling events for both projects together, 352 for BOWL only[6] and 432 for MORL Project 1 only scenarios. These calculations were made for all five marine mammal species considered in the ES (Harbour Seal, Grey Seal, Bottlenose Dolphin, Harbour Porpoise & Minke Whale). For harbour seals, the numbers of individuals that might be impacted in the absence of effective mitigation of these close-range impacts were also included in revised scenarios of the Seal Assessment Framework used in the BOWL and MORL ES's. This was then used to compare the long term population consequences of the worst case cumulative construction scenario, with and without mitigation.

Figure 1 provides an overview of the approach used, illustrating where information was drawn from the existing ES's and where new outputs have been generated. More detailed information on the methods used is presented below. As for the Seal Assessment Framework, the approach aimed to be conservative. For example, when generating random distributions of animals, it was assumed that the presence of vessels prior to piling did not disturb any individuals from the immediate vicinity of the piling vessel. Other key assumptions are listed in The Annex.

Potential impact zones were based on ES predictions of the distances at which different species may be killed or physically injured instantaneously from a single loud pulse. The approaches used in the

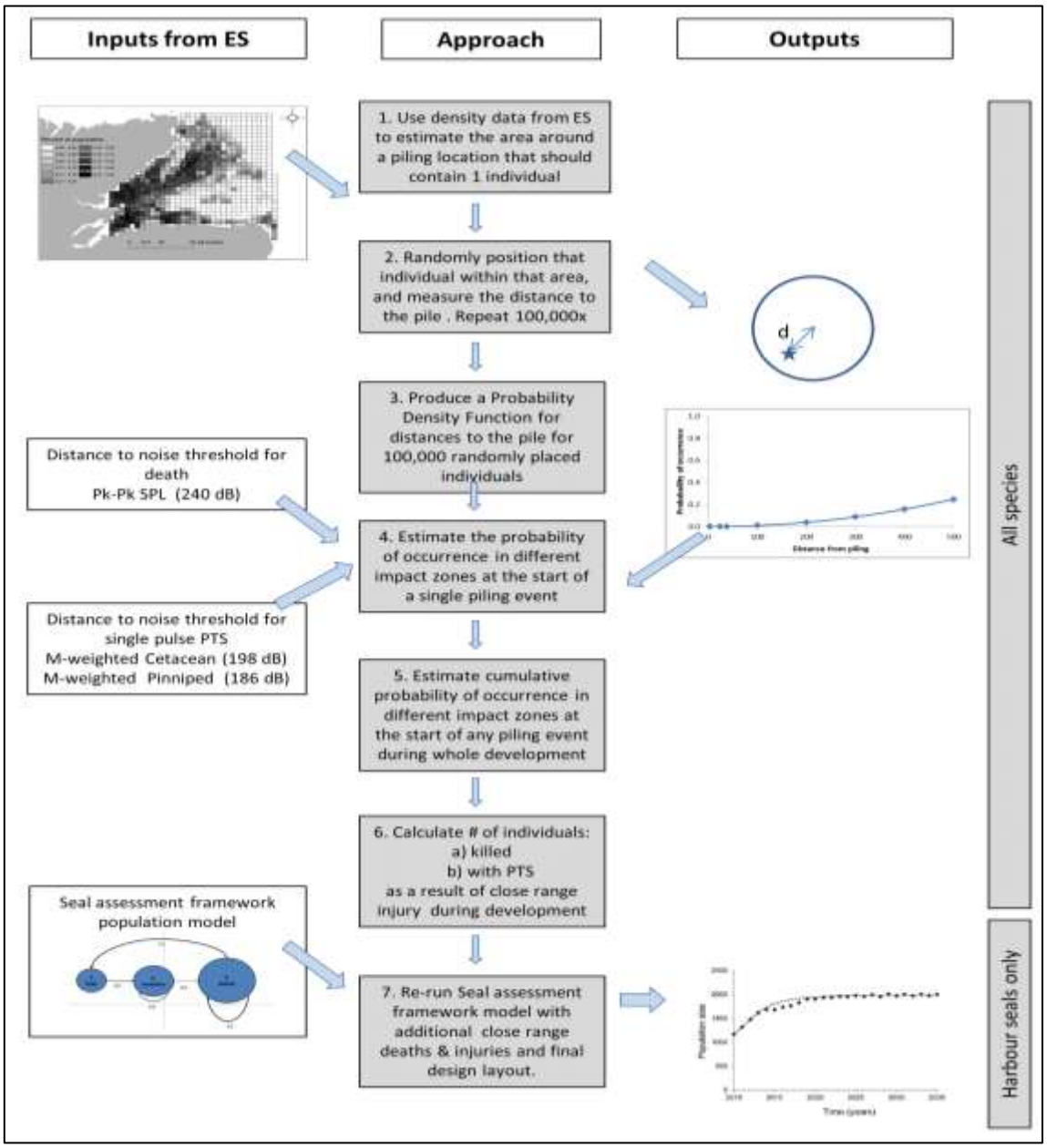
[6] This included 2 spare locations as a worst case scenario

BOWL and MORL ES's varied slightly (Table 1) but, in both cases, risk of death occurred only at extremely short range with risk of instantaneous injury always being <40m. To assess the potential risk of instantaneous injury from a 300 kJ soft start as proposed for the BOWL and MORL Project 1 developments, risk assessments were also used for a more conservative 60m impact zone (see Annex 1 of main document).

Table 1. Distance bands used to estimate close-range impacts of piling

Distance Band	Impact	Species	Criteria	Source
2m	Death	All Marine Mammals	Unweighted pk-pk SPL of 240 dB re. 1µPa (Lethality). Based on a 1200 kJ hammer and a 2.5m pile.	MORL ES Appendix 3.6a, S. 4.2.2.)
4m	Injury	Cetaceans	M weighted single pulse PTS criteria of 198 dB re. 1µPa^2-s. Based on a 360kJ hammer on soft start and a 1.8m pile.	Southall et al (2007) BOWL Supp. noise modelling (unpubl.)
24m	Injury	Pinnipeds	M weighted single pulse PTS criteria of 186 dB re. 1µPa^2-s. Based on a 360kJ hammer on soft start and a 1.8m pile.	Southall et al (2007) BOWL Supp. noise modelling (unpubl.)
38m	Injury	All Marine Mammals	Unweighted pk-pk SPL of 220 dB re. 1µPa (Injury). Based on a 1200 kJ hammer and a 2.5m pile.	MORL ES Appendix 3.6a, S. 4.2.2.)
60m	Injury	All Marine Mammals (based upon harbour porpoise being most sensitive)	Unweighted single pulse PTS criteria of 179 dB re. 1µPa^2-s. Based on a 300kJ hammer energy on soft start.	Annex 1 of main document
500m	N/A	All Marine Mammals	MMO Mitigation Zone	JNCC (2010)

Figure 1. Schematic showing the general approach used to compare the population consequences of variations in the efficacy of mitigation measures used to reduce the impacts of instantaneous death or injury around a piling site.



Methods

Estimating marine mammal occurrence within different impact zones at the start of piling sequences

Predicted distributions were based on the density estimates for each of the marine mammal species that were assessed in the BOWL and MORL ES's. Density estimates for impacts of BOWL and MORL together were based on mean values across all grid cells within the two development zones, whilst

density estimates for BOWL and MORL alone were based on the mean values within each individual development site (Table 2). For each species, density data were used to estimate the area and radius of a circle around each piling site that should include one individual (Table 2).

