Document Details

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Prepared by	[Redacted]	Dragados	9/8/18	
Reviewed by	[Redacted]	Dragados	9/8/18	
Approved by	[Redacted]	Dragados	9/8/18	

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1. Introduction

The following document describes the methodology and environmental mitigations for underwater rock drilling, blasting and rock dredging and disposal works which form part of the Aberdeen Harbour Expansion Project (AHEP). The works are to be carried out by WASA Dredging on behalf of Dragados UK Ltd,

2. European Protected Species Legislation

All drilling blasting and disposal works will comply with the following European Protected Species Legislation, Marine Licensing, and requirements detailed in the current approved CEMD 2017 and the AHEP Harbour Revision Order

All species of cetacean are listed on Annex IV of the Habitats Directive (92/43/EEC), the Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (The Habitats Directive), that requires they are offered strict protection from: all forms of deliberate capture, killing or disturbance, particularly during the period of breeding, rearing, hibernation or migration; and deterioration and destruction of breeding sites or resting places. There is also an obligation to establish a system to monitor incidental capture and killing of cetaceans.

The Habitats Directive has been transposed into domestic law via secondary legislation including:

- Conservation (Natural Habitats, &c.) Regulations 1994 (as amended);
- Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2012 in relation to the terrestrial environment and in territorial waters out to 12 nautical miles (nm). These are often referred to as the 'Habitats regulations';
- Offshore Marine Conservation (Natural Habitats, &c.) (Amendment) Regulations 2010 (SI 2010/491) (the '2010 Regulations'), which amend the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (SI 2007/1842) (these are often referred to as the 'Offshore Marine Regulations') and apply to UK territorial waters outside 12 nm; and
- The Wildlife and Natural Environment (Scotland) Act (2011), WANE.

These pieces of legislation define two offences relating to European Protected Species (including marine mammals); deliberate injury and deliberate disturbance, as well as refining the circumstances in which disturbance may be particularly damaging to the animals concerned (as envisaged by Article 12 of the Directive). In addition, the amendments also provide for the offence of deliberate injury.

Under Regulations 39(1)(a) and (b) of the Habitats Regulations (as amended) for activities within Scottish inshore waters (12 nm) (MS 2014), it is an offence to:

(a) Deliberately or recklessly to capture, injure, or kill a wild animal of a European protected species;
(b) deliberately or recklessly:
i. to harass a wild animal or group of wild animals of a European protected species;
ii. to disturb such an animal while it is occupying a structure or place which it uses for shelter or protection;
iii. to disturb such an animal while it is rearing or otherwise caring for its young;
iv. to obstruct access to a breeding site or resting place of such an animal, or otherwise to deny the animal use of the breeding site or resting place;
v. to disturb such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs;

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vi. to disturb such an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young; or
vii. to disturb such an animal while it is migrating or hibernating.

Regulation 39(2) provides that it is an offence to:
• Deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean).

Furthermore, it is an offence of strict liability to damage or destroy a breeding site or resting place of such an animal (SNH 2014a).

All of the above offences apply to all stages of the animal's life to which they apply (SNH 2014a).

2.1. Licensing

- MARINE (SCOTLAND) ACT 2010, PART 4 MARINE LICENSING; LICENCE TO CONSTRUCT,ALTEROR IMPROVE WORKS AND TO DEPOSIT OR USE EXPLOSIVE SUBSTANCES OR ARTICLES WITHIN THE SCOTTISH MARINE AREA- Licence Number 05965/16/0

- MARINE (SCOTLAND) ACT 2010, PART 4 MARINE LICENSING; LICENCE TO CARRY OUT DREDGING AND TO DEPOSIT DREDGED SPOIL SUBSTANCES OR OBJECTS WITHIN THE SCOTTISH MARINE AREA –License Number 05964/18/0

- Marine Scotland European Protected Species License –MSEPS 06/2018/0 25 March 2018

- Aberdeen Harbour Revision Order May 2016

2.2. CEMD

Chapter 3 – Construction Method Statement

Chapter 7 –Dredging & Dredge Spoil Disposal Management & Monitoring Plan

Chapter 8 –Fish Species Protection Plan

Chapter 11 – Marine Mammal Mitigation Plan

Chapter 13 – Noise and Vibration Management Plan

Chapter 15 – Pollution Prevention Plan

Chapter 17 – Vessel Management Plan

2.3. Associated Method Statements & Guidance Documents

This method statement should also be read in conjunction with the following;

- Aberdeen Harbour Expansion Project (AHEP) –Underwater Noise + Passive Acoustic Monitoring Procedure, July 2018, Eco Fish Global.
- Bubble Curtain Set Up

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3. Scope of Works

The scope of works covers drilling, blasting and dredging of material in the following areas in the Northern area of Nigg Bay, including areas for the North & East caisson quay trenches, and the southern shore areas, including the southern Break Water Trenches, as per the approved EPS Licence 2018 (Figure 3.1 Rock Blasting Zones North & South).

As per Figure 3.1 which is the final definitive version, the blasting/rock dredging area has increased slightly and was as discussed with MS-LOT during the EPS licence application stage. The volume of rock has not been amended (the maximum volume of rock to be removed will not exceed 250,000m^3). This does not impact upon the conclusions of the AHEP Environmental Statement or the Habitats Regulations Assessment given that the area of rock to be dredged/blasted was not used as an assessment parameter in either. In terms of the EIA process, whilst the area of rock to be removed may have changed, it does not extend further east than previously, meaning that any underwater noise generated is within the parameters modelled in the AHEP ES (See AHEP ES, Chapter 15, Figure 15.24).

Figure 3.1 - Rock Blasting Zones – North and South (Final Definitive Blasting Areas)

The drilling and dredging works will be carried out 24 hours per day, 7 days per week except for blasting which shall only be carried out in daylight hours between 7am and 7pm on weekdays, between 7 am and 4 pm on Saturdays and no blasting on Sundays.

The blasted material from the blasting of the bedrock will be placed in split hopper barges, these barges will dispose the blasted rock in the South Breakwater core or elsewhere within the site, disposal up to the level of CD -4.00 or higher if possible.

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3.1. Schedule of the Works

Drilling, blasting, and dredging of blasted bedrock shall not start on site until this method statement and the Underwater Noise and Passive Acoustic Monitoring Procedure has been approved by MS-LOT. Works will commence in the northern area first followed by the southern areas including the southern breakwater trenches.

