



**Scottish Natural Heritage**  
**Dualchas Nàdair na h-Alba**

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Nàdar air fad airson Alba air fad

Marine Scotland  
Licensing Operations Team  
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CNS REN OSWF BEATRICE

For the attention of: Fiona MacKintosh

22 January 2016

Dear Sirs

**BEATRICE OFFSHORE WIND FARM**  
**SNH ADVICE ON EUROPEAN PROTECTED SPECIES LICENCE APPLICATION**

Thank you for consulting us on this licence application considering possible disturbance of European protected species (EPS) during construction work at Beatrice offshore wind farm. We provide our comments on the scope of this licence and risk assessment for injury impacts, followed by our advice on whether any disturbance to EPS could be "detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range".

SNH is the statutory nature conservation adviser for Beatrice because it is located in Scottish territorial waters within 12 nautical miles of the coast. We have not co-ordinated our advice with JNCC in respect of this EPS licence application, however, we did provide joint advice on EPS in our original response to the Section 36 and marine licence application – please see Appendix B(iii) of our letter dated 8 July 2013.

**Scope of licence**

We agree with the applicant's supporting information regarding the scope and purpose of their licence application: that it is to allow for the potential disturbance of named EPS cetaceans where there is at least some risk of individuals being present during construction work at the Beatrice wind farm site. The specific elements of construction that could present risk of disturbance are identified in paragraph 4.1.2 of the supporting information: impact piling, vibro-piling, use of acoustic deterrent devices (ADDs) and vessel movements.

In this regard, **we recommend** that the licence also covers horizontal directional drilling (HDD) which is likely to be required in coastal waters for installation of the export cable (part of the offshore transmission works). We consider the risk of disturbance to EPS from this potential HDD work in our advice below.

Under the relevant legislation, Marine Scotland is required to consider the use of alternatives. It is our understanding that this relates to site selection and project design (particularly the choice of turbine foundation).

For the avoidance of doubt, SNH does not support the use of gravity foundations at Beatrice – we consider this would have far greater impacts on natural heritage interests than pin-piling and could detrimentally affect the prey resource of marine mammals (including EPS), seabirds and fish species. Any use of gravity foundations will result in greater loss of benthic habitat, and should be considered permanent (or at least long-term). This contrasts with pin-piling where EPS disturbance, even if it might prevent access to habitat, is only temporary.

### **Risk assessment – considering the potential for EPS injury<sup>1</sup>**

Methods to assess the risk of EPS injury have been under discussion between the relevant parties via the Moray Firth Regional Advisory Group (MFRAG), at meetings of the marine mammals sub-group. SNH is supportive of the risk assessment that has been developed by Paul Thompson on behalf of the developers (BOWL and MORL). We think this risk-based approach is helpful as it provides a means to estimate the numbers of marine mammals (EPS and seal species) that could be present within the injury zone, in the absence of any mitigation, at the time of the first (soft-start) piling strike. The method is discussed in more detail in the piling mitigation protocol, provided as Appendix A of the applicant's supporting information.

SNH supports this approach because it allows us to understand the unmitigated risk of injury across EPS cetaceans (on a species-by-species basis) from the intended piling work. This enables us to more effectively target the piling mitigation to minimise / prevent injury to EPS and we have confidence in the proposals that have been tabled by BOWL: to use acoustic deterrent devices (in combination with soft start piling) to ensure that target species clear the injury zone prior to the commencement of piling. We've already given advice to Marine Scotland in this regard – please see our response to the consultation on BOWL's piling strategy, 9 September 2015.

For the purpose of the current EPS licence application, we confirm that, with the adoption of the agreed pre-piling mitigation, there is no significant risk of instantaneous injury or fatality to harbour porpoise from impact piling at Beatrice offshore wind farm. Harbour porpoise is the only EPS species where the unmitigated risk is significant. For all other EPS, the predicted risk of instantaneous injury or fatality from impact piling is non-significant. We confirm that no other elements of the construction work – vibro-piling, use of ADDs, vessel movements and possible HDD – give rise to any significant risk of instantaneous injury or fatality.

