Beatrice Offshore Wind Farm

Phased Piling Mitigation Strategy

February 2016

Beatrice
Offshore Windfarm Ltd

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Beatrice Offshore Wind Farm Limited (BOWL)

Phased Piling Mitigation Strategy

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Executive Summary

This document sets out BOWL's proposed phased piling operations mitigation strategy at the Beatrice Offshore Wind Farm (the Wind Farm) over a period of up to 28 days, as recommended by MS-LOT. The phased mitigation comprises two stages: *Stage 1* follows the JNCC (2010) protocol as recommended in the 2010 guidelines for minimising the risk of injury to marine mammals from piling noise, requiring the use of marine mammal observers (MMOs); *Stage 2* follows the Piling Mitigation Protocol as set out in BOWL's Piling Strategy document with the addition of MMOs and a passive acoustic monitoring (PAM) operator to record a log of visual and acoustic detections of marine mammals during this stage. Following the phased mitigation period, mitigation will be applied whereby the Piling Mitigation Protocol will be followed for the remainder of the piling operations.

The effectiveness of the use of each mitigation method will be monitored throughout the relevant stages. Data collected over the first two stages of the phased mitigation period will be provided to MS-LOT in order to provide a summary of the observations made. The data collected will aim to provide a record of passive acoustic detections and sightings within each stage. Data will be presented to MS-LOT and MSS using the standard JNCC marine mammal data recording forms and as a report summarising the observations.

This document sets out the approach to be taken at Stages 1 and 2 of the phased mitigation period, including definition of the injury zone, personnel and equipment, data collected and reporting methods. This document therefore provides information on the phased approach to mitigation as requested by MS-LOT in their letter dated 2nd November 2015.

Table of Contents

1 Introduction

1.1 Background

BOWL submitted their draft Piling Strategy (BOWL, 2015) to Marine Scotland Licensing and Operations Team (MS-LOT) on 5th August 2015. Following consultation with the Joint Nature Conservation Committee (JNCC), Scottish Natural Heritage (SNH), Marine Scotland Science (MSS) and Whale and Dolphin Conservation (WDC) BOWL submitted a revised Piling Strategy on 2nd November (Ref. 003/OW/BOWL - 8). MS-LOT subsequently approved this Piling Strategy and discharged condition 12 of the Section 36 Consent and condition 3.2.2.5 of the Offshore Transmission Works Marine Licence. However, due to the different approach offered by the Piling Mitigation Protocol[1] available in Appendix D of the Piling Strategy compared with the draft JNCC (2010) protocol for mitigating injurious effects during piling, MS-LOT requested monitoring of the effectiveness of the use of Acoustic Deterrent Devices (ADDs) being offered in the Piling Strategy versus the use of MMOs. This monitoring should extend over a period, or periods of time, not exceeding 28 days with the outputs being reported to MS-LOT and MSS.

Following discussions with MS-LOT, BOWL noted in a letter dated 30th October 2015 (Ref. LF000005-LET-273) that they would implement mitigation that involves ADD deployment as well as MMOs and PAMs (in line with the draft JNCC (2010) protocol) over a period of time not exceeding 28 days , after which the Piling Mitigation Protocol would be implemented for the remainder of the piling operations. MS-LOT confirmed their acceptance of this proposal in their letter issued on 2nd November 2015. Over the phased piling mitigation period, BOWL also confirmed that during hours of darkness or low visibility, ADD and passive acoustic monitoring (PAM) will be used to ensure marine mammals are clear of the mitigation zone. ADDs have commonly been used in this manner alongside the JNCC (2010) protocol at other UK offshore wind farms.

1.2 Phased Approach

This document sets out the procedure for phasing and reporting on piling mitigation methods at the Wind Farm over the period of time not exceeding 28 days recommended by MS-LOT. *Stage 1* of the phased mitigation period will start by applying the draft JNCC (2010) protocol. *Stage 2* will be the application of the Piling Mitigation Protocol (Appendix D of the Piling Strategy: BOWL, 2015) with the addition of marine mammal observers (MMO) and PAM operators to record a log of visual and acoustic detections during the application of this mitigation.

The phased approach to mitigation during Stage 1 and Stage 2 at the Wind Farm is illustrated in Figure 1.

[1] The document "Protocol for mitigating the risk of instantaneous death or injury to marine mammals during piling at the BOWL and MORL Wind Farms" is referred to as the Piling Mitigation Protocol and was developed by BOWL, Moray Offshore Renewables Limited (MORL) and the University of Aberdeen. The implementation of the Piling Mitigation Protocol was approved in the Moray Firth Regional Advisory Group (MFRAG) Marine Mammal Subgroup. SNH, MSS, WDC), BOWL, MORL and Professor Paul Thompson voted for the implementation of the mitigation set out in the document. JNCC abstained from voting.

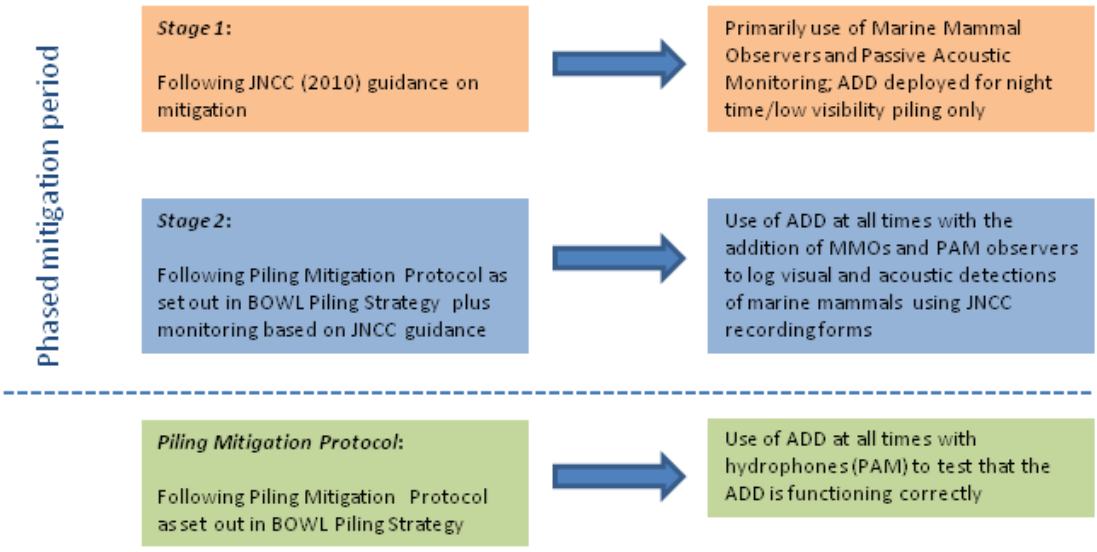

Figure 1 Phased approach to mitigation at the BOWL Offshore Wind Farm site

BOWL may decide that it is preferable to not implement the Phased Piling Mitigation Strategy at the start of piling operations if in its opinion conditions for data gathering will be better during a period of up to 28 days later in the piling campaign. In that event, BOWL will implement the Piling Mitigation Protocol described in Appendix D of the Piling Strategy (BOWL, 2015) before and after the application of the Phased Piling Mitigation Strategy.