The rock blasting and dredging in 2018 will be executed using 2 no of drill / dredge pontoons, each equipped with 1 drill tower and 1 marine excavator (backhoe). There will also be 2 split hopper barges either self-propelled or assisted by a tug.

During periods of favourable weather, one or both of the units will drill, blast and dredge on the South side. South Breakwater Drilling and Blasting shall be carried out during the summer time to take the benefit of the calm wave periods.

Explosives will be used below the seabed to fracture rock to allow the backhoe dredger to remove it for reuse. When blasting occurs the following conditions will be adhered to:

a. Blasting is restricted to daylight hours unless during exceptional circumstances, this could be for Health & Safety reasons, delays to blasting due to weather or marine mammals being present or coming into the exclusion zone once charges have been set. Charges will not be set unless there is a high confidence that they can be detonated in daylight hours.

b. A process to record and report, in writing to the licensing authority, within 48 hours, instances where blasting has occurred, out with daylight hours, due to exceptional circumstances as detailed in point a above.

c. The minimum amount of blasting will be undertaken using the smallest practicable charge. Any increase in charge size above 20kg needs to be agreed by MS-LOT. During the test blasting, the first blast on day 1 will be a reduced charge size of 10 kg and all other blasts will be 20kg. If adverse effects on marine mammals are observed by the MMOs, MS-LOT will be notified immediately.

d. Blasting will only occur behind a double bubble curtain which will be located in two different layouts to attenuate any blasting noise reaching ‘open water.’ One layout stretches from the south of Nigg Bay to North Breakwater and the other from the southern shore of Nigg Bay, southwards which will form an arc around the South Breakwater trench areas. In the northern area blast will also be behind the partially completed North Breakwater, (Figure 3.2 locations of Bubble Curtain)

e. Due to the operating limits of the Drill & Blast vessels, blasting will not occur during bad weather, if wave heights are greater than 0.5m. Blasting will not take place in a Beaufort Sea State greater than 3 (unless agreed otherwise with MS-LOT) due to the efficacy of the MMO and PAM mitigation measures. T

f. No Blasting shall be carried out within 100m of the Nigg Bay SSSI until the revised CEMD, including the Nigg Bay SSSI Management Plan has been approved.

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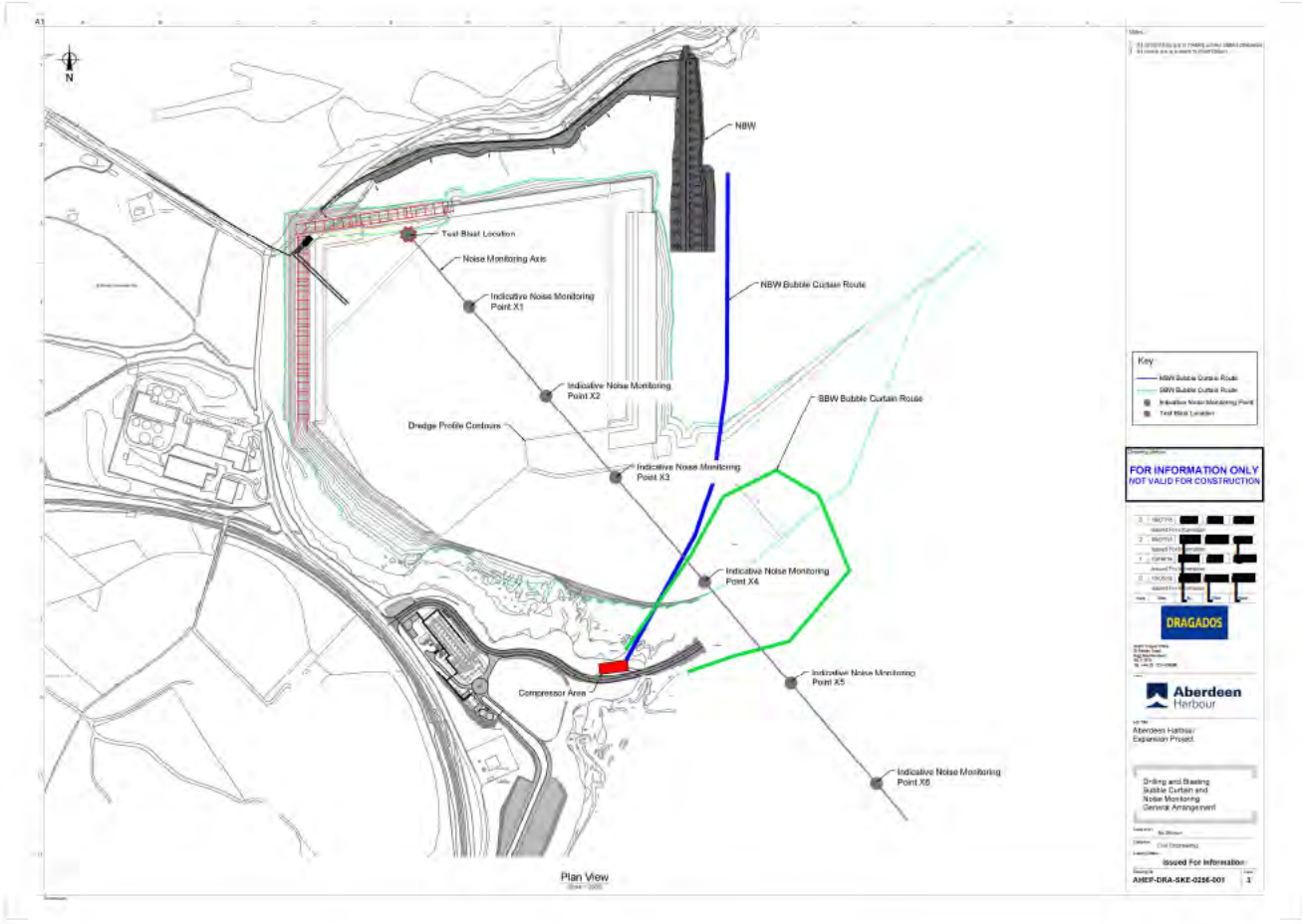

Figure 3.2 Locations of Bubble Curtain North and South Nigg Bay

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3.2. Vessels

In order to carry out the dredging rock works at Nigg Bay, Wasa Dredging Ltd. will use the following equipment:

- Backhoe Dredger/ Drill Platform “Hector” 250 ton excavator Hitachi EX 2500/6
- Backhoe Dredger/ Drill Platform “Boulder” 120 ton excavator Hitachi EX 1200
- Two split hopper barges 900-1000 m3, either self propelled (SP) or non self-propelled (NSP)
- One or 2 tugboats, to serve the barges

The pontoons and drill towers are both equipped with the latest technology, including a Top-hammer Rock Drill Sandvik Tamrock HL 1540. For drilling, 60 mm drill rods are used to drill holes in diameter ranging from 92 to 126 mm.