Individuals were then randomly positioned within these circles and their distance from the pile was measured. This was repeated 100,000 times to estimate the probability of individuals being present within different zones at the start of any individual piling sequence.

If each piling event is assumed to be independent (see the Annex to this Risk-based Framework Assessment), the probability of an individual marine mammal occurring within each impact zone during the first piling strike of any of the 784 piles required for construction of the BOWL and MORL Project 1 wind farms can be calculated from the cumulative binomial probability. This approach can also be used to estimate the maximum number of occasions on which an individual is likely to be present in each zone over the sequence of 784 piling events (here estimated using a 95% probability level). These probabilities were also calculated separately for the individual projects, although to simplify the analysis, the focus was on estimating the probability of occurrence within the 60m injury zone only (as this is the most relevant to the Piling Mitigation Protocol), rather than repeating for all the distance bands.

Table 2. Estimates of density within the Moray Firth development areas, with estimated circle radii that would be expected to contain one individual. Separate estimates were produced for BOWL only, MORL only and impacts for BOWL and MORL Project 1 together based upon local densities within each site

	Mean density (individuals per km^2)	Radius of circle containing one individual (m)
BOWL + MORL		
Harbour Seal	0.31	1020.7
Grey Seal	0.15	1456.0
Harbour Porpoise	0.862	607.7
Bottlenose Dolphin	0.00016	44514.4
Minke Whale	0.022	3803.8
BOWL		
Harbour Seal	0.312	1010.2
Grey Seal	0.119	1638.1
Harbour Porpoise	0.926	586.3
Bottlenose Dolphin	0.00006	70711.8
Minke Whale	0.022	3803.8
MORL		
Harbour Seal	0.304	1023.8
Grey Seal	0.159	1413.1
Harbour Porpoise	0.843	614.5
Bottlenose Dolphin	0.00019	41021.3
Minke Whale	0.022	3803.8

Assessing the population consequences of not mitigating instantaneous death and injury

Assessments of population level impacts were only made for one of the Moray Firth's priority species; harbour seals. This was because the estimated density of bottlenose dolphins in the Outer Moray Firth is so low that the cumulative probability of this second priority species occurring even within a 500m mitigation zone around piling events was <0.1 (see results below).

Population trajectories were compared for different construction scenarios with effective mitigation and without any mitigation to prevent instantaneous death or injury. These comparisons were developed using baseline models from the Moray Firth Seal Assessment Framework. Worst case scenarios used in the BOWL and MORL ES's were first adapted to reflect subsequent changes in the scale of each development (see Table 3), and these were used as baseline construction scenarios assuming that effective mitigation was in place.

These baseline construction scenarios already incorporated impacts of wind farm construction through (1) reductions in survival as a result of PTS from cumulative noise exposure (where 25% of animals that suffer injury from PTS will subsequently die) and (2) declines in reproduction as a result of behavioural displacement (where 100% of animals that suffer behavioural displacement will have reproductive failure in that year) [4]. In addition, baseline construction scenarios include the annual shooting of individuals due to licenced killing by fisheries interests. Any additional impacts from unmitigated instantaneous deaths can therefore be incorporated by supplementing the annual removals from shooting. Any additional impacts from unmitigated instantaneous injury can be incorporated by supplementing the number of individuals with PTS. In addition, an extreme worst case scenario was developed for the unmitigated injuries that assumed 100% mortality as a result of those injuries. In each of these cases, the numbers of individuals were based on the cumulative probability of an individual occurring within the different impact zones (see Table 1) during the initiation of piling at any of the 784 piling events during the entire BOWL and MORL Project 1 construction periods.

Table 3. Comparison of key piling parameters used in the ES worst case scenarios and the current design basis layout for the BOWL and MORL developments.

Parameter	BOWL		MORL[7]	
	ES Worst case	Design Basis Layout	ES Worst case	Project 1 Indicative Design
Number of turbines	277 x 3.6 MW	84 x 7 MW	339	< 100
Total piling phase for a single vessel	3 years	1.5 years	5 years	2 years

Overall, seven construction scenarios, with different combinations of mitigation and injury severities were compared as outlined in Table 4. These included one of the original ES worst case scenarios, and three variations for each of two different revised construction scenarios. The first revised construction scenario (Revised A) involved a four year construction period, and the second (Revised B) involved a three year construction period. The three variants of each related to whether or not there was mitigation and the mortality rate resulting from PTS (Table 4; Annex to this Risk-based Framework Assessment). To allow comparison with outputs from the ES, the first year of construction was set at 2014 in all cases. Similarly, to facilitate comparison of the effects of any mitigation, models were run using the best fitting curve for behavioural displacement and a carrying capacity of 2000. For further details see relevant ES sections [4]. The primary difference between these scenarios and those used in the ES relates to the numbers of turbines in the final layout, and the consequences that this has on the number of vessels used and the duration of construction. The main comparisons retain the original ES assumption that displacement leads to 100% failure in reproduction. However, the reduction in turbine numbers at both sites means that most piling is likely to occur in the summer months, and emerging data from DECC SEA funded studies in the Wash further indicate that displacement during piling is more limited in both space and time than predicted in the ES. In one additional scenario, we therefore explore the effects of reducing this conservatism in the impacts of displacement to a more probable worst case of a 50% failure in reproduction (see Annex to this Risk-based Framework Assessment).

[7] MORL has received three Section 36 consents for a maximum total capacity of 1,116 MW generated by not more than 186 turbines. MORL is planning to develop the area through a phased approach. The first phase of development (Project 1) is currently being developed pending announcements of a future Contract for Difference (CfD) allocation round. However, MORL anticipates that Project 1 will not exceed 100 turbines with the balance being developed in a subsequent phase(s).

Table 4. Summary of the different indicative construction scenarios modelled to explore the consequences of not mitigating instantaneous death and injury

Model Scenario		Duration	Construction Scenario (see ES)	Mitigation	Mortality rate from instantaneous injury
1	ES Worst Case Cumulative A	5 yrs	2 piling vessels on BOWL for 2 yrs followed by: 2 piling vessels on MORL for 3 yrs	Yes	-
2	Revised A	4 yrs	1 piling vessel on BOWL for 2 yrs followed by: 1 piling vessel on MORL for 2 yrs	Yes	-
3		4 yrs		No	25%
4		4 yrs		No	100%
5	Revised B	3 yrs	1 piling vessel on BOWL for 1 yr followed by 1 piling vessel on BOWL + 1 piling vessel on MORL for 1 yr followed by 1 piling vessel on MORL for 1 yr	Yes	-
6		3 yrs		No	25%
7		3 yrs		No	100%

Results

Estimating marine mammal occurrence within different impact zones at the start of piling sequences for BOWL and MORL Project 1together.

The probability that individuals of any of the five species of marine mammals were within the instantaneous death or injury zones at the beginning of a single piling event was extremely low in all cases (Table 5a). Probabilities are provided for relevant injury zones (death, PTS from instantaneous M weighted single pulse criteria for seals and cetaceans and physical injury) as shown in Table 1. For instantaneous death (within 2m) this was always ≤ 0.0001, and for instantaneous physical injury (within 60m) this was always < 0.05, even using the most conservative case of a harbour porpoise and a 300KJ hammer. In contrast, the probability that individuals may be present within the 500m mitigation zone at the beginning of a single piling event was sometimes much higher, and only extremely low (<0.01), for bottlenose dolphins. In particular, the probability that an individual may be present within the 500m zone at any single point in time was 0.68, for harbour porpoise, and 0.24 for harbour seals (Table 5a).