During the implementation of the Piling Mitigation Protocol (BOWL, 2015), the ADD operator will visually scan the area surrounding the installation vessel for marine mammal presence/ absence prior to deploying the ADD. This will be completed up to twice a day on selected days or periods and only during daylight hours and when weather conditions are suitable for observation. Any additional factors to be taken into account in assessing suitable conditions for observation will be agreed with MS-LOT. In the event that a marine mammal is observed, this will be recorded and BOWL will continue with the mitigation measures and piling operations as set out in the Piling Mitigation Protocol.

Further detail for each stage of the Phased Piling Mitigation Strategy is presented in the following sections.

1.3 Timing and Scope of the Phased Mitigation Period

1.3.1 Timing

Several considerations may determine the most appropriate timing of implementing the Phased Piling Mitigation Strategy during the piling operations programme, including the following key items;

- Aligning it with the study developed to monitor the behavioural responses of harbour seal and harbour porpoise to ADDs as part of the construction Marine Mammal Monitoring Programme (cMMMP) developed by Professor Paul Thompson (University of Aberdeen), BOWL and MORL. The scope of this monitoring programme is being developed in consultation with the MFRAG Marine Mammal Subgroup;
- The likelihood of capturing information across wind turbine or Offshore Transformer Module (OTM) locations with varying anticipated maximum hammer energies (most importantly at locations where the anticipated hammer energy is highest);
- The time of year when marine mammals may be most abundant in the area; and
- The likely weather conditions, in particular visibility, prevalent during this period.

BOWL propose that the timing of implementing the Phased Piling Mitigation Strategy is determined following the completion of BOWL's detailed pre-construction pile driveability modelling to inform the installation programme and anticipated maximum hammer energies at each wind turbine and OTM location (as referred to in section 7.2.3 in BOWL's Piling Strategy). This modelling is likely to be completed in Quarter 2 or 3 in 2016. At this time the necessary information should be available to determine the most appropriate timing of implementing the Phased Piling Mitigation Strategy, with reference to the above criteria.

1.3.2 Scope

The scope of the Phased Piling Mitigation Strategy has been determined through discussions with the offshore construction engineers, Seaway Heavy Lifting (SHL), and Professor Paul Thompson, as the lead scientist for the construction MMMP. SHL provided information on the likely duration of each step in the foundation installation sequence and the number of wind turbines that could be installed within 28 days. On the basis that the Phased Piling Mitigation Strategy is implemented concurrently with the construction MMMP, Professor Paul Thompson provided an overview of the likely locations and duration of deployment of static acoustic recorders (C-PODs) as part of the monitoring of responses to ADD at the MFRAG Marine Mammal Subgroup meeting on 15th December 2015.

In order to ensure that sufficient data is collected, BOWL have specified a minimum of two foundations to be included in each Stage of the phased mitigation period (Stage 1 and Stage 2) should installation be delayed by weather down time or any other reason. In summary, the following rules will be applied to the phased mitigation period to ensure sufficient data is collected (and such that monitoring plans for marine mammals are not compromised should the two coincide);

- A minimum of two and maximum of three wind turbine or OTM foundations will be included within each Stage;
- The number of locations in each Stage of the phased mitigation period will be equal;
- The mitigation protocol at each Stage will be applied to complete foundations only i.e. mitigation will not be switched half way through the pile installation sequence at a single location;

- Stage 1 will end when a maximum of three wind turbine or OTM foundations have been completed, or when the 14th day is reached as long as the minimum of two complete foundations have been installed before that day;
- The phased mitigation period will end once an equal number of wind turbine or OTM foundations have been installed in each Stage (and this number is a minimum of two in each Stage), regardless of whether the duration is less than or more than the guideline 28 day period.

2 Stage 1: JNCC Approach to Mitigation

2.1 Overview

Although the draft JNCC (2010) protocol has been widely applied during the construction of offshore wind farms in the UK, there is considerable uncertainty as to the effectiveness of this mitigation in reducing the risk of injury (Herschel *et al.,* 2013). During Stage 1 of the test period for the Beatrice Offshore Wind Farm, data will be gathered by trained MMOs and a PAM operator in line with the draft JNCC (2010) protocol.

2.2 Roles and Responsibilities

2.2.1 MMOs

Two MMOs will be appointed by BOWL, and will be responsible for carrying out the pre-piling search, recording the observations on the JNCC marine mammal recording form, and liaising with the SHL Offshore Manager to advise whether a delay to piling is necessary if any marine mammals are detected. The MMO will be in direct contact with the SHL Offshore Manager and PAM/ADD Operator via radio.

The MMOs will be trained to JNCC standards as Marine Mammal Observers (by a JNCC approved course provider). The MMOs will have an appropriate level of field experience, including where possible, experience of offshore piling operations. BOWL will inform MS-LOT and the Statutory Nature Conservation Bodies (SNCBs) on the appointment of the MMOs.

2.2.2 PAM/ADD Operators

The PAM/ADD Operator, appointed by BOWL, will be responsible for deployment, maintenance and operation of the PAM hydrophone and ADD device, including spares. Two PAM/ADD Operators are required to cover shifts since the piling is scheduled to take place over a 24 hour working period. During each shift the PAM/ADD Operator will be supported by SHL vessel personnel, who can be trained *in situ*. The PAM/ADD Operator will be required to liaise with the SHL Offshore Manager and MMOs in order to confirm timings for piling operations and start of the 30 minute pre-watch period. The PAM/ADD Operator will be in direct contact with the SHL Offshore Manager and MMOs via radio. Any recordings of marine mammals using PAM can be communicated immediately to the SHL Offshore Manager to delay the commencement of soft start.