Boulder and Hector will alternately drill and dredge, however it is foreseen that Boulder will be used in drilling mode most of the time, whereas Hector will give priority to the dredging. Transportation of rock will be by the split hopper barges, and blasted rock will be disposed in the South Breakwater core or other areas where rock placement is required, e.g. as general fill material.

4. Works Methodology & Environmental Mitigation –Marine Mammals

4.1. Drilling Works

As detailed in the approved CEMD 2017 the following equipment will be used for marine drilling and blasting.

A Top-hammer Rock Drill Sandvik Tamrock HL 1540 and 60 mm drill rods are used to drill holes in diameter ranging from 92 to 126 mm. During each drill the Hector can drill an area of 20 m x 4m which equates to 10-14 holes and an area of 30m x 4m by the Boulder rig, 16-22 holes.

A typical field for blasting can be 40 to 80 holes, depending on the sectioning (no of detonators in a hole).

Before drilling starts, the outer guidance tube is lowered on the seabed and pushed into the overlaying layer, down to the rock level, by assistance of air wash. The vertical position of the outer guidance tube is used for recording the top of rock level. This level is logged in the blasting plan chart, and is later used to calculate the amount of explosive. Drilling of the hole now starts. The length of the hole and the final depth of drilling is determined by the required amount of over-drill, a parameter that shall be minimized however selected in such a way that when dredging is executed after the blast, the excavation can take place to the required level without encountering hard spots. When drilling is on a grid of 4 x 4 m, the vertical over-drill usually is 2.5m. When the drilling is on a 3 x 3 m grid, as we would suggest for the part of the caisson trenches, the vertical over-drill is 2 m.

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This drill pattern is preferable chosen in a way so that on one side there is an open face, so that the rock during blasting can freely expand sideways (Figure 4.1).

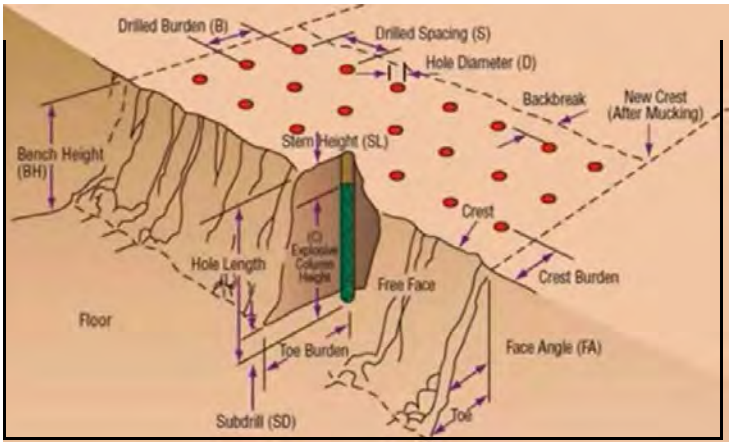

Figure 4.1 – Blasting principles

When the drilling of a hole is finished, the drill rod is removed, and the hole is ready for charging. Prior to pumping the explosive, a detonator with booster (cartridge) is placed in the bottom of the hole. The amount of explosive pumped in to the hole is carefully monitored and logged for each hole by the loading computer. If necessary the charge is limited to a set quantity, some gravel is placed, and the next charge is pumped on top of the previous one, again with its own booster and detonator in the bottom.

After the hole is charged, the drill rig is moved on top of the next hole position. Upon completion of the row, the second row is drilled and charged, after that the pontoon is moved parallel sideways (backwards away from the field) to its next spud position in a controlled manner.

4.1.1. - Environmental Controls

Detailed below are the environmental controls and protocols to be followed for drilling, blasting and disposal of material. The sequence of work will commence with drilling followed by blasting and latterly the dredging of blasted material which will be reused or if material is unsuitable for use will be disposed off.

4.1.2.Drilling - Environmental Controls

Prior to the start of drilling the MMO and PAM operator will commence a 30 minute watch for marine mammals within the 1km (direct line of sight) exclusion zone of the works area. If any marine mammals are observed the MMO/PAM will notify the Drill Master. Drilling will be postponed until the mammals move away. Once MMO/PAM is satisfied that area is clear of marine mammals then Drilling can commence. All sightings will be recorded on MMO recording from. Flow chart 4.2 Drilling Marine Mammal Protocol provides a step by step process to be used during all drilling operations.

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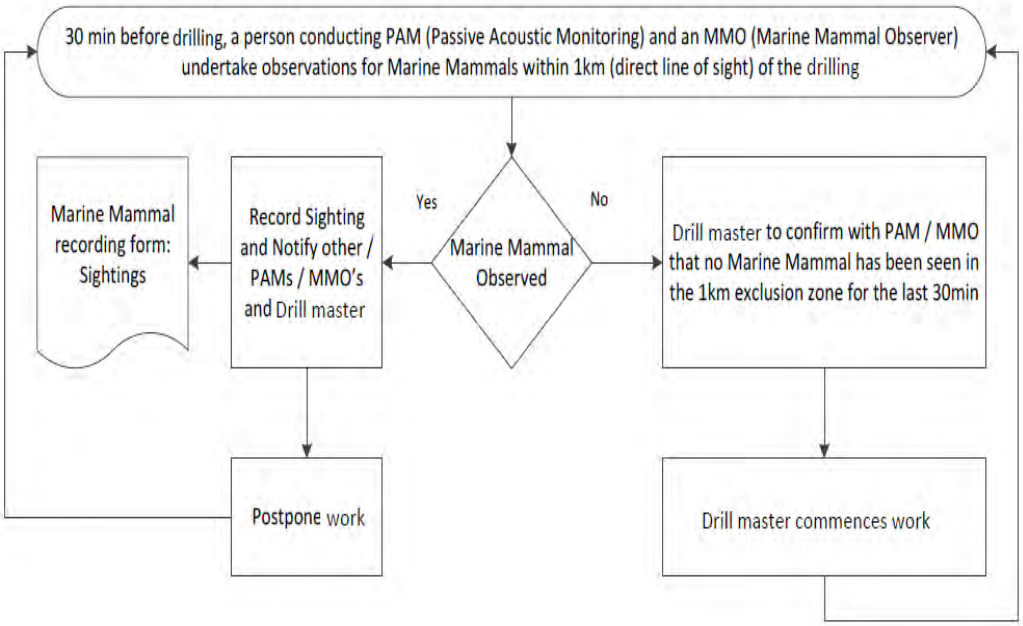

Figure 4.2 Drilling Marine Mammal Protocol

It must be noted that during drilling of the blast holes only one hole is drilled at a time, once complete, the next hole is drilled as detailed in Figure 1, Blasting Principles.