This updates the advice we provided in our response to the piling strategy (9 September 2015) so that we are able to confirm that it is only the risk of disturbance impacts that will need to be addressed under EPS licensing for the Beatrice wind farm.

Going forward, we consider that this risk-based approach to consider possible EPS injury from pile-driving has wider application beyond the offshore wind farms (BOWL and MORL) for which it was developed. Under EPS licensing, we think it will prove helpful to adopt/adapt this method for a range of different development types where pile-driving may be required (such as ports, harbours, bridges and coastal defence works).

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<sup>1</sup> This is "instantaneous" injury – the risk of an animal being close enough to the turbine that they would be killed or suffer permanent threshold shift (deafening) from the noise of the first piling strike. We discuss "cumulative" injury below in our advice on EPS disturbance. Cumulative injury may occur when an animal is repeatedly exposed to piling noise at distance from the turbine (beyond the zone of instantaneous injury). The risk of cumulative injury to EPS has been assessed together with disturbance in the Section 36 / marine licence application for Beatrice.

## **SNH advice on EPS disturbance**

Under the legislation, SNH is required to provide advice to Marine Scotland on whether any disturbance to EPS could be "detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range". We have reviewed the applicant's supporting information in order to provide the following advice.

The risk of disturbance to EPS cetaceans was considered as part of the Section 36 and marine licence application for Beatrice, for which SNH and JNCC provided advice in our response dated 8 July 2013 – please see Appendix B(iii):

For all EPS that may potentially be recorded in the Moray Firth, JNCC & SNH agree with the conclusion of the ES that disturbance arising to these species from the Beatrice windfarm proposal, alone or in combination with development in the MORL Round 3 zone, **will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status of these species in their natural range.** This is due to the scale of the impacts identified for these species within the impact assessments, the very conservative, worst case scenarios used in the impact assessments and the intermittent nature of the piling noise itself as described in the impact assessment, alongside the current favourable conservation status of all three species within UK waters (draft Habitats Directive Article 17 species reports in preparation).

We confirm that this conclusion still holds, and we note the substantial refinement of the project envelope since the "worst case" assessed for the Section 36 / marine licence – this is discussed in more detail in Section 1.6 (and Table 1.1) of the supporting information for the EPS licence application.

We agree that impact piling gives rise to the highest risk of disturbance, and may potentially lead to "cumulative" injury as discussed below (and in footnote 1). While the other elements of wind farm construction are much less disturbing (and won't result in any injury) they do still need to be considered. So we have reviewed the applicant's information in this regard and confirm that we are satisfied with the assessment and stated outcomes, as follows:

- **Impact piling**

It is possible that an individual's exposure to multiple piling events could result in permanent deafening (or threshold shift). This is known as "cumulative" injury and should not be confused with the risk of "instantaneous" injury that we discussed earlier in the letter. It is important to note that cumulative injury has already been assessed, along with disturbance impacts, at application stage (for the Section 36 consent and marine licence). This was the key focus of noise modelling and the marine mammal impact assessments submitted in the environmental statement for Beatrice. In our response of 8 July 2013, SNH and JNCC considered the predicted levels of cumulative injury and disturbance impacts to EPS, giving advice on whether this would lead to any significant effects on the populations of each species.

As set out in the applicant's supporting information the number of turbines has now been confirmed as 88, reduced from a maximum of 280 turbines assessed at application stage. Each turbine requires four pin piles reducing the number of piling events from 1,120 to 352. The total duration of impact piling is estimated to be ~6.8 weeks compared to the 33.4 weeks assessed at application stage. The estimates of required hammer energy have also been reviewed and for most of the turbine locations are substantially less than the "worst case" previously modelled (see Table 1.1 for further detail).

As a result, SNH confirms that the risk of cumulative injury or disturbance to EPS from impact piling at Beatrice wind farm has been substantially reduced from the “worst case” assessed at application stage. While there could be some impacts on individual animals we confirm that **this will not be detrimental to the maintenance of EPS cetacean populations at a favourable conservation status in their natural range.**

We do not identify any specific conditions on the EPS licence in this regard. This is because the impacts are primarily addressed through the “embedded mitigation” achieved by the developer in their changes to wind farm design (reductions in the number of turbines) and refinement of the piling schedule (optimising the pile-driving efficiency for engineering and cost-benefit will also reduce the environmental impacts).