The PAM/ADD Operators will be suitably trained in passive acoustic monitoring and the use of PAMGuard with training provided by an appropriate organisation. The PAM/ADD Operators will have an appropriate level of field experience, including where possible, experience of offshore piling operations. BOWL will inform MS-LOT and the SNCBs on the appointment of the PAM/ADD Operators.

2.2.3 Offshore Manager and SHL Vessel Personnel

The Offshore Manager, employed by SHL, will be based on the heavy lift vessel (HLV) used to install the pile foundations. In consultation with the vessel's master, the Offshore Manager will be in

charge of all operations on the main deck, including piling operations. The Offshore Manager will be responsible for ensuring that piling operations are undertaken in a controlled, safe and efficient manner in line with the Piling Strategy and the Phased Piling Mitigation Protocol.

The PAM/ADD Operator will be assisted by SHL vessel personnel on the HLV for the deployment of the PAM and ADD device.

2.3 Mitigation Zone

A mitigation zone of 500 m radius will be established around the piling location. This exceeds the instantaneous injury zone for harbour porpoise of 60m for the initial hammer energy of 300 kJ employed during soft start (see Section 4.2).

2.4 Soft Start

Soft start piling will be undertaken as per the procedure detailed in BOWL's Piling Strategy (BOWL, 2015). This procedure commences with five to six blows (~1 blow per 10 seconds) at as low an energy as possible (≤ 300 kJ). Soft start continues with blows at an increased frequency (~1 blow per 2 seconds) starting at an energy of ≤ 300 kJ and not exceeding 500 kJ over a duration of 20 minutes. After the 20 minutes has elapsed the hammer energy will ramp up as required for each location to achieve pile movement of ~2.5 cm per blow, with the maximum energy no greater than 2,300 kJ.

2.5 Approach

2.5.1 Daylight hours

During daylight hours mitigation will be achieved through visual observations using two suitably trained, dedicated MMOs located on the bridge of the installation vessel, which will give a 360^{o} view of the 500m mitigation zone. Observations, including species present, number of animals, distance and behaviour, will be recorded using the JNCC Marine Mammal Recording Forms. Further detail on reporting is provided in Section 6 below. Acoustic detection of cetaceans will be undertaken by a suitably trained, dedicated PAM/ADD Operator who will be located on the deck of the installation vessel in order to manage the computer interface of the PAM system using PAMGuard software. The PAMGuard software will be used to record the vocalisations of cetaceans and these then saved as a .wav file as a log. These detections will also be logged by the PAM/ADD Operator using the JNCC Recording form. Section 6 of Appendix C in BOWL's Piling Strategy (BOWL, 2015) provides detail on the possible locations of the computer station on board the *Stanislav Yudin*, the piling vessel that has been specified for the offshore piling phase.

Visual and acoustic detection will be undertaken over a 30 minute period prior to the start of soft start piling. If a marine mammal is detected within the 500 m mitigation zone during this pre-piling visual and acoustic detection period, the start of soft start piling will be delayed until a period of 20 minutes has elapsed after the last visual or acoustic detection within the mitigation zone. Any animals detected will be observed to ensure that they have left the mitigation zone prior to the start of soft start piling.

If a marine mammal is detected within the 500 m mitigation zone during the soft start, the soft-start will continue at the same hammer energy until the marine mammal has left the mitigation zone and no detections are made for a further 20 minutes, after which time piling may continue to ramp up to the maximum rate required to install the pile at a rate of ~2.5 cm per blow.

Following completion of the soft start, the MMOs and PAM/ADD Operator will continue to record detections during piling operations in the event that a break in piling occurs and they are required to communicate to the Offshore Manager whether piling soft start can commence (if no marine mammal is detected) or whether the pre-watch must be repeated (if marine mammal is present) (see Section 2.6).

2.5.2 Night time/low visibility

During night time or hours of low visibility, mitigation will be undertaken acoustically by the PAM/ADD Operator through the computer interface using PAMGuard software. Acoustic detection will commence 30 minutes prior to the start of soft start piling. The PAMGuard software will be used to record the vocalisations of cetaceans and these then saved as a .wav file as a log. These detections will also be logged by the PAM/ADD Operator using the JNCC Recording form. During the acoustic detection period (and regardless of whether a marine mammal is present) the ADD will be activated for a period of 15 minutes (to be consistent with the Piling Mitigation Protocol) prior to the start of soft start piling. The PAM/ADD Operator will be responsible for managing the computer interface when the ADD is activated to ensure the device is working correctly. Soft start piling will not commence until the ADD has functioned correctly for a period of 15 minutes.

If a cetacean is detected within the mitigation zone during the pre-piling acoustic detection period (either before or after the ADD is deployed), the start of soft start piling will be delayed until a period of 20 minutes has elapsed after the last acoustic detection. The ADD device will continue to be activated during this period. The PAM/ADD Operator will ensure that no further vocalisations are detected prior to the start of soft start piling.

If a marine mammal is detected within the 500 m mitigation zone during the soft start, the soft-start will continue at the same hammer energy until the marine mammal has left the mitigation zone and no detections are made for a further 20 minutes, after which time piling may continue to ramp up to the maximum rate required to install the pile at a rate of ~2.5 cm per blow.

Following completion of the soft start, the PAM/ADD Operator will continue to record detections during piling operations in the event that a break in piling occurs and they are required to communicate to the Offshore Manager whether piling soft start can commence (if no cetacean is detected) or whether the pre-watch must be repeated (if cetacean is present) (see Section 2.6).

2.6 Planned and Unplanned Breaks

The JNCC (2010) guidelines recommend that where there is a pause in piling for greater than 10 minutes, the pre-piling 30 minute search using MMOs and PAM will be repeated before piling recommences. If, however, the MMO and PAM/ADD Operator have continued to record detections

during the piling operation they will be able to confirm the presence or absence of marine mammals and it may therefore be possible to commence the soft start immediately.

Since the approach to be employed in Stage 1 will include ongoing detections during piling operations, the MMO and PAM/ADD Operator will continue to communicate with the Offshore Manager during a break in piling to advise whether the soft start can commence immediately. The soft start following a break in piling will be undertaken following the approach described in Section 2.4.