PAM will be used prior to drilling if they are to commence during hours of darkness. If these operations are continuing from daylight hours, without a break, then there will be no need to use PAM. If measurements of noise generated from drilling show it occurs at a level unlikely to cause significant disturbance, it may be a possibility to reduce this mitigation. Note there is no marine rotary piling being carried out.

4.2. Blasting

Immediately after each hole is drilled; the holes are filled by a computerized special pump with the explosives in the form of the pumped emulsion, together with the Nonel (Non-electric) igniters. The explosives used consist of an emulsion called “Merikemiiti”, a specialized, proven slurry for underwater use.

When the drill supervisor is satisfied that a field is completely drilled and the lead PAM operator has given the Green Light that no Marine Mammals are within the 1km mitigation zone, the field is immediately blasted. Blasting is expected to take place once or twice per day. If needed the platform “Boulder” can switch to dredging. Similarly, “Hector” is also equipped with a drill tower, so it can be deployed for drilling.

During the first 6 days of blasting, test blasting will be carried out to determine the effectiveness of the Bubble curtain in attenuating noise, with the results used to validate the blast model as detailed in the AHEP Environmental Statement. After 6 days a report will be issued to MS-LOT & SNH detailing the results of the testing. No further blasting will occur without the agreement of MS-LOT. Further information on the test blasting is provided in ‘Aberdeen Harbour Expansion Project (AHEP) –Underwater Noise + Passive Acoustic Monitoring Procedure, July 2018, Eco Fish Global’.

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Vibration monitoring will also be in place to determine that parameters are not exceeded in relation to Scottish Water and Kelda Water assets.

During the initial blasting the actual fracturing of the rock is also checked to determine if the blast charges are producing the required fracturing.

4.2.1. Blasting Environmental Controls

Prior to the actual blast, the following safety and environmental mitigation protocol will be followed.

1. PAM monitoring will be located on two vessels Typical locations and coverage for PAM and UWN monitoring for blasting in the north of Nigg Bay are presented in Figure 4.3. This shows the areas that each boat will typically cover for mitigation control/PAM (pre-blast) for marine mammals out to the boundary of the 1 km mitigation zone. An additional figure showing the hydrophone set-up for blasting in the south of the bay will be provided to MS-LOT for approval at least 2 weeks prior to blasting taking place in the south of the bay.

2. Immediately prior to the blast, the two monitoring vessels will move to the UWN monitoring locations (near / inside the bubble curtain and far / outside the bubble curtain). Two MMOs will also be located on the North & South Headlands and will be in radio contact with the lead MMO.

3. One hour prior to the blast, the Blast master alerts the Lead MMO/PAM operator, MMO and the Bubble Curtain Operator of the intention to blast at a given time.

4. The Lead MMO/PAM operator will remain in constant communication with the acoustic technicians, MMOs, Blast master and the Bubble Curtain operator, via VHF Channel 13. The lead MMO/PAM operator will be responsible for mitigation controls across the site and will instruct the blast master to delay operations until the Acoustic mitigation team is satisfied that all marine mammals are out of the mitigation zone and that mitigation protocols have been adhered to.

5. There will be a constant MMO presence during the whole period of blasting. 1 hour before the scheduled blast the Marine Mammal Observer and Passive Acoustic Monitoring operator (PAM) will undertake marine mammal monitoring within 1km (direct line of site) of the blast. The MMOs will be positioned on the North and South headlands, which are at approximately 18m above sea level. (Figure 4.4). If any Marine Mammals are observed in the mitigation zone, the Blast will be postponed, until the both PAM and the MMOs have confirmed that no Marine Mammals of been observed in the 1km exclusion zone for the last 30 minutes. The Lead MMO then confirms to the Blast Master that Blasting can commence. (Figure 4.5 Blasting marine mammal protocol)

6. 15 minutes before the Blast commences the Bubble Curtain is switched on, and the operator confirms to the Blast master and MMO/PAM lead that it is operating effectively.

7. Before all blasts a small explosive device (for instance the ‘Shockstar MS’ containing 720mg of explosives) will be detonated five minutes prior the start-up of the double bubble curtain to scare fish away.

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8. The Project ECoW will also carry out checks for rafting birds in the vicinity of the blasting area and advise the Blast master that the area is clear. The detonator charge used for fish scare will also scare any birds away in the immediate area.

9. Drill platform / dredger is moved to safe distance from the blast area

10. Blast master will visually check the area of blasting, to make sure no ships come near or that there is no one within the vicinity of the blast exclusion zone.

11. If there is a vessel approaching (or other activity occurs in or near) the area of blasting, the procedure is suspended, until the vessel has left the area.

12. Blast master will make final check with MMO/PAM operator that no marine mammals are present. The PAM operator will confirm and give the 'Green Light' to blast.

13. During the one minute before the blast the Drill & Blast pontoon will signal the load horn using the blasting signal (increasing intervals).

14. Blasting takes place

15. Immediately after blasting, the Drill & Blast pontoon will signal the "no more danger" signal (one long signal)

16. The Bubble curtain will be switched off, any fish kill etc. or unusual activity recorded. As per the requirements of the current approved CEMD 2017, checks for any dead or injured salmon or other fish during marine construction activities will be carried out; this will form part of the environmental induction and toolbox talks.

    All fish carcases which can be collected safely will be stored in an air tight container. The fish health inspectorate will be contacted immediately on collection of Fish carcass to arrange uplift to the MS-Fish Pathology Unit for sampling to determine cause of death. The Dee District Salmon Fishery Board will also be informed.