These project refinements are presented in the piling strategy for Beatrice, required under the Section 36 and marine licence conditions. The piling strategy was consulted upon last year and is now discharged by Marine Scotland.

- **Vibro-piling**

The risk of EPS disturbance from vibro-piling has not been assessed previously. Therefore we have reviewed Appendix B of the applicant’s supporting information and are content with the way the noise emissions from vibro-piling have been modelled and assessed. While there could be some disturbance of individual animals from vibro-piling we confirm that **this will not be detrimental to the maintenance of EPS cetacean populations at a favourable conservation status in their natural range.**

We do not identify any specific mitigation measures or EPS licence conditions required in respect of vibro-piling.

- **Use of acoustic deterrent devices**

Along with soft-start piling, ADDs are a key part of the agreed mitigation to avoid “instantaneous” injury impacts to harbour porpoise from impact piling to install turbine foundations. The noise emitted by an ADD is intended to deliberately disturb the porpoise so that they clear the injury zone prior to commencement of the soft-start. It is currently unproven whether ADDs disturb other cetacean species (such as bottlenose dolphin and minke whale) but only a minimal number of individuals of these other species are predicted to be in the area.

Therefore we confirm that use of ADDs as a piling mitigation measure at the Beatrice wind farm site **will not be detrimental to the maintenance of EPS cetacean populations at a favourable conservation status in their natural range.**

- **Vessel movements**

The supporting information indicates that the maximum numbers of vessels required on-site at any one time is 26, reduced from the “worst case” estimate of 46. SNH advises that while there could be some disturbance of individual animals from these construction vessels **there will no detrimental impacts to the maintenance of EPS cetacean populations at a favourable conservation status in their natural range.**

We note that the applicant is required to provide a vessel management plan under the Section 36 / marine licence conditions, and we do not identify any further requirements specifically in relation to EPS licensing.

- **Horizontal directional drilling**

Horizontal directional drilling (HDD) may be required in coastal waters for installation of the export cable. This may give rise to EPS disturbance from the sound of drilling (as well as the vessel disturbance considered previously). While this matter hasn't explicitly been addressed by the applicant in their licence submission, we do not require any further information in order to give our advice in this regard.

There could be some disturbance of EPS individuals from use of HDD, particularly bottlenose dolphin and minke whale where densities are higher in coastal waters, however, we confirm that this work **will not be detrimental to the maintenance of EPS cetacean populations at a favourable conservation status in their natural range.**

### **Conclusion**

SNH therefore confirms that a licence to disturb EPS cetaceans is required for the construction work at Beatrice offshore wind farm. Taken individually and in combination, the elements of construction work may disturb individuals of each species but **will not be detrimental to the maintenance of EPS cetacean populations at a favourable conservation status in their natural range.**

SNH does not have any specific conditions that we recommend for the EPS licence as all necessary mitigation has already been identified, discussed and agreed through project design and other relevant conditions that apply to the Section 36 consent and marine licence.

We trust that this advice to Marine Scotland is helpful. If you have any queries, please do not hesitate to contact me.

Yours faithfully

**Catriona Gall**

Renewable Energy Casework Adviser (Offshore Wind)



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Our reference:  
BOWL EPS Licence Application

Date: 29<sup>th</sup> January 2016

Dear Fiona MacKintosh,

**BEATRICE OFFSHORE WIND FARM: JNCC's ADVICE ON EUROPEAN PROTECTED SPECIES LICENCE APPLICATION**

Dear Fiona

JNCC is the statutory nature conservation body who provides advice on European Protected Species (EPS) in respect of the Habitats Regulations for UK waters, outside of 12nm (territorial waters).