2.7 Task Plan

A task plan has been prepared in order to aid communications between the Offshore Manager and the marine mammal team (MMOs and PAM/ADD Operator). This task plan sets out the sequence of events required to apply the JNCC (2010) protocol for mitigation during daylight hours (Figure 2) and during night time/low visibility (Figure 3).

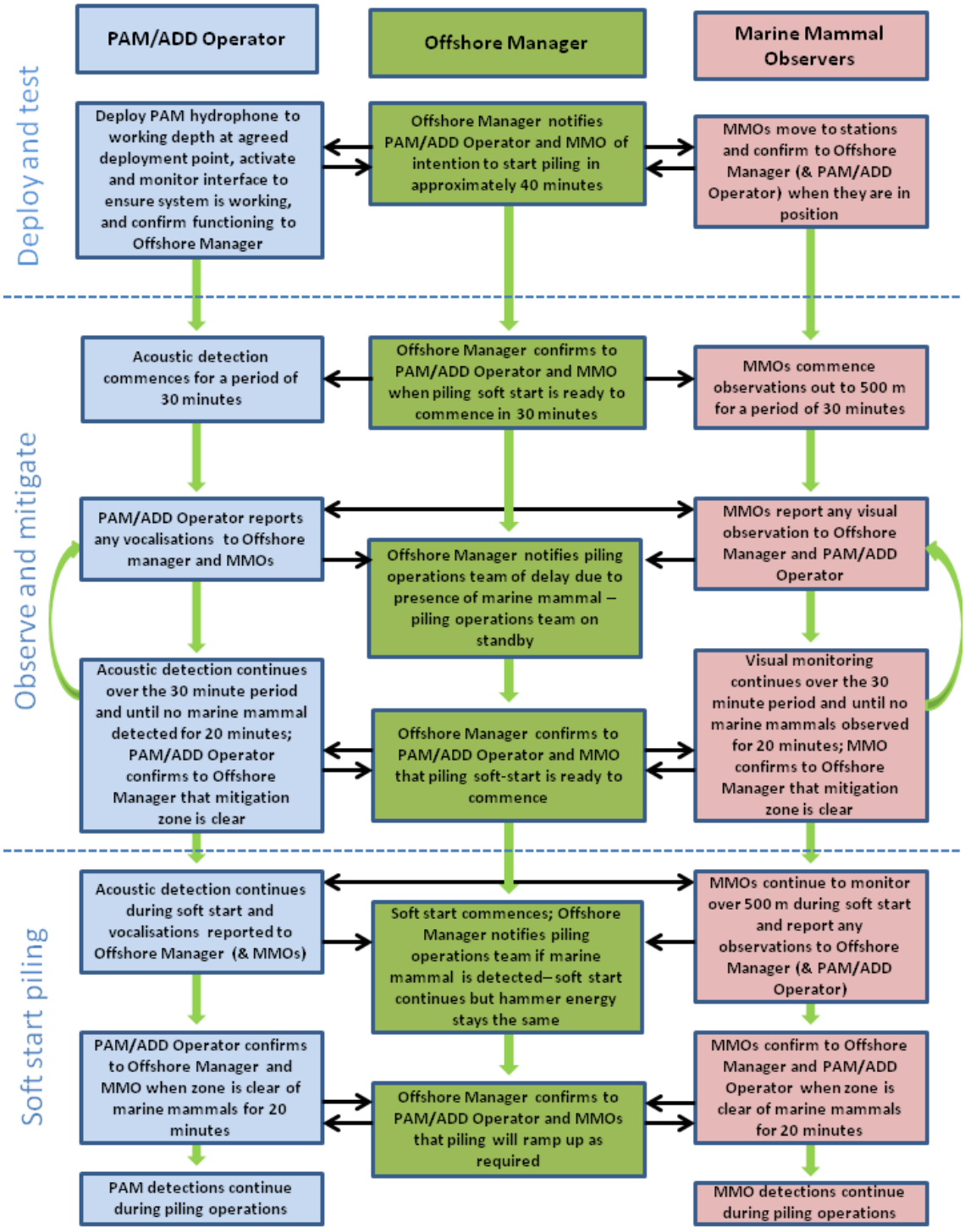

Figure 2 Task plan for applying the JNCC (2010) protocol during daylight hours for Stage 1 of the phased mitigation period.