    In the event that five or more fish carcasses (or injured, or moribund fish) are reported during one 24 hour period within 50m of a construction zone, the ECoW will notify MS-LOT and the Environmental Manager via phone and email. Within 24 hours of the fifth reported carcass, consultation will be sought with the Environmental Manager and MS-LOT to determine any temporary mitigation requirements. If deemed necessary, temporary mitigation will be implemented as soon as it is safe to do so.

    The number of dead or injured fish noted pre-blasting and post-blasting recorded, along with any pictures, will be provided to MS-LOT in the blasting report.

17. The Drill and Blast pontoon will be maneuverer back into position ready for the next phase of drilling. The waste from Nonel cords are collected on board, drilling can be resumed.

18. The MMO will continue to watch for 15 minutes after blasting has occurred to record any information on behaviour of animals that enter into the mitigation zone after blasting.

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19. PAM will continue monitoring for 20 minutes after blasting to determine how quickly marine mammals move back into the 1km mitigation zone.

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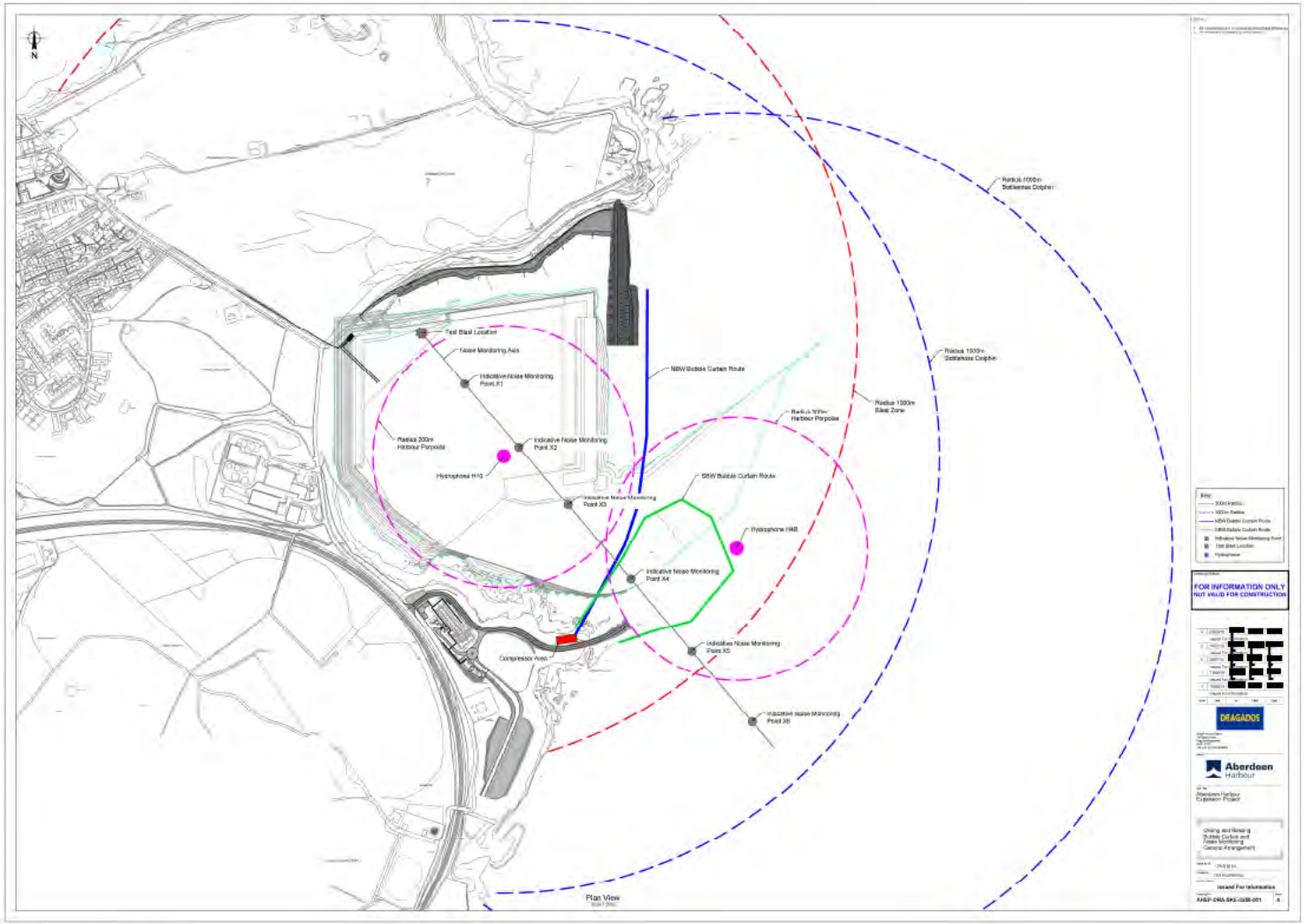

Figure 4.3 PAM Monitoring Locations during Blasting (northern area)

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Figure 4.4 Location for MMO Watches (height of each vantage point is approximately 18 m above sea level)