The cumulative probability for each of the five species being within the instantaneous death zone during the first strike of any of the 784 piling events was also extremely low (<0.01) for all species (see Table 5b). However, cumulative probabilities suggest that, with the exception of bottlenose dolphin, one cannot have 95% confidence that individuals are likely to be absent from the instantaneous injury zones during all the first piling strikes. Conversely it is almost certain (≥99%

probability) that all species except bottlenose dolphin will be present within the 500m mitigation zone during at least one first piling strike of the 784 piling events.

The cumulative probabilities can also be used to place an upper 95% confidence limit on the number of occasions (from the total of 784 piling events) on which individuals might be present in different zones during the first piling strike as shown in Table 5c. Table 5b indicates that there is a cumulative probability of 0.97 that a harbour seal will be present in the 60m single pulse PTS zone at the start of at least one of the 784 piling events. While Table 5c indicates that there is a 95% probability that this will not occur on more than 7 different occasions.

The data in Table 5c can therefore be used to put an upper limit on the number of individuals that may be affected by these instantaneous injuries during the construction period. These values can subsequently be used to assess population consequences, and assess the relative importance of these impacts compared with previously assessed impacts from cumulative noise exposure or behavioural disturbance. Here, this is explored for harbour seals through the Moray Firth Seal Assessment Framework, but data for other species such as harbour porpoise could be compared, for example, with estimates of Potential Biological Removal (PBR) [10, 11].

Similarly, data in Table 5c can be used to provide an indication of the number of times that different species may be present within the 500m mitigation zone (as detailed within JNCC guidelines as discussed above) during the construction period. These data suggest that harbour seals may be present within the mitigation zone during up to 208 (26%) of the first piling strikes, whereas harbour porpoises may be present during up to552 (70%) of these events.

Table 5. Probabilities for each species occurrence in each distance ban. Estimates are based on the BOWL + MORL Project 1 scenario using average densities across the two sites (see Table 2)

a) Probability of an individual being present in each distance band during the first strike of a single pile

	2m	4m	24m	38m	60m	500m
Harbour Seal	0.00001		0.00056	0.00136	0.0045	0.24109
Grey Seal	<0.00001		0.00038	0.00076	0.00218	0.11772
Harbour Porpoise	<0.00001	0.00003		0.00389	0.01293	0.67604
Bottlenose Dolphin	<0.00001	<0.00001		<0.00001	<0.00001	0.0001
Minke Whale	<0.00001	<0.00001		0.00016	0.0004	0.01697

b) Cumulative probability of an individual being present in each zone during at least one of the 784 first piling strikes

	2m	4m	24m	38m	60m	500m
Harbour Seal	<0.01		0.36	0.66	0.97	<1
Grey Seal	<0.01		0.26	0.45	0.82	<1
Harbour Porpoise	<0.01	<0.03		0.95	<1	<1
Bottlenose Dolphin	<0.01	<0.01		<0.01	<0.01	<0.1
Minke Whale	<0.01	<0.01		0.12	0.27	< 1

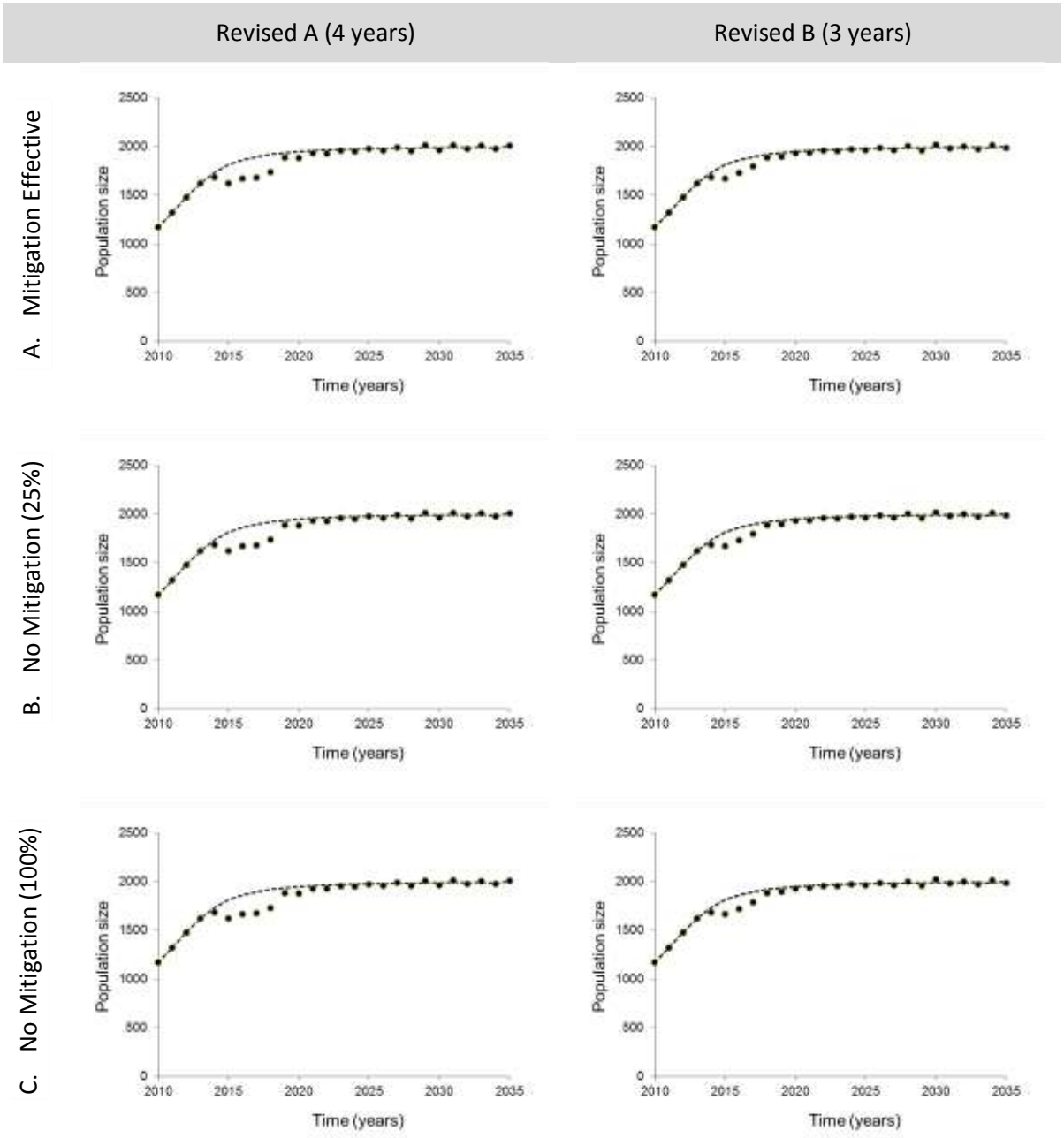
c) Maximum number of first piling strikes in which an individual is likely to be present in each zone (95% Confidence). Data are only presented for those scenarios where the cumulative probability of an individual being present is >0.05 (see Table 5b)