Thank you for consulting JNCC on BOWL's EPS Licence Application. JNCC's response should be considered in the context of our previous advice provided to Marine Scotland Licensing on the BOWL Piling Strategy (PS) and to the Moray Firth Regional Advisory Group - Marine Mammal sub group. We have considered the application documents provided, however we have referred to the discharged BOWL Piling Strategy Consent Plan available on the MS website (specifically Appendix D, dated 2<sup>nd</sup> October 2015) and not Appendix A as provided with the application (dated 29<sup>th</sup> June 2015) as we assume the former to be the most up to date and the discharged version of the PS and associated justification.

BOWL's European Protected Species Licence Application is for the construction of an offshore wind farm and offshore transmission works, in relation particularly to foundation piling and vessel movements during the construction period. Foundation installation at the BOWL site will be undertaken using vibro-piling and impact piling in a total of 88 locations. Foundations will comprise jacket foundations with 4 piles of 2.2 m diameter per foundation, with a total of 344 piles for all foundations. It is estimated that a maximum of 26 vessels will be operating at any one time during the construction period (3 years). Vibro-piling will be used to settle the piles into position prior to impact pile-driving with Acoustic Deterrent Devices (ADDs) used in between as mitigation.

### *Advice on the risk of injury of European Protected Species*

The PS sets out the mitigation protocol that BOWL has designed and which relies on the use of ADDs to ensure EPS (and seals) are outside an estimated instantaneous injury/ death zone of 60m radius from the pile. The intention is for this protocol to be put in place following a period of no longer than 28 days from the start of the piling operations, during which a phased piling mitigation strategy will be in place (BOWL's Phased Piling Mitigation Strategy (January 2016)) which includes the deployment of Marine Mammal Observers (MMOs) and Passive Acoustic Monitoring (PAM).

In BOWL's Environmental Statement (2012) a commitment was made to follow the Statutory Nature Conservation Agency Protocol for minimising the risk of injury to marine mammals from piling noise. JNCC has previously advised that this includes monitoring (with MMOs and PAM) for the full area over which auditory injury (i.e. PTS onset) could occur for EPS. **The mitigation strategy now proposed and agreed with Marine Scotland Licensing constitutes a significant departure from the Statutory Nature Conservation Agency protocol.** The main difference is the reliance on ADDs as the main mitigation measure and the revised smaller extents of the injury/ mitigation zones (60m) based on instantaneous injury as opposed to cumulative sound exposure (approximately 500 to 1000m radius).

JNCC has recommended in its 2010 draft guidance<sup>1</sup> that the dual injury criteria proposed by Southall *et al.* (2007) be used when assessing the risk of PTS onset. For single and multiple pulsed sound types such as a single pile strike and sequential pile strikes, respectively, the threshold should correspond to a received Sound Exposure Level (SEL) of 198dB re: 1 $\mu$ Pa<sup>2</sup>-s weighted by functional group or a received Sound Pressure Level (SPL) of 230dB re: 1  $\mu$ Pa (peak) (flat). In BOWL's ES (2012), noise propagation modelling was carried out to infer the distance from the pile at which animals of species of concern must start to move away such that, at the end of a piling event, its accumulated noise dose is below the Southall SEL threshold. A worst case scenario hammer energy of 2300kj and an assumption that animals would gradually move away from the noise as the ramp up commenced were used in the model. The distance was estimated to be between 490m (for harbour porpoise) and 1.6 km (for minke whales). JNCC advises that this is the distance that should inform the mitigation zone, acknowledging that the anticipated maximum hammer energies now to be employed for the majority of piling locations will be lower than the worst case scenario, and therefore the zones of injury risk will be mostly smaller than predicted, although would not be as small as the instantaneous injury radius of 60m.

The deployment of MMOs/ PAM (in conjunction with ADDs on some coastal developments) has been routinely applied in pile-driving noise mitigation for the last 5 years. The standard mitigation 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. JNCC has advised<sup>1</sup> that the statutory piling protocol when used adequately is likely to reduce the risk of an injury offence to negligible levels. In addition, when there is a risk of injury to any European Protected Species that cannot be

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<sup>1</sup> JNCC et al (2010). The protection of marine European Protected Species from injury and disturbance. Draft guidance for the marine area in England and Wales and the UK offshore marine area. 118pp.