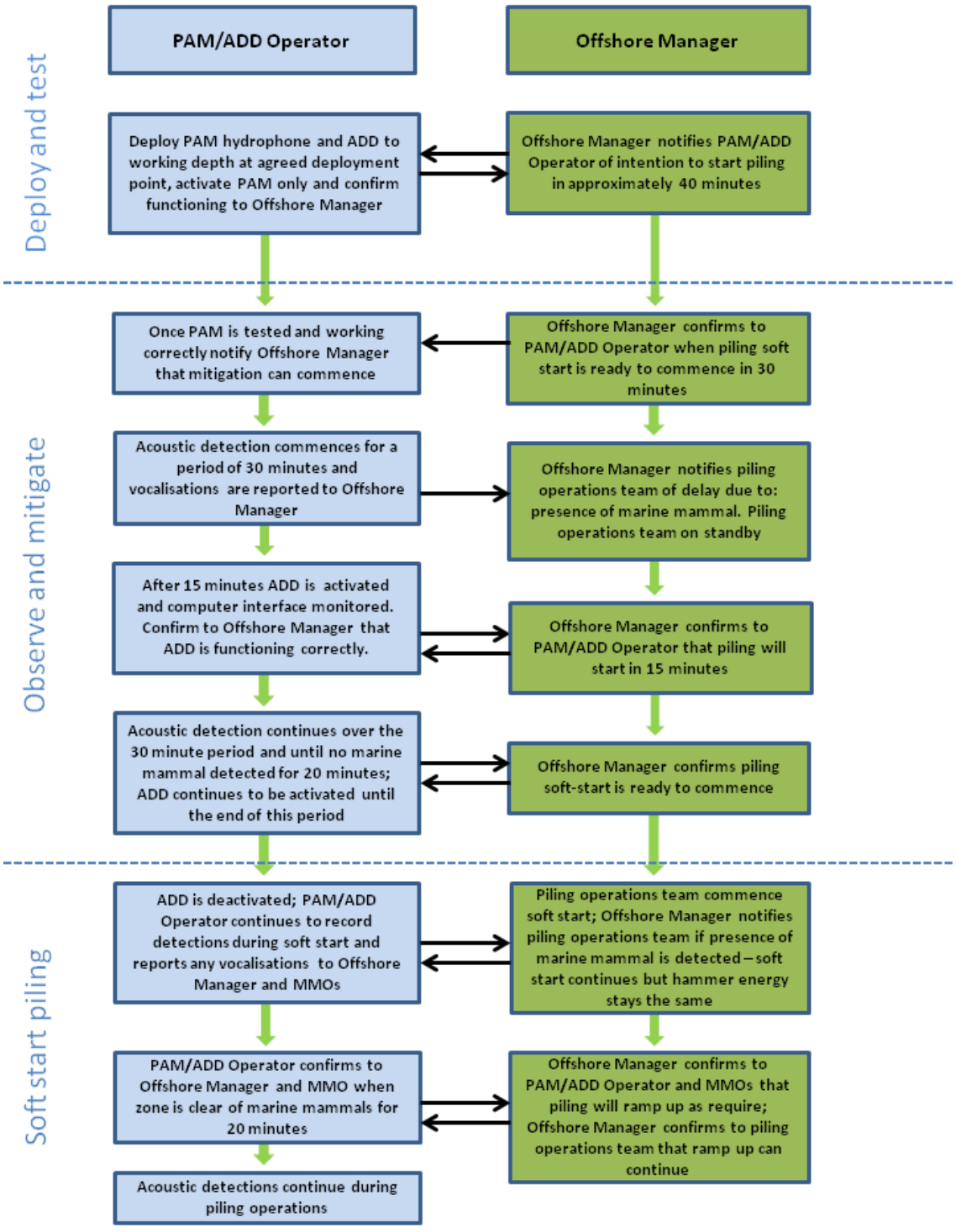

Figure 3 Task plan for applying the JNCC (2010) protocol during night time/low visibility hours for Stage 1 of the phased mitigation period.

3 Stage 2: Piling Mitigation Protocol with MMOs and PAM

3.1 Overview

Stage 2 of the phased mitigation period will be the application of the BOWL Piling Mitigation Protocol with the addition of MMOs and PAM. The key differences between Stage 1 and Stage 2 mitigation are summarised in Box 1 below.

Box 1 - Summary and Key Differences from Stage 1 Mitigation

- An ADD will be deployed for 15 minutes into the 30 minute PAM and MMO pre-watch (i.e. 15 minutes prior to soft start piling commences) every time, also during the day/ good visibility.
- If, during the 30 minute PAM detection and MMO pre-watch (including the 15 minute ADD deployment) a marine mammal is detected within the 500 m mitigation zone, soft-start will commence as planned, unless a marine mammal is observed within the 60 m injury zone. In this unlikely event the ADD will continue to be activated and soft start will be delayed until it is assessed by the MMOs and/ or PAM/ ADD Operator that the marine mammal has vacated this 60 m injury zone.
- If, during soft start a marine mammal is observed or detected within the 500 m mitigation zone, soft-start will continue as planned.
- The PAM/ADD Operator and MMOs will continue to note detections and observations on the animals' behaviour during the soft start procedure.

3.2 Roles and Responsibilities

3.2.1 MMOs

The MMOs, appointed by BOWL, will be responsible for carrying out the pre-piling observations and recording the observations on the JNCC marine mammal recording form. In this stage of the phased mitigation period there is no requirement to delay piling if a marine mammal is sighted in the 500 m mitigation zone (unless a marine mammal is observed within the 60m injury zone – see sections 3.5 and 3.6 for further information). The MMOs will continue to note observations on an animals' behaviour during the soft start procedure. The MMO will be in direct contact with the SHL Offshore Manager and PAM/ADD Operator via radio.

The MMOs will be trained to JNCC standards as Marine Mammal Observers (by a JNCC approved course provider). The MMOs will have an appropriate level of field experience, including where possible, experience of offshore piling operations. BOWL will inform MS-LOT, MSS and the SNCBs on the appointment of the MMOs.

3.2.2 PAM/ADD Operator

The PAM/ADD Operators, appointed by BOWL, will be responsible for deployment, maintenance and operation of the PAM hydrophone and ADD device, including spares. Two PAM/ADD Operators are required to cover shifts since the piling is scheduled to take place over a 24 hour working period.

During each shift the PAM/ADD Operator will be supported by SHL vessel personnel, who can be trained *in situ*. The PAM/ADD Operator will be required to liaise with the SHL Offshore Manager and MMOs in order to confirm timings for piling operations and start of the 30 minute pre-watch period. The PAM/ADD Operator will be in direct contact with the SHL Offshore Manager and MMOs via radio.

In this stage of the phased mitigation period there is no requirement to delay piling if a cetacean is detected in the 500 m mitigation zone (unless it is considered that the cetacean could be within a distance of approximately 60 m – see sections 3.5 and 3.6 for further information). The PAM/ ADD Operator will continue to note detections of cetaceans in the 500m zone during the soft start procedure.

The PAM/ADD Operators will be suitably trained in passive acoustic monitoring and ADDs and the use of PAMGuard software with training provided by an appropriate organisation. The PAM/ADD Operators will have an appropriate level of field experience, including where possible, experience of offshore piling operations. BOWL will inform MS-LOT, MSS and the SNCBs on the appointment of the PAM/ADD Operators.

3.2.3 Offshore Manager and SHL Vessel Personnel

The Offshore Manager, employed by SHL, will be based on the heavy lift vessel (HLV) used to install the pile foundations. In consultation with the vessel's master, the Offshore Manager will be in charge of all operations on the main deck, including piling operations. The Offshore Manager will be responsible for ensuring that piling operations are undertaken in a controlled, safe and efficient manner in line with the Piling Strategy and the Phased Piling Mitigation Protocol.

The PAM/ADD Operator will be assisted by SHL vessel personnel on the HLV for the deployment of the PAM and ADD.

3.3 Mitigation Zone

A mitigation zone of 500 m radius will be established around the piling location. This exceeds the instantaneous injury zone for harbour porpoise of 60 m for the initial hammer energy of 300 kJ employed during soft start (see Section 4.2).

3.4 Soft Start

Soft start piling will be undertaken following the procedure detailed in BOWL's Piling Strategy (BOWL, 2015). This procedure has been summarised in Section 2.4 of this document.