	2m	4m	24m	38m	60m	500m
Harbour Seal	-		2	3	7	208
Grey Seal	-		1	2	4	108
Harbour Porpoise	-	-		6	16	552
Bottlenose Dolphin	-	-		-	-	1
Minke Whale	-	-		1	2	21

Assessing the population consequences of not mitigating instantaneous death and injury for BOWL and MORL Project 1 together

As outlined above, estimates for harbour seals suggest that in the absence of mitigation, there is >99% probability that harbour seals will not be killed during any of the first piling strikes, and a maximum of only seven additional individuals are expected to suffer physical or auditory injury using the larger injury zones (60m) considered in this assessment (Table 1). The impacts of including or not including these additional impacts were explored using the two revised construction scenarios outlined in Table 4, and also by varying the mortality resulting from instantaneous injury between 25% (as used for PTS in the baseline model) and 100% (Figure 2). Inspection of Figure 2 suggests that there is no discernible population level impact from the lack of any mitigation when constructing the BOWL and MORL Project 1 wind farms for either of these construction scenarios, even when all injuries were assumed to result in mortality.

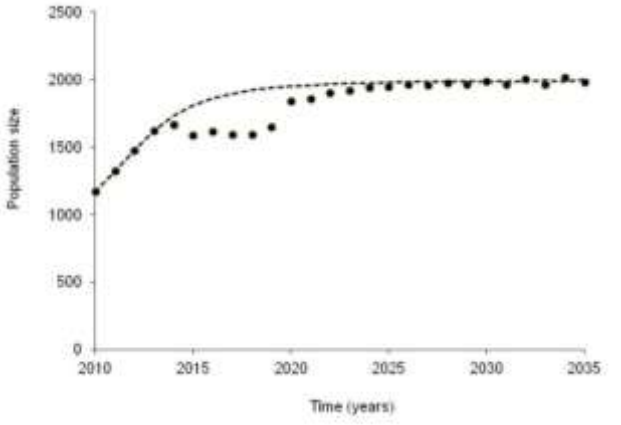
Figure 2. Modelled population trajectories for the two construction scenarios (solid circles) in relation to baseline trends (dashed line) showing patterns with (a) effective mitigation for instantaneous death and injury (b) no mitigation and traumatic injury resulting in 25% mortality and (c) no mitigation and traumatic injury resulting in 100% mortality.



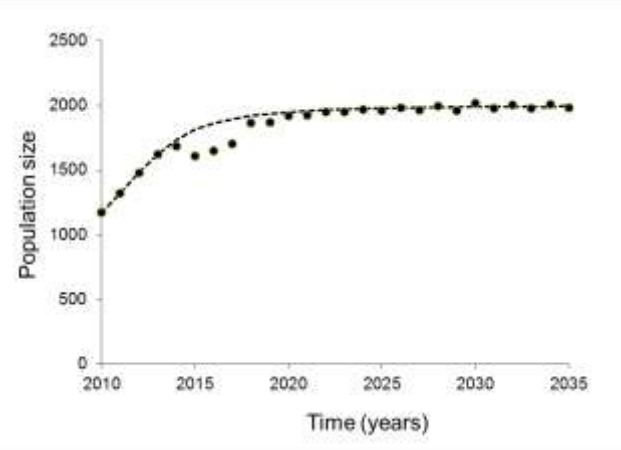
Revised scenario B is presented below in relation to the worst case cumulative assessment from the BOWL and MORL ESs (Figure 3). Assuming 100% reproductive failure and the absence of mitigation for Revised Scenario B, the decrease in population is smaller compared to the worst case scenario assessed in the ESs (Figure 3). Adopting a less conservative assumption for Revised Scenario B, where displacement leads to 50% reproductive failure (a more probable worst case scenario),

illustrates that the decrease in population would be smaller again compared to the worst case cumulative scenario presented in the ES (Figure 3).

Figure 3. Comparison of baseline and construction scenarios for the worst case scenario A (from the ES) and Revised Scenario B with no mitigation and 100% mortality from Figure 2. These can also be compared with a further alternative for Revised Scenario B in which the reduction in reproductive success due to displacement is reduced to 50% instead of 100%.

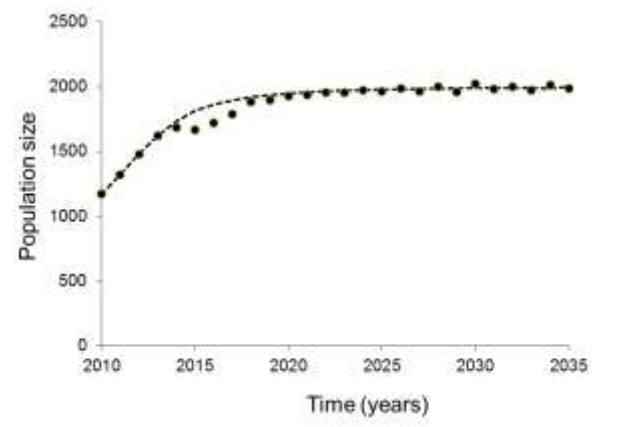


ES Worst Case Cumulative A



Revised Scenario B

100% reproductive failure due to displacement



Revised Scenario B

50% reproductive failure due to displacement

Project specific estimates of marine mammal occurrence within different impact zones at the start of piling sequences

In response to requests from the SNCBs, Table 6 also presents project specific estimates of the risk of different species being present within the 60m instantaneous injury zone, as calculated by Cefas. Here, probabilities are based on the local densities presented in the respective ESs, as summarised in Table 2. The probabilities of occurrence for each species are less than those calculated for the assessment of both projects together (Table 5). On this basis, it can be surmised that there will be no discernible population level impact from the lack of any mitigation when constructing either the BOWL or MORL Project 1 wind farms alone since the construction scenarios for each development alone are considerably less than the scenarios assessed for these two developments together (see Figures 2 and 3). Therefore, even when all injuries are assumed to result in mortality, based on the results of the assessment of both BOWL and MORL Project 1 together, it is considered unlikely that either BOWL or MORL alone would result in a population-level effect.

Table 6. Project specific estimates of the probabilities for each species occurrence within the 60m instantaneous injury zone.

a) Probability of an individual being present within the 60m instantaneous injury zone during the first strike of a single pile

	BOWL	MORL
Harbour Seal	0.00349	0.00339
Grey Seal	0.00141	0.00195
Harbour Porpoise	0.01014	0.00983
Bottlenose Dolphin	<0.00001	0.00001
Minke Whale	0.0002	0.00022

b) Cumulative probability of an individual being present within the 60m instantaneous injury zone at least one of the first piling strikes for BOWL (n=352) and MORL (n=432)

	BOWL	MORL
Harbour Seal	0.71	0.77
Grey Seal	0.39	0.57
Harbour Porpoise	0.97	0.99
Bottlenose Dolphin	<0.01	<0.01
Minke Whale	0.07	0.09

c) Maximum number of first piling strikes in which an individual is likely to be present in each zone (95% Confidence). Data are only presented for those scenarios where the cumulative probability of an individual being present (Table 6b) is >0.05.