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 impact piling to go ahead as proposed, JNCC advises that the EPS licence should cover the risk of an injury offence in addition to that of disturbance. As part of the licensing process, and in the context of the 'no satisfactory alternatives' test an objective demonstration of why lower risk alternatives have been discounted will have to be made (i.e. in this case why the use of best practice mitigation (i.e. MMOs/ PAM) is not feasible). In addition, an estimate of numbers potentially at risk of PTS onset should be provided where possible. Several EPS occur frequently in BOWL's development area, such as harbour porpoise, minke whale, common dolphin, white-beaked dolphin and Risso's dolphin. JNCC notes that **for species other than seals and harbour porpoise there is no evidence that ADDs would be effective deterrents and therefore the risk of injury remains and best practice mitigation should be employed, or if this is not feasible, the activity should proceed under an EPS licence that covers injury.** It is unlikely that anything but a relatively small number of animals could be present in the potential injury zone (500-1.6km) zone before the start of piling events, over the course of turbine installation, and therefore unlikely to be detrimental to Favourable Conservation Status (FCS) and hence licensable.

BOWL's Phased Piling Mitigation Strategy (January 2016) has been devised by BOWL in response to a request by MS-LOT that monitoring of the effectiveness of ADDs versus the MMOs be carried out. This is the first opportunity JNCC has had to review the document, and whilst JNCC welcomes the intention of the request, research on the effectiveness of ADDs, in particular on the main outstanding question of whether ADDs are able to deter species such as dolphins and minke whales from an injury risk zone, is the subject of consideration for funding from the Offshore Renewables Joint Industry Programme (ORJIP) and it would be more appropriate, effective and comprehensive if the research was delivered in that way.

In relation to Stage 2 of BOWL's Phased Piling Mitigation Strategy, JNCC advises that in no circumstances should piling be allowed to start (or recommence following a break) if a marine mammal is detected within the mitigation zone (500-1000m), given the risk of auditory injury.

#### *Advice on the risk of disturbance of European Protected Species*

For those EPS recorded more frequently in the Moray Firth – harbour porpoise, bottlenose dolphin, white-beaked dolphin, common dolphin, risso's dolphin and minke whale JNCC agrees with the conclusion in the licence application that disturbance arising to these species from the Beatrice windfarm proposal will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range and therefore it is licensable. This is due to the scale of the impacts identified for these species within the impact assessments alongside the current favourable conservation status of the six species within UK waters ([Habitats Directive Article 17 species reports](#)). However, the planned offshore renewable windfarm developments in UK waters could involve multiple piling events occurring concurrently and sequentially, across a species range, over several years. This has the potential to result in cumulative effects and therefore the potential to have a detrimental impact on the FCS of populations of marine mammal species occurring in UK waters. Continued strategic discussion is needed between UK Regulators (including Marine Scotland) and statutory nature conservation advisers (including JNCC & SNH) to consider the wider issue of an EPS licensing framework across UK waters as a whole. One component of such framework should be a population effects modelling approach such as

iPCoD and DEPONS. These models need further improvements (currently being progressed) before they can be used in a robust exploration of the potential cumulative effects at the population level from piling noise resulting from the construction of offshore wind farms in the North Sea.

*Vessel movements*

Whilst we note the reduction, from the worst case scenario, of the number of vessels required, we note that the applicant is required to provide a vessel management plan under the Section 36 / Marine Licence conditions, that this is currently under preparation and that we will be consulted on this separately to the EPS application.

Yours sincerely,

**Dr. Sónia Mendes**

Senior Marine Mammal Advisor, JNCC

cc, Catriona Gall, SNH

**Marine Scotland Science**  
**BOWL EPS licence**  
**Marine Mammal Advice**

MSS have been fully involved in the MFRAG-MM process that has been discussing the BOWL (and MORL) approach to mitigating the risk of injury to marine mammals as a result of exposure to noise produced through construction pile driving. This group has been attended by representatives of BOWL and MORL wind farms and their consultants, MSS, SNH, JNCC and WDC. MSS agreed with the piling protocol that was presented to the group, which details the risk assessment for injury that was undertaken and the intention of the developers to use ADDs and soft start as mitigation against injury.