3.5 Approach

3.5.1 Daylight hours

During daylight hours visual observations will be recorded by two suitably trained, dedicated MMOs located on the bridge of the installation vessel, which will give a 360^{o} view of the 500m mitigation zone. Observations including species present, number of animals, distance and behaviour will be recorded using the JNCC Marine Mammal Recording Forms. Further detail on reporting is provided

in Section 6 below. Acoustic detection and deployment of the ADD will be undertaken by a suitably trained, dedicated PAM/ADD Operator who will be stationed in an appropriate location in order to monitor the computer interface of the PAM system. The PAMGuard software will be used to record the vocalisations of cetaceans and these then saved as a .wav file as a log. These detections will also be logged by the PAM/ADD Operator using the JNCC Recording form. Section 6 of Appendix C in BOWL's Piling Strategy (BOWL, 2015) provides detail on the possible locations of the computer station on board the *Stanislav Yudin* piling vessel.

Visual and acoustic observations and detections will be undertaken over a 30 minute period prior to the start of soft start piling. Fifteen minutes into this pre-watch period the ADD device will be deployed at an appropriate depth and location (see Appendix C of the Piling Strategy: BOWL, 2015) by the PAM/ADD Operator and the system activated. The PAM/ADD Operator will monitor the ADD functioning via the computer interface (using the PAMGuard software). Any malfunctions will be reported immediately to the Offshore Manager and the start of piling will be delayed while the back-up device is deployed, tested and verified to be working correctly. Once functioning correctly, the ADD device will be deployed for a period of 15 minutes, as agreed with MS-LOT, MSS and the SNCBs for the Piling Mitigation Protocol (Appendix D of the Piling Strategy: BOWL, 2015).

If, during the 30 minute MMO pre-watch and 15 minute ADD deployment a marine mammal is detected within the 500 m mitigation zone, soft-start will continue as planned unless a marine mammal is observed or acoustically detected within the 60 m injury zone. In the unlikely event that this occurs, the MMOs and/or PAM / ADD Operator will notify the SHL Offshore Manager via hand held radio that soft start should be delayed and the ADD will continue to be activated until it is assessed by the MMOs and/or PAM/ADD Operator that the marine mammal has vacated the 60 m injury zone. The PAM/ADD Operator and MMOs will continue to detect vocalisations and observe the animals' behaviour in the 500m zone throughout the pre-watch and also during the soft start procedure.

3.5.2 Night time/low visibility

During night time or hours of low visibility, mitigation will be undertaken acoustically by the PAM/ ADD Operator through the computer interface using PAMGuard software. Acoustic detection will commence 30 minutes prior to the start of soft start piling. The PAMGuard software will be used to record the vocalisations of cetaceans and these then saved as a .wav file as a log. These detections will also be logged by the PAM/ADD Operator using the JNCC Recording form. During the acoustic detection period (and regardless of whether a marine mammal is present) the ADD will be activated for a period of 15 minutes (to be consistent with the Piling Mitigation Protocol) prior to the start of soft start piling. The PAM/ADD Operator will be responsible for managing the computer interface when the ADD is activated to ensure the device is working correctly. Soft start piling will not commence until the ADD has functioned correctly for a period of 15 minutes. Any malfunctions will be reported immediately to the Offshore Manager and the start of piling will be delayed while the back-up device is deployed, tested and verified to be working correctly. Once functioning correctly,

the ADD device will be deployed for a period of 15 minutes, as agreed with MS-LOT, MSS and the SNCBs for the Piling Mitigation Protocol (Appendix D of the Piling Strategy: BOWL, 2015).

If a cetacean is detected during this period the PAM/ADD Operator notes this as a record but no further action is taken to delay the start of soft start piling, unless it is considered that the cetacean could be within a distance of approximately 60 m. [2] In this case it will be communicated to the SHL Offshore Manager via hand held radio that soft start should be delayed and the ADD will continue to be activated until the cetacean is assessed by the PAM/ADD Operator to be beyond the 60 m injury zone. The PAM/ADD Operator will continue to record acoustic detections during the pre-watch and during the piling soft start.

3.6 Planned and Unplanned Breaks

The procedure for planned and unplanned breaks has been illustrated in Figure 10.1 and Appendix D of the Piling Strategy (BOWL, 2015). If the break during piling exceeds 2.5 hours, the PAM/ADD Operator and MMO will cease observations until such a time that the Operations Manager can notify them that piling will re-commence in ~40 minutes. At this point the approach described above (Section 3.5) will be repeated including the pre-watch observations and detections required as part of Stage 2. If the break is less than 2.5 hours the PAM/ADD Operator will liaise with the Offshore Manager and the ADD will be deployed for 10 minutes prior to piling re-start. In the unlikely event that a marine mammal is observed within the 60m injury zone, the MMOs and/ or PAM / ADD Operator will communicate this to the SHL Offshore Manager via hand held radio. The ADD will continue to be deployed and piling will be delayed until it is assessed by the MMOs and/or PAM/ADD Operator that the marine mammal has vacated the zone. Piling will be initiated with 5 – 6 single blows at low energy after which time the hammer energy will be ramped up to the levels required to maintain pile movement at approximately 2.5 cm/blow (Section 5 of the Piling Mitigation Protocol (Appendix D in the Piling Strategy; BOWL, 2015)).

3.7 Task Plan

A task plan has been prepared in order to aid communications between the Offshore Manager and the marine mammal team (MMOs and PAM/ADD Operator). This task plan sets out the sequence of events required to apply the Piling Mitigation Protocol with the addition of MMOs and PAM during daylight hours (Figure 4). The task plan for the sequence of events for night time/low visibility piling is the same with the exception of the MMOs, who will not be present during this time.

[2]Exact distances can not be measured during acoustic detections but it will be possible to estimate these by undertaking a ground truthing exercise during daylight hours to match the strength of the vocalisations displayed on the computer interface with the distances estimated by the MMOs during visual observations.