	BOWL	MORL
Harbour Seal	3	4
Grey Seal	2	3
Harbour Porpoise	7	8
Bottlenose Dolphin	-	-
Minke Whale	1	1

Conclusions

All stakeholders wish to minimise the likelihood that any marine mammals suffer instantaneous death or injury during offshore piling. Given that these species are expected to move away from loud noise sources, it is accepted that the period of highest risk is likely to be at the beginning of a piling sequence when naïve animals may be close to a piling vessel. Understanding of the noise thresholds that could result in instantaneous death or traumatic injury from a single pulse of this kind is relatively good, and predicted zones in which death or injury may occur (Table 1) are all relatively small for the Moray Firth developments (< 60m). The precautionary nature of the current JNCC guidelines means that MMOs and PAM are required to monitor a much larger 500m mitigation zone around piling activity, with the aim of ensuring that animals are absent from this area before piling can be initiated.

These simulations highlight that, at typical Moray Firth densities, the probability of randomly distributed marine mammals being at risk from instantaneous death or injury at the start of an individual piling event is extremely low (<1%)(see Table 5). In practice, it is likely that the noise coming from vessels during the pile setup would already have displaced individuals out of the immediate danger area, and these values should be even lower. This suggests that, even if mitigation using either JNCC guidelines or ADD failed completely, there are unlikely to be any deaths and a maximum of only 2-16 instantaneous injuries per species during the whole construction programme of the BOWL and MORL Project 1 wind farms. Incorporation of the relevant numbers for seals into the revised scenarios for the Moray Firth Seal Assessment Framework indicate that the absence of mitigation for these near field instantaneous injuries has negligible impact on the resulting population trajectories (Fig. 2).

Notwithstanding these results, it is important to emphasise that they should not be seen as a reason to abandon efforts to mitigate near-field impacts. However, they do provide an evidence base to help balance decisions on the risks of trialling alternative mitigation measures such as ADDs. This framework could also be applied to other developments which have different animal densities or injury zones. Similarly, the approach could be extended for use with other species such as harbour porpoise by considering these injuries as “takes” within a Potential Biological Removal analysis.

References

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3. Weir C.R., Dolman S.J. 2007 Comparative Review of the Regional Marine Mammal Mitigation Guidelines Implemented During Industrial Seismic Surveys, and Guidance Towards a Worldwide Standard. *Journal of International Wildlife Law & Policy* **10**(1), 1-27. .
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10. Wade P.R. 1998 Calculating limits to the allowable human-caused mortality of cetaceans and pinnipeds. *Marine Mammal Science* **14**(1), 1-37.
11. Thompson P.M., Mackey B., Barton T.R., Duck C., Butler J.R.A. 2007 Assessing the potential impact of salmon fisheries management on the conservation status of harbour seals (Phoca vitulina) in north-east Scotland. *Animal Conservation* **10**(1), 48-56..

Annex. Summary of key assumptions made within the framework.

1. **The objective of mitigation during the piling process is to minimise the risk of instantaneous death or injury during the initial piling strikes, not to reduce potential impacts from cumulative noise exposure or disturbance**.

2. **Individuals of each species are randomly distributed across the development site at the densities reported within the BOWL and MORL ES's.** This will be a simplification due to spatial variation in habitat quality and, for some species at least, social behaviour. The former should balance out across the sites when considering cumulative probabilities (Table 5b), but assessments could be re-run using minimum and maximum densities to assess how individual probabilities (Table 5b) vary between sites.

3. **Estimates of the cumulative probability of animals occurring in particular impact zones assume that all piling events are independent.** In reality, piling events will be clustered in groups of 4, with longer intervals between events at different turbine sites. Thus, it is more likely that disturbance during the first piling event at each turbine site will reduce the probability of animals being within the injury zone during the next three piling events.

4. **The revised project design for BOWL's construction scenario, as presented in the Piling Strategy, assumes that piling will involve a single vessel working over a maximum 1.5 year period. MORL's development details are still to be finalised, but here it is assumed that MORL Project 1 will also involve a single vessel working over a 2 year period.** Additional piling vessels may be required particularly in case of delays in construction programme, in which case this increase in the intensity of disturbance would result in concurrent reductions in the overall duration of disturbance. Piling at BOWL may be completed within two spring/summer seasons, reducing potential impacts of disturbance on reproductive success.

5. **To model the population consequences of instantaneous death or injury, it was assumed that mortality rates from injury from PTS resulted in either 25% mortality (eg. Fig 2b) or 100% mortality (eg. Fig 2c).** Recent use of Southall et al.'s (2007) M weighted PTS threshold for cumulative noise exposure suggest that ~ 50% of this rapidly increasing harbour seal population may have been at risk of PTS (Hastie et al. 2015). This suggests either that this pinniped PTS threshold is conservative, or that the risk of mortality from PTS is lower than the values used here.

6. **All other assumptions in the population model were the same as those used in the Moray Firth Seal Assessment Framework (Thompson et al. 2013).** The only exception is the final panel in Figure 3, where the impacts of behavioural displacement were reduced to a 50% reduction in reproductive success. This is now likely to represent a more realistic worst case given a) reductions in turbine numbers and the potential to focus piling over the summer season rather than maintain piling intensity throughout the whole annual cycle and b) emerging evidence from DECC SEA funded studies in the Wash that Harbour Seals were not displaced over the whole construction period, and continued to use preferred areas between piling events.

Annex Refs:

Hastie, G.D., Russell, D., McConnell, B., Moss, S., Thompson, D. & Janik, V.M. (2015) Sound exposure in harbour seals during the installation of an offshore wind farm: predictions of auditory damage. *Journal of Applied Ecology* 52, 631-640.

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Southall B.L., Bowles A.E., Ellison W.T., Finneran J.J., Gentry R.L., Jr C.R.G., Kastak D., Ketten D.R., Miller J.H., Nachtigall P.E., et al. 2007 Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. *Aquatic Mammals* 33, 411-521.

APPENDIX B

SNH response dated 7th August 2015

CATARINA REI

From: Catriona Gall <Catriona.Gall@snh.gov.uk>
Sent: 07 August, 2015 17:10
To: CATARINA REI; Ian Davies (Ian.Davies@scotland.gsi.gov.uk); Kate Brookes (Kate.Brookes@scotland.gsi.gov.uk); Nicola Bain (nicola.bain@scotland.gsi.gov.uk); Caroline Carter; Erica Knott; Karen.Hall@jncc.gov.uk; Enrique Pardo (Enrique.Pardo@jncc.gov.uk); fiona.read@whales.org; Jonathan Wilson (jonathan.wilson@sserenewables.com); Royle, Lis; Reynolds, Elizabeth; Tom McGuinness; SARAH PIRIE; EDWARD MAYCOCK; 'Tessa McGarry'; Professor Paul M. Thompson (lighthouse@abdn.ac.uk); Benjamin King
Cc: Alexander.Ford@scotland.gsi.gov.uk; Robert.Main@scotland.gsi.gov.uk
Subject: MFRAG-Marine Mammals Subgroup - SNH comments on updated piling mitigation protocol

Follow Up Flag: Follow up
Flag Status: Flagged

Via the MFRAG marine mammals sub-group, thank you for sending us the updated copy of the 'Protocol for mitigating the risk of instantaneous death or injury to marine mammals during piling at the BOWL and MORL Wind Farms' (copy dated 29 July 2015). SNH has reviewed the updated protocol and can confirm that we are happy with the revisions: these reflect the discussion and agreement that was reached at the meeting held 19 June 2015.