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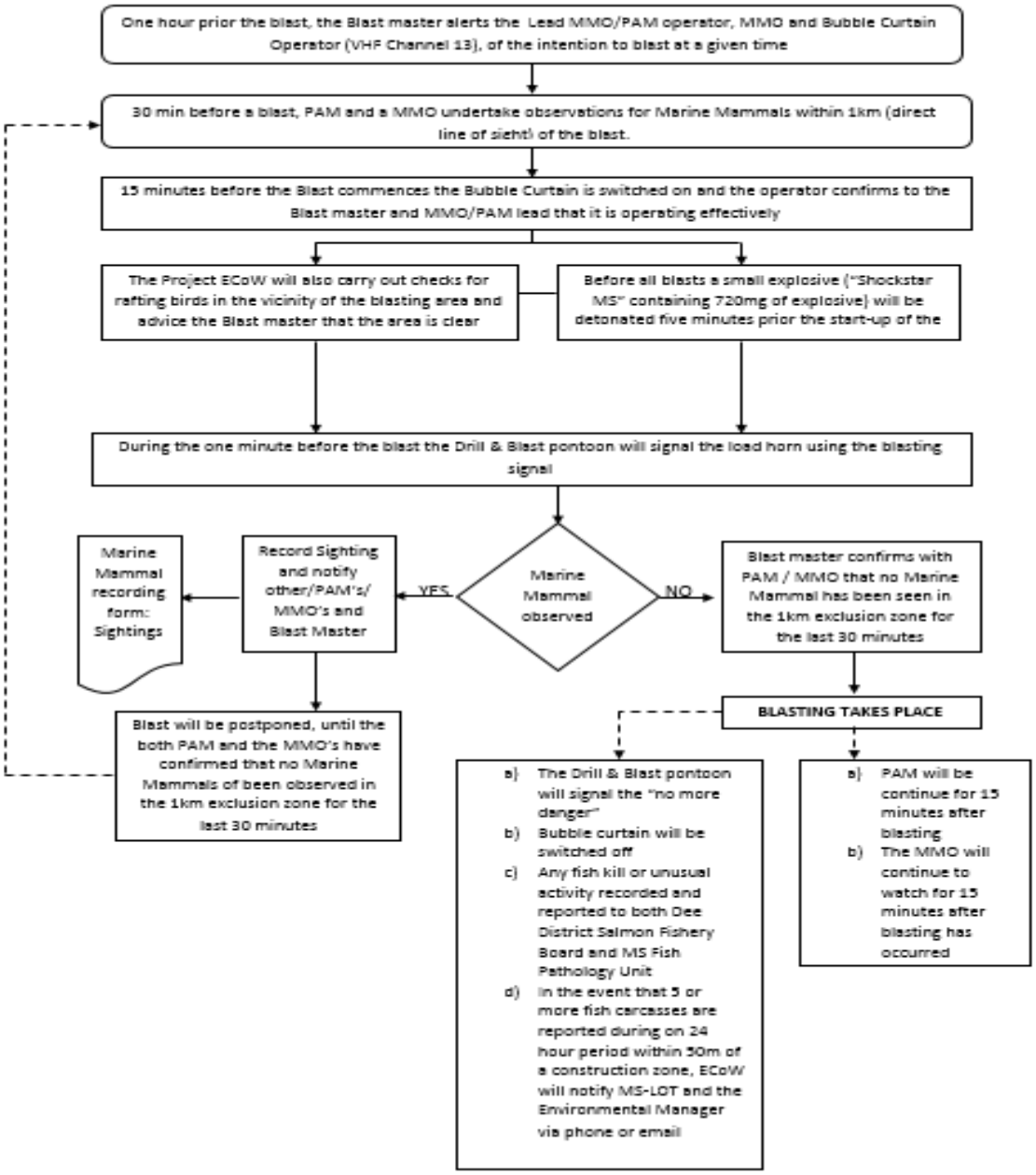
Figure 4.5 -Blasting & Marine Mammal Protocol



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4.2.2. Blasting Exceedence Protocol

As requested by MS-LOT and SNH a protocol that will be followed in the event that there is an exceedence of the 170dB re 1uPA rms (183 dB re 1 uPa peak equivalent) level predicted by the underwater noise modelling undertaken for the AHEP Environmental Statement, see Figure 4.6.

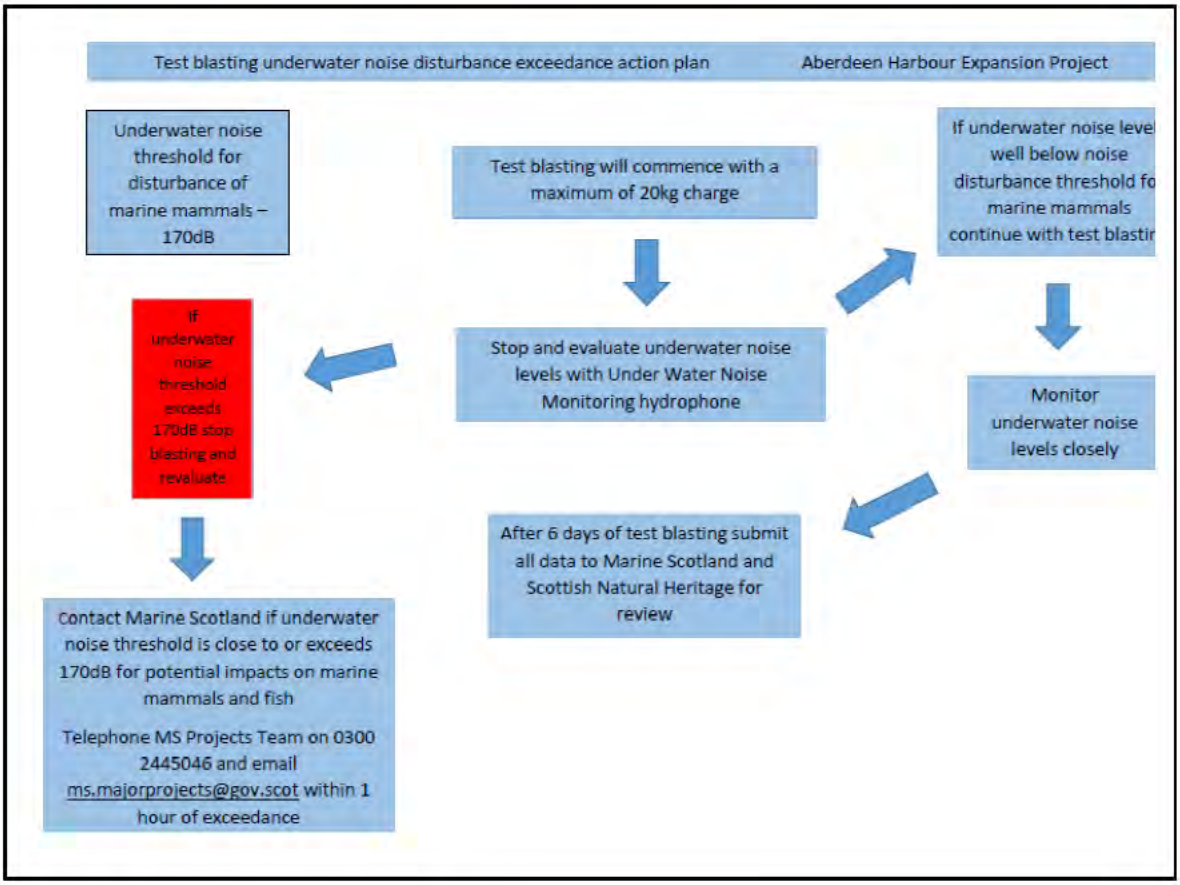

Figure 4.6 Blast Exceedence Protocol

4.3. Rock Dredging

Suitable dredge material from the drilling and blasting will be re-used as much as possible in the project.