MSS have also reviewed the advice provided by SNH and JNCC on this EPS licence application. We note that there is a difference of opinion between the two and that SNH are supportive of the approach that the developers have taken, while JNCC have some outstanding concerns. These are largely related to the size of the zone in which it may be possible for individual cetaceans to receive noise levels sufficient to cause injury.

**Mitigation range**

JNCC advised that the Southall et al. (2007) criteria are used as the thresholds to Permanent Threshold Shift (PTS), which is considered to be synonymous with injury. For cetaceans these are Sound Exposure Level (SEL) of 198dB re:  $1\mu\text{Pa}^2\text{s}$  weighted by functional group or a received Sound Pressure Level (SPL) of 230dB re:  $1\mu\text{Pa}$  (peak) (flat). BOWL have largely used these values, although they have also taken account of work undertaken following the publication of these thresholds that showed that porpoises were more sensitive to noise than originally thought (Lucke et al., 2009). BOWL have therefore used the more stringent thresholds of SEL 179dB re:  $1\mu\text{Pa}^2\text{s}$  (unweighted) and SPL 200dB re:  $1\mu\text{Pa}$ .

Despite BOWL using lower noise thresholds than those recommended by JNCC, the range of mitigation that JNCC have requested is considerably larger than the range that BOWL propose. JNCC suggest that the range for mitigation should be in the region of 500-1000m and potentially as large as 1.6km, while BOWL have suggested that it should be 60m and this position is supported by SNH. The difference between these ranges is because JNCC are requesting that the mitigation zone is informed by the maximum hammer energy that has been consented (2300kJ), while BOWL are suggesting that it should be informed by the maximum hammer energy that will be used during the soft start (300kJ).

The piling strategy provided by BOWL discusses several steps in the process to develop a protocol. This includes optimising hammer energies for every piling location, based on the local rock and sediment types. This is to ensure that the minimum energy is always used, while not extending the overall duration of pile driving. This means that while the maximum hammer energy is 2300kJ, this is only anticipated to be required at five out of 88 piling locations, while at 72 locations, the maximum energy anticipated to be required is 1200kJ and at a further 11 the maximum energy anticipated to be required is 1800kJ. MSS support the strategy of optimising hammer energies in this way and view it as inbuilt mitigation.

The mitigation protocol proposed includes both ADDs and soft start, so is not only reliant upon ADDs for mitigation against injury. BOWL have stated that they will sound an ADD for 15 minutes prior to any pile driving. They will then commence piling at a maximum hammer energy of 300kJ, for 1 minute with 5 or 6 blows. Following this, they will increase the blow rate to approximately once every 2 seconds, and gradually, over the course of 20 minutes, increase the hammer energy to a maximum of 500kJ. Hammer energy will then be ramped up to the energy required at that location to achieve pile movement of 2.5cm per blow. This is a more prescriptive soft start than is usually applied for pile driving.

If animals respond to the ADDs (see below for further comments on this) then this allows them 35 minutes to vacate the area before hammer energies are increased to the maximum required at that site. Assuming an average porpoise swimming speed from the literature, BOWL consider that this would be enough time for an animal to move 3240m away from the piling source. If they do not respond to the ADD, this still allows them 20 minutes to vacate the area, while not receiving noise levels sufficient to cause injury. At the same swimming speed porpoises would be able to move 1890m away from the piling source. MSS therefore consider that regardless of the size of the mitigation zone defined, the mitigation proposed will protect marine mammals from the risk of injury.

MSS consider that the 60m mitigation zone, based on the soft start hammer energies, is suitable for the purposes of determining the spatial extent of the zone in which marine mammals may be exposed to noise levels sufficient to cause injury. This is because we would expect the soft start piling to encourage animals away from the piling source to distances at which their risk of injury will be lower. Once full energy piling is started, animals will have had at least 20 minutes (35 minutes if they respond to the ADD) to move into areas with less noise exposure and would therefore not be exposed to full hammer energies. It should also be borne in mind that in the majority of cases these will be in the region of 1200kJ rather than the consented 2300kJ.