SNH is content that this updated mitigation protocol can be referred to, and used to inform, the BOWL and MORL piling strategies (the one from BOWL has been recently received for consultation). We are therefore content with ADD deployment during pre-piling for a period of not less than 10 minutes and not more than 15 minutes. For clarity, we confirm that we are also content with ADDs being deployed during pre-piling concurrent with the set up and positioning of the pile-driving hammer. We anticipate that other technical details (such as whether a single ADD can provide full 360 coverage) will be worked out over the course of finalising the BOWL piling strategy.

We think Figures 1 and 2 of the updated protocol (p5 and p6) offer a particularly clear representation of the proposed mitigation: (i) deployment of an ADD during pre-piling and (ii) use of soft-start. As addressed in Figure 2, there is an agreed procedure for applying mitigation following either planned or unplanned breaks in piling, including any breaks that might occur during soft-start. We believe that this should cover every likely contingency.

We have only one slight suggestion in relation to the text in section 4 (p3) describing the actions to be taken following any breaks in piling. Under 4b, we think it clearer to state: "If the break (planned or unplanned) is less than 2.5 hours:

(i) deploy ADD for 10 - 15 minutes immediately prior to resuming piling," etc.

If felt necessary, then a footnote could indicate that this has been agreed via the MFRAG marine mammals sub-group (and is the same period of time as for 3a).

In relation to identifying the impact zone (step 2 of the mitigation protocol), we note the slight updates to Annex 1 and Annex 3. Annex 1 now provides the calculation of the (maximum) impact zone that could result from the soft-start piling: 67.6m. We are satisfied with the way this impact zone has been calculated. Annex 3 now includes this information to calculate the maximum number of individuals of each species that could be within the 67.8m (rounded to 68m) injury zone during first piling strikes over a total of 912 pile-driving events (see Table 5, p22 for these calculations and Table 3, p20 for the details of each wind farm development).

The population consequences of these impacts have been modelled for harbour seal and we confirm that we are satisfied with this modelling. The methods are in line with the ES for BOWL and MORL, and so the modelling now addresses instantaneous fatality / injury as well as cumulative noise disturbance.

In line with our advice at application stage (letters dated 8 July 2013) we confirm that no population modelling is required for grey seal or minke whale and no further modelling (in respect of BOWL and MORL) for bottlenose dolphin. Whether there could be any additional requirements as a result of any future designation of harbour porpoise SACs is an area that's under current discussion with Marine Scotland and JNCC. We consider that, alongside other relevant information, this risk assessment will be helpful to inform EPS licence applications.

In respect of this risk assessment (Annex 3), we confirm that we have read and understand the key assumptions listed on p28-29.

Please note that the advice we've provided in this email solely relates to the BOWL and MORL wind farms in the Moray Firth and does not prejudice any comments we might make on other developments. Any discussion over piling mitigation for other industry sectors and/or in other locations will be progressed separately with the relevant parties concerned.

Finally, we will progress discussion over any ADD test trials and/or monitoring requirements in dialogue with MSS, JNCC and developers via the offshore wind sub-groups (MFRAG and FTRAG) and ORJIP.

Comments on the meeting notes from 19 June will be provided under separate cover.

Yours,

Catriona

Catriona Gall
Marine Renewables Casework Adviser - Offshore Wind

SNH
Battleby
Redgorton
Perthshire
PH1 3EW

direct dial: 01738 - 458665

From: CATARINA REI [mailto:Catarina.Rei@edpr.com]
Sent: 31 July 2015 14:38
To: Ian Davies (Ian.Davies@scotland.gsi.gov.uk); Kate Brookes (Kate.Brookes@scotland.gsi.gov.uk); Nicola Bain (nicola.bain@scotland.gsi.gov.uk); Catriona Gall; Caroline Carter; Erica Knott; Karen.Hall@jncc.gov.uk; Enrique Pardo (Enrique.Pardo@jncc.gov.uk); fiona.read@whales.org; Jonathan Wilson (jonathan.wilson@sserenewables.com); Royle, Lis; Reynolds, Elizabeth; Tom McGuinness; SARAH PIRIE; EDWARD MAYCOCK; 'Tessa McGarry'; Professor Paul M. Thompson (lighthouse@abdn.ac.uk); Benjamin King
Cc: Alexander.Ford@scotland.gsi.gov.uk; Robert.Main@scotland.gsi.gov.uk
Subject: MFRAG-Marine Mammals Subgroup - Minutes of meeting and updated piling mitigation protocol
Importance: High

Dear all,

Please see attached draft notes from the last MFRAG-MM Subgroup meeting and the updated 'Protocol for mitigating the risk of instantaneous death or injury to marine mammals during piling at the BOWL and MORL Wind Farms' following on from comments received on the document at the meeting.

As mentioned it is MORL and BOWL's intention to use the attached protocol within the Piling Strategies for each of the projects and therefore I would request if you could review the attached documents and provide any comments

by the end of next week (i.e. **by the 7 August**). As per the subgroup's Terms of Reference the Chair (Ian Davies) will provide the group's recommendation to MS-LOT soon afterwards.

Kind regards

Cat

Catarina Rei
PROJECT DEVELOPMENT
4th floor 40 Princes Street, EH2 2BY, Edinburgh, United Kingdom
Phone +44 (0) 131 556 7602 Ext. 40407 Mobile +44 (0) 7557 018 985

APPENDIX C

JNCC response dated 9th September 2015

9th September 2015

JNCC comments on the 'Protocol for mitigating the risk of instantaneous death or injury to marine mammals during piling at the BOWL and MORL Wind Farms' (copy dated 29 July 2015)

JNCC would like to provide some clarifications relating to some of the assumptions and statements included in the piling protocol and which have been highlighted by JNCC within the Moray Firth Regional Advisory Group- Marine Mammal (MFRAG-MM) sub group meetings.

The standard piling mitigation that has been routinely applied offshore for the last 5 years follows a protocol published in 2010 by three of the UK's Statutory Nature Conservation Bodies after undergoing an extensive public consultation. This protocol was adapted from the *JNCC guidelines for minimising the risk of injury and disturbance to marine mammals from seismic surveys*, which have, over the last two decades, been widely adopted by the UK's offshore oil and gas industry, have become a best practice model and used as a benchmark in other parts of the world. The guidelines specify a range of measures to protect marine mammals, including the use of trained Marine Mammal Observer (MMO) personnel and Passive Acoustic Monitoring (PAM). Whilst there is no mitigation method that is 100% effective, the guidelines aim to promote the application of the best available mitigation measures possible under each circumstance. The criticism the guidelines have received in the past and highlighted in the piling protocol are mostly related to the inability of the guidelines to mitigate for the wider ranging effect of noise disturbance and the lack of a shut-down policy. None of the critics suggested that MMOs and PAM be dropped from the guidelines in favour of Acoustic Deterrent Devices (ADDs).