The backhoe dredger(s) will be used to take away the blasted rock. The backhoe will load the dredged or blasted material straight into split hopper barges. The split hopper barge will sail to a selected location to dispose of the material which will be used as the core for the breakwaters, or bring the material to an offloading location for re-use on land.

No dredged rock will be disposed of at the designated off-shore disposal site.

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4.3.1.Rock Dredging & Disposal –Environmental Controls

For all dredged material disposed of at the designated Off-shore Disposal site, the following Environmental mitigation must be followed.

Non-dedicated: A trained MMO who may undertake other roles on the vessel when not conducting a mitigation role. This person can be a member of the rig's or vessel's crew providing they do not undertake other roles during mitigation periods

1. Before disposal a trained MMO on the disposal vessel will carry out a 20 minute watch of a 500m radius of the disposal area. (Figure 4.5 Disposal –Marine mammal Protocol)

2. If marine mammals are spotted the MMO will notify the master of the vessel and disposal will be postponed until the MMO has confirmed that no marine mammals have been present in the 500m exclusion zone for a period of 20 minutes.

3. A continuous watch must be kept during operations and if marine mammals are observed within 500m then disposal operations must be ceased until the area has been clear of marine mammals for at least 20 minutes

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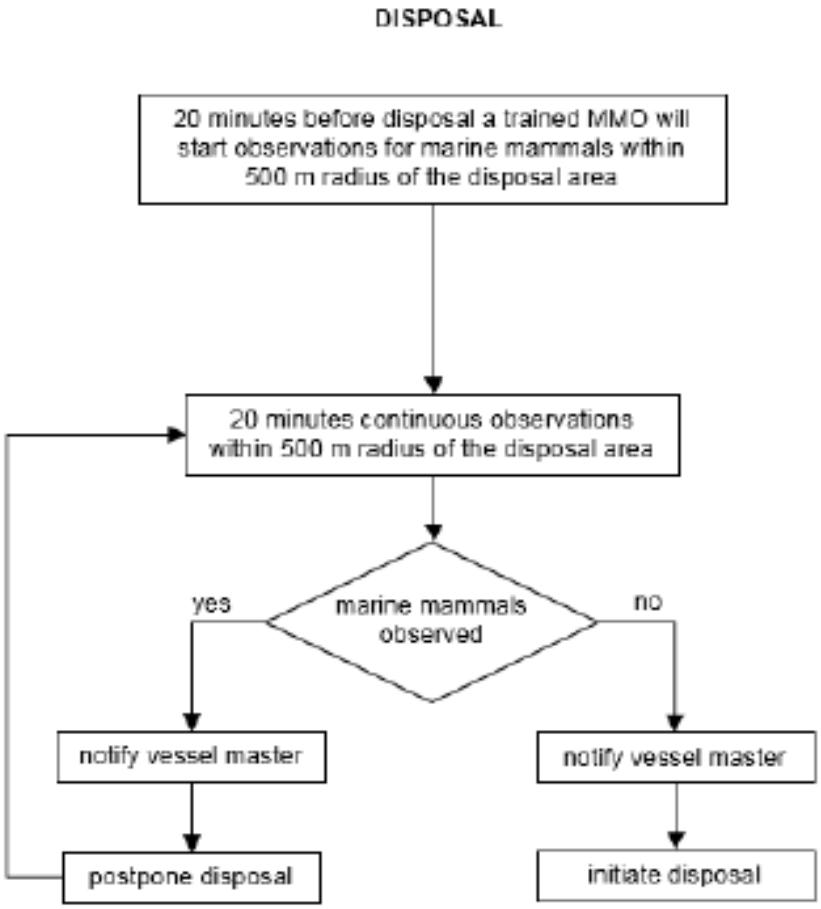

Figure 4.5 –Disposal Marine Mammal Protocol

4.4. Reporting

The MMO team will record all relevant events for all activities on standard forms and submit to JNCC on a weekly basis. As an example of the recording form is included in Appendix A. Recorded information will include:

- Marine mammal identification
- Details concerning the behaviour of the animal
- Date and location of the operations
- Start and end time of the observation
- Weather conditions and visibility

Whilst activities are ongoing on site with the potential to create underwater noise likely to disturb marine mammals, the Dragados Environment Team will produce a monthly report on the mitigation measures deployed, marine mammal monitoring undertaken and noise measurements collected, as well as a forward look to activities planned in the next month and any specific

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mitigations proposed. This report will include an Action Log to detail any problems encountered or issues to be raised with the regulator and provided to Marine Scotland, SNH and other interested parties. The report will also detail any exceptional circumstances where blasting has occurred, out with daylight hours, although any specific incidences will be reported within 48 hours. Reports will include:

• Completed Marine Mammal Reporting Forms

• Date and location of the operations

• A record of all operation, including details of the duration of the MMO/PAM search and any occasions when activity was delayed or stopped due to presence of marine mammals

• Details of watches made for marine mammals, including details of any sightings, details of the PAM equipment and detections, and details of the activity during the watches

• Details of any problems encountered including instances of non-compliance with the agreed MMMP

• Any recommendations for amendment of the MMMP.

If desired, Marine Scotland and SNH and other interested parties will also be able to visit site and operations to fully understand the ongoing activities and mitigation measures deployed and input suggested amendments/best practice ideas**.**

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Appendix A- Marine Mammal Recording Forms

MARINE MAMMAL RECORDING FORM - COVER PAGE

Regulatory reference number (e.g. DECC no., BOEM permit no., OCS lease no., etc.)	**Country**	**Location**	**Ship/ platform name**
Client **Dragados**	**Contractor**		**Survey type** ☐ site ☐ VSP ☐ 2D ☐ WAZ ☐ 3D ☐ piling ☐ 4D ☐ explosives ☐ OBC ☐ other ☐ 4C
Start date	**End date**		

Number of source vessels	**Type of source** (e.g. airguns)	**Number of airguns** (only if airguns used)	**Source volume** (cu. in.)
Source depth (metres)	**Frequency** (range in which peak energy is emitted, in Hz)	**Intensity** (primary peak-to-peak amplitude in dB re. 1µPa or bar metres)	**Shot point interval** (metres)
Method of soft start ☐ increase number of guns ☐ increase frequency (where permitted) ☐ increase pressure (where permitted) ☐ increase number and frequency ☐ increase number and pressure ☐ other			