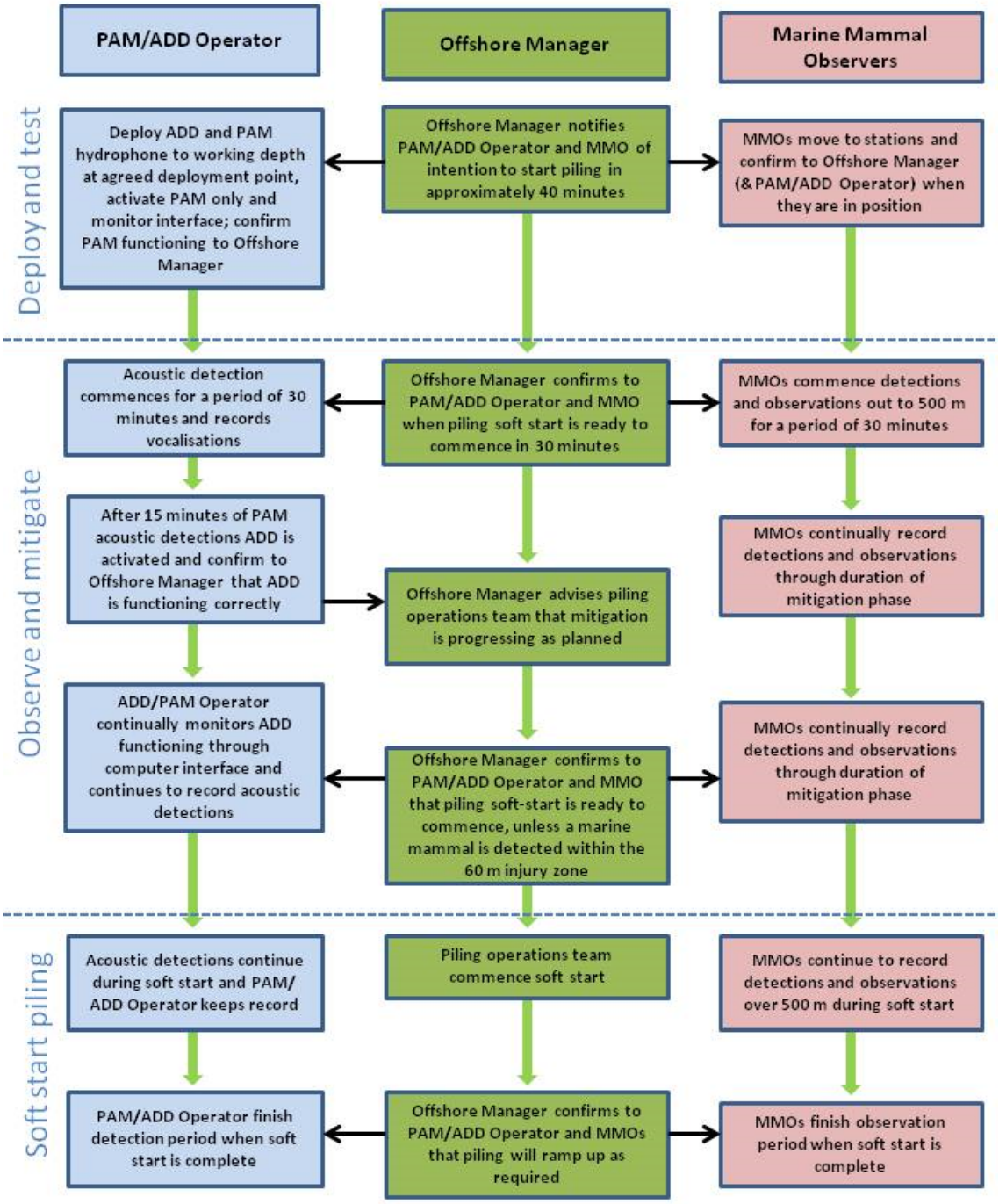

Figure 4 Task plan for applying The Piling Mitigation Protocol with PAM and MMOs during daylight hours for Stage 2 of the phased mitigation period.

4 Piling Mitigation Protocol

4.1 Overview

Following the completion of the phased mitigation period BOWL will implement the Piling Mitigation Protocol as described in Appendix D of BOWL's Piling Strategy document (BOWL, 2015).

4.2 Mitigation Zone

The mitigation zone assessed in the Piling Mitigation Protocol is 60 m, based on the instantaneous injury zone for harbour porpoise at the soft start hammer energy of 300 kJ. The injury zone was predicted by the CEFAS noise modelling assessment undertaken for the Piling Mitigation Protocol (Appendix D in the Piling Strategy: BOWL, 2015).

4.3 Approach

The Piling Mitigation Protocol is described in full in Appendix D of the Piling Strategy (BOWL, 2015). Further detail on the ADD deployment protocol is provided in Appendix C of the Piling Strategy (BOWL, 2015), including: 1) the technical specification of the Lofitech device and depth of deployment, 2) effectiveness of the Lofitech device, 3) role and training of the ADD Operator, 4) testing the ADD functioning, 5) task plan for communication (and what to do in planned and unplanned breaks), 6) storage and location of deployment on board the *Stanislav Yudin*, and 7) reporting methods.

4.4 Planned and Unplanned Breaks

The procedure for planned and unplanned breaks of less than 2.5 hours and more than 2.5 hours has been illustrated in Figure 10.1 and Appendix D of the Piling Strategy (BOWL, 2015).

4.5 Soft Start

Soft start piling will be undertaken following the procedure detailed in Appendix D of BOWL's Piling Strategy (BOWL, 2015). This procedure has been summarised in Section 2.4 of this document.

4.6 Task Plan

The task plan showing the sequence of events described in this protocol is provided below (Figure 5).