The proposed piling protocol is aimed at 'minimising instantaneous death or injury (physical or auditory) for marine mammals during piling operations as a result of single noise pulses at close range'. The *Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise* forms part of a more general guidance document[1] which has interpreted the offence of injury to European Protected Species (EPS) as the onset of a permanent shift in hearing thresholds, or PTS. This guidance also recommends the use of the dual injury criteria proposed by Southall *et al* 2007[2], which considers either single or multiple exposures within a 24-hour period and therefore could refer to the cumulative exposure to loud sound. The recommendations in the JNCC mitigation protocol should be considered as best practice for piling operations aimed at minimising the risk of injury, be it instantaneous or from cumulative exposure. Noise propagation modelling considering cumulative sound exposure routinely predicts larger ranges of potential injury than the 68m estimate for instantaneous injury used in the protocol. The impact ranges predicted for potential cumulative exposure are normally within distance that can be enforced by MMOs/PAM but in some cases larger ranges are predicted, particularly for pinnipeds (although it has been recognised that the Southall thresholds are likely to be too conservative for this group of animals).

[1] The protection of marine European protected species from injury and disturbance. Guidance for the marine area in England and Wales and the UK offshore marine area Draft Guidance, 2010. JNCC, NE and CCW (now NRW).

[2] Southall, B. L., Bowles, A. E., Ellison, W. T., Finneran, J. J., Gentry, R. L., Greene, C. R., Kastak, D., Ketten, D., Miller, J. H., Nachtigal, P. E., Richardson, W. J., Thomas, J. A. and Tyack, P. 2007 Marine mammal noise exposure criteria: initial scientific recommendations. *Aquatic Mammals*, **33**, pp. 411-521.

The assertion in the piling protocol that the probability of visually detecting marine mammals at sea is extremely low applies primarily to moving platforms such as vessels, particularly smaller vessels and secondarily also to more cryptic species such as beaked whales and porpoise/seals in high sea states. An observer placed on the fixed piling barge/ installation vessel with 30 minutes to scan a 500-1000m radius zone will have higher detection ability than from a moving platform at a much lower vantage point. With the combined effort of PAM, the detection ability for porpoise and dolphins will be much enhanced. The placement of MMOs and PAM on the fixed piling barge/ installation vessel has been used in previous renewables piling operations in the UK and may have logistical and health and safety advantages in comparison to deploying the mitigation from a support vessel.

JNCC has reiterated throughout the MFRAG-MM sub group meetings that the full suite of mitigation measures (MMOs, PAM and ADDs) should be employed as part of the marine mammal mitigation protocol and JNCC remains confident that this would provide the most comprehensive, best available mitigation package, lowering the risk of hearing impairment for animals of all species likely to occur in the area.

The current proposal is to not employ MMOs/PAM. JNCC recognises that there is evidence that certain ADDs provide a level of mitigation that may be comparable to that of MMO/PAM for seals and harbour porpoise (noting that this is currently under discussion in much more detail via ORJIP). Seals and harbour porpoise are the main receptors considered within the piling strategy consent conditions, which was agreed via subsequent discussions at MFRAG-MM sub group. However, any mitigation devised for the piling protocol to inform developer piling strategies will also need to consider how such proposals may work for other species of cetacean found within the Moray Firth, albeit likely to be in lower densities than both harbour seals and harbour porpoise, to inform their EPS licence. The evidence base on ADD effectiveness is still lacking for these other species of cetacean (e.g. minke whale).

When there is a risk of injury to any wild animal of any European Protected Species that cannot be removed or sufficiently reduced by using alternatives and/or mitigation measures, then the activity may still be able to go ahead under licence, but this should be a last resort. In order for the activity to go ahead as proposed, the developer will therefore need to apply for an EPS licence to cover the risk of an injury offence and provide evidence to support the licence tests:

1) whether the activity fits one of the purposes specified in the Regulations (e.g. imperative reasons of over-riding public interest including those of a social or economic nature and beneficial consequences for the environment);

2) whether there are no satisfactory alternatives to the activity proposed (i.e. why the use of MMOs/PAM is not feasible);

and 3) that the licensing of the activity will not be detrimental to the maintenance of the species'/population's Favourable Conservation Status (FCS).

We welcome the risk-based assessment framework in the piling protocol and its estimation, for the most common species, of numbers likely to be present in the standard 500m mitigation zone (Table 5 in Annex 3), as, based on noise propagation modelling, this distance is a closer reflection of the potential 'injury zone' when taking into account cumulative sound exposure. Although there is some uncertainty in the density estimates and as the authors themselves recognise the averaging of densities could lead to an underestimation of numbers affected due to cetaceans social behaviour, it is still very unlikely that for species other than harbour porpoise and harbour seals, anything but a small number of animals will be present in the 500m mitigation zone before the start of each piling

event. Whilst we note that we will be consulted separately on EPS licences we consider the information within the protocol helpful in providing evidence for the third EPS test.

Notwithstanding our concerns and recommendations for the implementation of the full JNCC piling protocol (i.e. MMOs, PAM and ADDs), if the Regulator allows, under an EPS licence, the use of ADDs as the main mitigation measure then JNCC do agree with the timing of ADD deployment as outlined in Figures 1 and 2. This protocol is based predominately on the pile installation technique BOWL are using and as such further discussion on these specifics may be required once MORL have finalised their piling structures/ installation method and programme. In addition, on reflection we consider it may be better to specify a set time rather than a range within Figure 1, Box 3a, and Figure 2, Box 4b (i), i.e. instead of deploy ADD for 10-15 minutes specify a deployment time of 15 minutes, as this would provide greater clarity for the ADD operator.

Furthermore, if the full suite of mitigation measures (MMOs, PAM and ADDs) were to be employed then the procedures outlined in Figures 1 and 2 could be considered further alongside the full mitigation suite for the Moray Firth piling programmes. This would potentially aid with concerns over how to deal with planned/unplanned breaks in piling operations and the risk of pile consolidation with how the JNCC guidelines are currently written, particularly if the 15 minute ADD deployment for example could form part of the 30 minute pre search and the soft start is carried out as outlined in Figure 4. Such aspects could be considered further via the MFRAG-MM sub group.

APPENDIX D

MSS response to voting request, dated 20th October 2015

CATARINA REI

From: Kate.Brookes@gov.scot
Sent: 20 October, 2015 13:42
To: Robert.Main@gov.scot; lis.royle@sse.com; CATARINA REI
Cc: Ian.Davies@gov.scot; Paul.Stainer@gov.scot
Subject: Re: MFRAG-MM Subgroup Vote

All,

Just to confirm, I agree with the vote provided by Rob on this.

Best wishes,
Kate

From: Main RAK (Robert)
Sent: Tuesday, October 20, 2015 11:50 AM
To: Royle, Lis (lis.royle@sse.com) <lis.royle@sse.com>; Catarina.Rei@edpr.com <Catarina.Rei@edpr.com>
Cc: Davies I (Ian) (MARLAB); Brookes K (Kate)
Subject: FW: MFRAG-MM Subgroup Vote

Hi Both,

As Kate is on leave I have the MSS vote.

MSS vote **YES** to weather MFRAG MM should agree the document 'Protocol for mitigating the risk of instantaneous death or injury to marine mammals during piling at the BOWL and MORL Wind Farms' as the agreed position of the MFRAG – MM and send the document to MS-LOT.