Visual monitoring equipment used (e.g. binoculars, big eyes, etc.)	**Magnification of optical equipment** (e.g. binoculars)	**Height of eye above water surface** (metres)	**How was distance of animals estimated?** ☐ by eye ☐ with laser rangefinder ☐ with rangefinder stick/ callipers ☐ with reticle binoculars ☐ by relating to object at known distance ☐ other
Number of dedicated MMOs	**Training of MMOs** ☐ JNCC approved MMO training course for UK waters ☐ PSO training course for the Gulf of Mexico ☐ MMO training course for Irish waters ☐ MMO training course for New Zealand waters ☐ other ☐ none		

Was PAM used? ☐ yes ☐ no	**Number of PAM operators**	
Description of PAM equipment		
Range of PAM hydrophones from airguns (metres)	**Bearing of PAM hydrophones from airguns** (relative to direction of travel)	**Depth of PAM hydrophones** (metres)

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MARINE MAMMAL RECORDING FORM - OPERATIONS

Regulatory reference number ..... **Ship/ platform name** .....
(e.g. DECC no., BOEM permit no., OCS lease no., etc.)

Complete this form every time the airguns are used, including overnight, whether for shooting a line or for testing or for any purpose.
Times should be in UTC, using the 24 hour clock.

Date	Reason for firing l = line t = test x = test followed immediately by line	Time soft start/ ramp-up began	Time of full power	Time of start of line	Time of end of line	Time of reduced output (if relevant)	Time airguns/ source stopped	Time pre-shooting search began	Time search ended	Time PAM began	Time PAM ended	Depth range (during pre-shooting search) s = <200m d = >200m b = both	Was it day or night in period prior to firing? d = day n = night w = dawn k = dusk	Was any mitigating action required? (yes/ no)

MARINE MAMMAL RECORDING FORM - EFFORT

Regulatory reference number ..... **Ship/ platform name** .....
(e.g. DECC no., BOEM permit no., OCS lease no., etc.)

Record the following for all watches, even if no marine mammals are seen.
START A NEW LINE IF SOURCE ACTIVITY OR WEATHER CHANGES. ENTER DATA AT LEAST EVERY HOUR.

Date	Visual watch or PAM (v/ p)	Observer's/ operator's name(s)	Time of start of section of watch (UTC, 24hr clock)	Time of end of section of watch (UTC, 24hr clock)	Source activity (f/ s/ r/ n/ v)	Start position (latitude and longitude)	Depth at start (m)	End position (latitude and longitude)	Depth at end (m)	Speed of vessel (knots)	Wind dir'n	Wind force (B'fort scale)	Sea state (g/ s/ c/ r)	Swell (o/ m/ l)	Vis. (visual watch only) (p/ m/ g)	Sun glare (visual watch only) (n/ wf/ sf/ vf/ wb/ sb/ vb)	Precip. (n/ l/ m/ h/ s)

Visual watch or PAM: v = visual watch; p = PAM
Source activity: f = full power; s = soft start; r = reduced power (not soft start); n = not active; v = variable (e.g. tests)
Sea state: g = glassy (like mirror); s = slight (no/ few white caps); c = choppy (many white caps); r = rough (big waves, foam, spray)
Swell: o = low (< 2 m); m = medium (2-4 m); l = large (> 4 m)
Visibility: p = poor (< 1 km); m = moderate (1-5 km); g = good (> 5 km)
Sun glare: n = none; wf = weak forward; sf = strong forward; vf = variable forward; wb = weak behind; sb = strong behind; vb = variable behind
Precipitation: n = none; l = light rain; m = moderate rain; h = heavy rain; s = snow

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MARINE MAMMAL RECORDING FORM - SIGHTINGS

Regulatory reference number (e.g. DECC no., BOEM permit no., OCS lease no., etc.)	**Ship/ platform name**	**Sighting number (start at 1 for first sighting of survey)**	**Acoustic detection number (start at 500 for first detection of survey)**
Date		**Time at start of encounter** (UTC, 24hr clock)	**Time at end of encounter** (UTC, 24hr clock)
Were animals detected visually and/ or acoustically? ☐ visual ☐ acoustic ☐ both	**How were the animals first detected?** ☐ visually detected by observer keeping a continuous watch ☐ visually spotted incidentally by observer or someone else ☐ acoustically detected by PAM ☐ both visually and acoustically before operators/ observers informed each other		
Observer's/ operator's name	**Position** (latitude and longitude)	**Water depth (metres)**	
Species/ species group	**Description** (include features such as overall size; shape of head; colour and pattern; size, shape and position of dorsal fin; height, direction and shape of blow; characteristics of whistles/ clicks)		
Bearing to animal (when first seen or heard) (bearing from true north)	**Range to animal** (when first seen or heard) (metres)		
Total number	**Number of adults** (visual sightings only)	**Number of juveniles** (visual sightings only)	**Number of calves** (visual sightings only)	**Photograph taken** ☐ yes ☐ no
Behaviour (visual sightings only)				
Direction of travel (relative to ship) ☐ towards ship ☐ away from ship ☐ parallel to ship in same direction as ship ☐ parallel to opposite direction to ship ☐ crossing perpendicular ahead of ship ☐ variable ☐ milling ☐ stationary ☐ other ☐ unknown	**Direction of travel** (compass points) ☐ N ☐ W ☐ NE ☐ NW ☐ E ☐ variable ☐ SE ☐ stationary ☐ S ☐ unknown ☐ SW		
Airgun (or other source) activity when animals first detected ☐ full power ☐ not firing ☐ soft start ☐ reduced power (other than soft start)	**Airgun (or other source) activity when animals last detected** ☐ full power ☐ not firing ☐ soft start ☐ reduced power (other than soft start)	**Time animals entered mitigation/ exclusion zone** (UTC, 24hr clock) **Closest distance of animals from airguns (or other source)** (metres)	**Time animals left mitigation/ exclusion zone** (UTC, 24hr clock) **Time of closest approach** (UTC, 24hr clock)
If seen during soft start give (during soft start (metres): **First distance** **Closest distance** **Last distance**	**What action was taken?** (according to requirements of guidelines/ regulations in country concerned) ☐ none required ☐ delay start of firing ☐ shut-down of active source ☐ power-down of active source ☐ power-down then shut-down of active source	**Length of power-down and/ or shut-down** (if relevant) (length of time until subsequent soft start, in minutes)	**Estimated loss of production (if relevant) due to mitigating actions** (km)

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