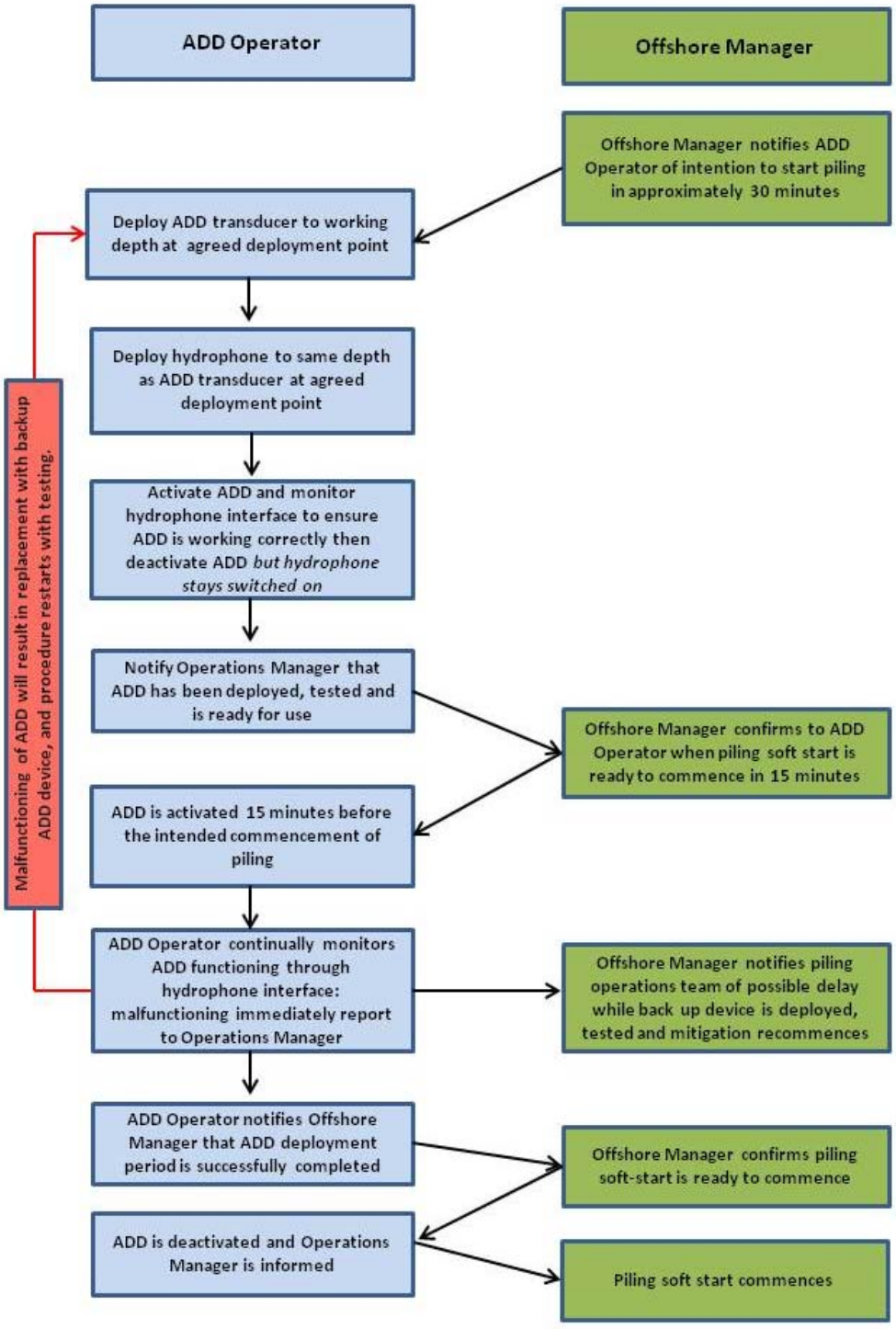

Figure 5 Task plan for undertaking mitigation using ADDs following the procedure described in the Piling Mitigation Protocol.

5 Equipment

5.1 MMOs

MMOs will be equipped with binoculars, a range finding stick and the JNCC Marine Mammal Recording Forms.

5.2 PAM

The PAM equipment will comprise a single hydrophone, calibrated in the laboratory in order to test the sensitivity of the system and ensure repeatability with the construction MMMP. The hydrophone will also be used to monitor the functioning of the ADD device. A spare hydrophone will be carried on board the vessel in the event of equipment failure.

5.3 ADD

The device identified in BOWL's Piling Strategy for carrying out the Piling Mitigation Protocol is the Lofitech Seal Scarer (Lofitech AS, Leknes, Norway). The specification of this device is described in full in Appendix C of the Piling Strategy (BOWL, 2015). A single device will be used for mitigation, although a spare ADD device and spare batteries will be carried on board the vessel in the event of equipment failure.

6 Reporting

During the phased mitigation period (Stages 1 and 2), BOWL propose to report to MS-LOT and MSS on the mitigation described in this Phased Piling Mitigation Strategy on a weekly basis. This reporting will include the following information as set out in the JNCC (2010) guidance;

- JNCC Marine Mammal Reporting Forms completed by the MMOs, including information on any species present, number of animals, distance from installation vessel and behaviour during pre-piling watches (including during soft start piling and ADD deployment in Stage 2);
- Details of PAM equipment used, recording of detections using PAMGuard supplied as .wav files, log of acoustic detections in JNCC Marine Mammal Reporting Form completed by the PAM/ADD Operator, including information on time and location of detection and species or species group;
- Marine Mammal Reporting Forms completed by the MMO and PAM/ADD Operator will be compiled to determine any duplicate detections (this may assist in calibrating the distance of acoustic detections);
- Date and location of the piling operations and details of the piling activity;
- A record of all occasions when piling occurred, including details of the duration of the pre-piling search and soft-start procedures, and any occasions when piling activity was delayed or stopped due to presence of marine mammals;
- Details of the Acoustic Deterrent Device (ADD) used, and any relevant observations on its efficacy (as set out in the JNCC (2010) protocol); and
- Details of any problems encountered during the piling process including instances of non-compliance with the Piling Mitigation Protocol and this Phased Piling Strategy (as set out in the JNCC (2010) protocol).

Upon completion of the Phased Piling Mitigation Strategy (Stages 1 and 2), BOWL will provide any raw observational data that has not been provided as part of the data listed above to MS-LOT, and a report summarising the observations made. Further to this BOWL will propose a meeting with MS-LOT and MSS no later than three working days before the end of Stage 2 of the Phased Piling Mitigation Period to review the data collected to date and the summary report. This will however not delay BOWL in progressing piling operations in line with BOWL's Piling Strategy (BOWL 2015).

BOWL's Piling Strategy (Section 13; BOWL 2015) sets out the method of reporting during the implementation of the Piling Mitigation Protocol.

7 References

BOWL (2015). Beatrice Offshore Wind Farm Consent Plan: Piling Strategy. November 2015.

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.

JNCC (2010) Statutory Nature Conservation Agency Protocol for Minimising the Risk of Injury to Marine Mammals from Piling Noise. August 2010.

Thompson, P. (2015) A strategic regional Marine Mammal Monitoring Programme for assessing the population consequences of constructing the BOWL and MORL wind farm developments. 20th May 2015.