Many thanks

Rob

From: Davies I (Ian) (MARLAB)
Sent: 19 October 2015 12:11
To: Brookes K (Kate); Erica.Knott@snh.gov.uk; Karen.Hall@jncc.gov.uk; fiona.read@whales.org; lighthouse@abdn.ac.uk; jonathan.Wilson@sserenewables.com; Sarah Pirie
Cc: Main RAK (Robert); caroline.carter@snh.gov.uk; Catriona.Gall@snh.gov.uk; Sonia.Mendes@jncc.gov.uk; lis.royle@sse.com; Catarina.Rei@edpr.com; Bain N (Nicola) (MARLAB)
Subject: MFRAG-MM Subgroup Vote

<<Piling Mitigation Protocol_BOWL_MORL_Final_051015.pdf>>

<<MORAY FIRTH REGIONAL ADVISORY GROUP - MM Subgroup ToR Draft v1.4.docx>>

All,

As there remains some disparity in the views of the organisation on the MFRAG-MM Subgroup regarding the document 'Protocol for mitigating the risk of instantaneous death or injury to marine

mammals during piling at the BOWL and MORL Wind Farms'. I have concluded that the way forward is to have a vote so the views of the group can be sent to MS-LOT.

Following the procedures in the ToR's (attached, but please note in paragraph 18 MFRAG should be MS-LOT) the organisations with votes are in the following table.

Organisation Contact
Marine Scotland Science (MSS) **Kate Brookes**

Robert Main
Scottish Natural Heritage (SNH) **Erica Knott**

Catriona Gall

Caroline Carter
The Joint Nature Conservation Committee (JNCC) **Karen Hall**

Sonia Mendes
Whale and Dolphin Conservation (WDC) **Fiona Read**
University of Aberdeen **Paul Thompson**
Beatrice Offshore Wind Ltd (BOWL) **Jonathan Wilson**

Lis Royal
Moray Firth Offshore Renewables Ltd (MORL) **Sarah Pirie**

Catarina Rei

Each organisation has one vote, so only primary contacts in bold will be asked for the organisational view unless that individual is not available in the time frame, whereupon the next contact will be asked.

Can the above organisations please send back their view as a yes/no vote on whether MFRAG MM should agree the document **'Protocol for mitigating the risk of instantaneous death or injury to marine mammals during piling at the BOWL and MORL Wind Farms'** (attached) as the agreed position of MFRAG MM and forwarded to MS-LOT. Votes should be sent to the secretariat (lis.royle@sse.com and Catarina.Rei@edpr.com).

Votes are required by 16:00 on Friday the 23rd October. Late replies will be recorded as abstentions. After which the secretariat will provide the determined views of MFRAG-MM (from the vote, supplemented by extracts from the minutes of the meetings or individual organisational representations, as appropriate) to MS-LOT as soon as possible.

Many thanks

Ian

<< File: Piling Mitigation Protocol_BOWL_MORL_Final_051015.pdf >> << File: MORAY FIRTH REGIONAL ADVISORY GROUP - MM Subgroup ToR Draft v1.4.docx >>

the effective operation of the system and for other lawful purposes. The views or opinions contained within this e-mail may not necessarily reflect those of the Scottish Government.

Tha am post-d seo (agus faidhle neo ceanglan còmhla ris) dhan neach neo luchd-ainmichte a-mhàin. Chan eil e ceadaichte a chleachdadh ann an dòigh sam bith, a' toirt a-steach còraichean, foillseachadh neo sgaoileadh, gun chead. Ma 's e is gun d'fhuair sibh seo le gun fhiosd', bu choir cur às dhan phost-d agus lethbhreac sam bith air an t-siostam agaibh, leig fios chun neach a sgaoil am post-d gun dàil.

Dh'fhaodadh gum bi teachdaireachd sam bith bho Riaghaltas na h-Alba air a chlàradh neo air a sgrùdadh airson dearbhadh gu bheil an siostam ag obair gu h-èifeachdach neo airson adhbhar laghail eile. Dh'fhaodadh nach eil beachdan anns a' phost-d seo co-ionann ri beachdan Riaghaltas na h-Alba.

****

APPENDIX E

WDC response to voting request, dated 23rd October 2015

CATARINA REI

From: Fiona Read <fiona.read@whales.org>
Sent: 23 October, 2015 15:55
To: lis.royle@sse.com; CATARINA REI
Subject: RE: MFRAG-MM Subgroup Vote

Dear Lis and Cat,

As previously reported, we have some concerns over the use of ADDs and no other monitoring/mitigation but we agree ('yes') that the document can be signed off.

Best wishes,

Fiona

Fiona Read
Scottish policy officer

Telephone: +44 (0)791 869 3023
Working Hours: Monday, Tuesday, Wednesday AM.
whales.org

From: Ian.Davies@gov.scot [mailto:Ian.Davies@gov.scot]
Sent: 19 October 2015 12:11
To: Kate.Brookes@gov.scot; Erica.Knott@snh.gov.uk; Karen.Hall@jncc.gov.uk; Fiona Read; lighthouse@abdn.ac.uk; jonathan.Wilson@sserenewables.com; Sarah.Pirie@edpr.com
Cc: Robert.Main@gov.scot; caroline.carter@snh.gov.uk; Catriona.Gall@snh.gov.uk; Sonia.Mendes@jncc.gov.uk; lis.royle@sse.com; Catarina.Rei@edpr.com; Nicola.Bain@gov.scot
Subject: MFRAG-MM Subgroup Vote

All,

As there remains some disparity in the views of the organisation on the MFRAG-MM Subgroup regarding the document 'Protocol for mitigating the risk of instantaneous death or injury to marine mammals during piling at the BOWL and MORL Wind Farms'. I have concluded that the way forward is to have a vote so the views of the group can be sent to MS-LOT.

Following the procedures in the ToR's (attached, but please note in paragraph 18 MFRAG should be MS-LOT) the organisations with votes are in the following table.

Organisation	Contact
Marine Scotland Science (MSS)	**Kate Brookes** Robert Main
Scottish Natural Heritage (SNH)	**Erica Knott** Catriona Gall Caroline Carter
The Joint Nature Conservation Committee (JNCC)	**Karen Hall** Sonia Mendes
Whale and Dolphin Conservation (WDC)	**Fiona Read**
University of Aberdeen	**Paul Thompson**
Beatrice Offshore Wind Ltd (BOWL)	**Jonathan Wilson**

Moray Firth Offshore Renewables Ltd (MORL)

Lis Royal
Sarah Pirie
Catarina Rei

Each organisation has one vote, so only primary contacts in bold will be asked for the organisational view unless that individual is not available in the time frame, whereupon the next contact will be asked.

Can the above organisations please send back their view as a yes/no vote on whether MFRAG MM should agree the document **'Protocol for mitigating the risk of instantaneous death or injury to marine mammals during piling at the BOWL and MORL Wind Farms'** (attached) as the agreed position of MFRAG MM and forwarded to MS-LOT. Votes should be sent to the secretariat (lis.royle@sse.com and Catarina.Rei@edpr.com).

Votes are required by 16:00 on Friday the 23rd October. Late replies will be recorded as abstentions. After which the secretariat will provide the determined views of MFRAG-MM (from the vote, supplemented by extracts from the minutes of the meetings or individual organisational representations, as appropriate) to MS-LOT as soon as possible.

Many thanks

Ian

<< File: Piling Mitigation Protocol_BOWL_MORL_Final_051015.pdf >> << File: MORAY FIRTH REGIONAL ADVISORY GROUP - MM Subgroup ToR Draft v1.4.docx >>