### **Risk assessment and efficacy of ADDs**

BOWL have used a risk assessment procedure to determine the likelihood of any marine mammal species being exposed to noise levels sufficient to cause injury. This has included consideration of the density of animals of each species at the site and the probability that they will be present during any single first pile strike (at 300kJ), as well as the cumulative probability that they will be present during any first pile strike throughout the piling campaign.

MSS support the use of such a risk assessment to allow mitigation to be targeted at the most vulnerable species.

The results of the risk assessment are copied below from the BOWL piling strategy. This table includes piling at the MORL site, and shows the likelihood that different species will be present during any first piling strike.

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

Copied from Annex 3 of BOWL's piling strategy.

Of these species, the greatest risk is presented to harbour porpoise and it is therefore appropriate that mitigation is used that will protect them. Seal species are not EPS, so are not considered in more detail here. The probability of minke whales being present is small, and is close to zero for bottlenose dolphins. Other species of dolphin are not considered, largely because they are not a regular presence in the Moray Firth. The SCANS-II densities of these species in block J (which covers the Moray Firth, Orkney and Shetland) were in line with those for minke whale, so the potential risk to those species would be of the same order as for minke whale.

Research has been undertaken on the efficacy of ADDs to deter porpoises and seal species and has shown them to be effective. For seals, some of this work was carried out by the Sea Mammal Research Unit under contract from Marine Scotland (Gordon et al. 2015). For porpoises, this work has been undertaken during wind farm construction in Danish waters (Brandt et al., 2013) and demonstrated that very few porpoises were detected within 1000m of the operational ADD compared with baseline periods, over 4 hour blocks of time.

It is important, given that the greatest risk of injury is to harbour porpoise from the pile driving that will be undertaken, that any mitigation effectively protects this

species. Porpoises are notoriously difficult to detect visually. On the basis of this and that ADDs have been shown to be effective in deterring porpoises from pile driving events, MSS are content to accept that ADDs are a suitable mitigation for use in these circumstances. Indeed, they are likely to be effective to distances much greater than those required to avoid the risk of injury to this species.

Similar evidence for the effectiveness of ADDs for other species, such as minke whale and dolphin species is not available. Although MSS consider it unlikely that they would show no response at all to an ADD, the likelihood of them being present in areas where they may be exposed to noise levels sufficient to cause injury is very small and MSS consider the risk to them to be negligible. The effectiveness of ADDs for these species is the subject of a proposal for an ORJIP project which may in time provide useful evidence. At the time of writing, this project is not yet funded, and will be unlikely to deliver results before BOWL are due to commence their construction campaign.

### **Phased piling mitigation strategy**

MSS have also had the opportunity to review the phased piling mitigation strategy produced by BOWL, which details the protocol which will be used to phase in the use of ADDs from MMOs and PAM. While MSS are content to support the use of ADDs without such a protocol, we welcome the opportunity to collect further evidence to support their use. We consider that such a protocol, with two stages, the first of which uses MMOs and PAM and the second of which uses ADDs, with MMOs and PAM to provide observations, will allow testing of the hypothesis that ADDs do in fact deter cetaceans and seals from the area around the pile driving activity. We consider that there may be value in carrying out such a procedure during a period when marine mammal (especially harbour porpoise) abundance is expected to be highest at the site. However, we recognise that MS-LOT may wish to see this test done early in the construction schedule to provide added confidence for the remainder of the piling campaign, and that the timing of these two variables may not coincide.

MSS also welcome the clarification of roles and responsibilities of those involved in managing the mitigation process.

### **Conclusion**

MSS support the use of BOWL's piling strategy as adequate mitigation against injury to EPS cetaceans. We do not consider that there is an outstanding risk of injury to cetaceans and would not advise that an EPS licence for injury is required.

The piling strategy will not mitigate against effects of disturbance, but MSS do not consider that disturbance as a result of construction activities at the BOWL site will affect the favourable conservation status of any of the species present. We therefore advise that an EPS licence should be granted for disturbance.

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