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ANNEX C - JNCC guidelines for minimising the risk of disturbance and injury to marine mammals whilst using explosives

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These guidelines have been written for activities on the United Kingdom Continental Shelf, and are aimed at minimising the risk of injury and acoustic disturbance from explosive activities to marine mammals including, seals, whales, dolphins and porpoises.

The use of explosives in the marine environment ranges from inshore activities such as harbour construction to offshore operations such as well-head or platform decommissioning, and includes research, commercial and military activities, all of which have the potential to impact upon marine mammals.

The Habitat Regulations (HR) for England and Wales (as amended in 2007 and 2009) and the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (OMR, as amended in 2009) make it an offence to kill, injure or disturb marine European protected species (e.g. all cetaceans), and it has been recognised that sound generated from explosive use has the potential to cause injury or death to marine mammals.

JNCC notes that other fauna, for example turtles, occur in waters where these guidelines may be used, and would suggest that, whilst the appropriate mitigation may require further investigation, the protocols recommended for marine mammals would also be appropriate for marine turtles and basking sharks¹.

These guidelines will be refined following on from the results of any applicable research into the effectiveness of these protocols. However, the JNCC explosive guidelines reflect best practice for operators to follow during the planning, operational and reporting stages, and it is considered that adherence to the recommendations will minimise the risk of an offence being committed.

JNCC recommend that the generic guidance provided below is customised and incorporated by those planning on carrying out such activities into an Environmental Management Plan (EMP), detailing the actions and responsibilities for a specific activity. Ideally, this EMP should be attached to any applications for relevant consents.

¹ Basking sharks are protected from intentional capture or disturbance in British waters (up to 12 miles offshore) under a 1998 listing on the Wildlife and Countryside Act (1981), Schedule 5.

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Terminology:

Marine European Protected Species: These are marine species in Annex IV of the Habitats Directive that occur naturally in the waters of the United Kingdom. These consist of several species of cetaceans (whales, dolphins and porpoises), turtles, and the Atlantic Sturgeon.

Marine Mammal Observer (MMO): Individual responsible for conducting visual watches for marine mammals. For some seismic surveys it may be requested that observers are trained, dedicated and / or experienced. The MMO may also be a PAM operative if sufficiently trained.

- **Trained MMO:** Has been on a JNCC recognised course.
- **Dedicated MMO:** Trained observer whose primary and only role is to conduct visual watches for marine mammals.
- **Experienced MMO:** Trained observer with 3 years of field experience observing for marine mammals, and has practical experience of implementing the JNCC mitigation guidelines.
- **PAM Operative:** Person experienced in the use of PAM software and hardware and marine mammal acoustics.

Mitigation Zone: The area where a Marine Mammal Observer keeps watch for marine mammals (and delays the start of activity should any marine mammals be detected). In instances where there is uncertainty about the extent of the mitigation zone, it is recommended that the default mitigation zone should have a radius of 1 kilometre. Applicants who wish to implement a reduced mitigation zone of 500 metres must provide suitable evidence in their application for consent.

Passive Acoustic Monitoring (PAM): Software system that utilises hydrophones to detect the vocalisations of marine mammals.

Section 1 - The Planning Stage

When the use of explosives is planned, the body responsible for undertaking the proposed activity should:

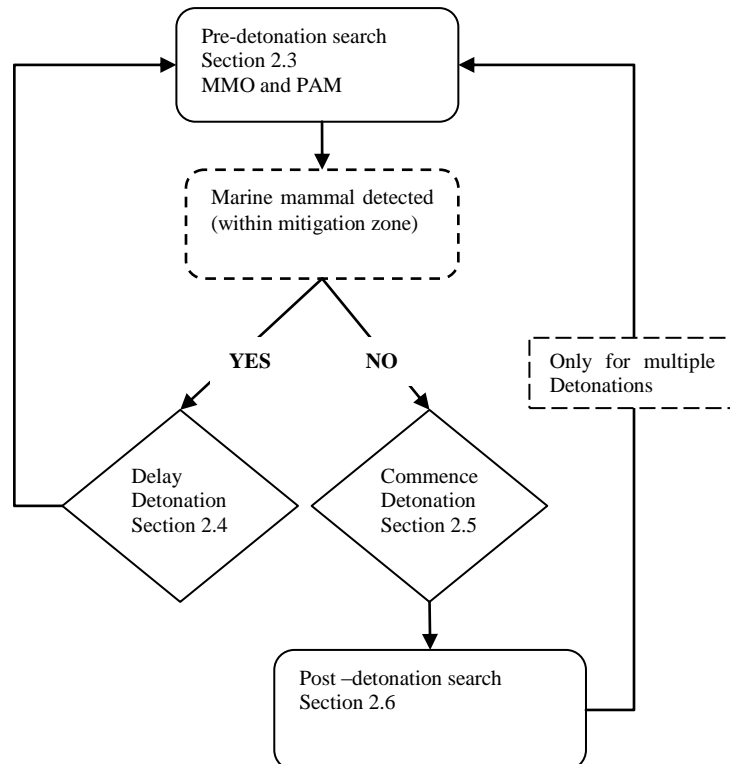
- Determine what marine mammal species are likely to be present in the survey area and assess if there are any seasonal considerations that need to be taken into account, including for example periods of migration, breeding, calving or pupping. For UKCS activities the [‘atlas of cetacean distribution in north-west European waters’](#) (Reid, *et al* 2003) is a useful starting point.
- Consult the JNCC guidance on *‘The protection of marine European Protected Species from injury and disturbance’* to assist in the environmental impact assessment.
- Assess the likelihood of injuring or disturbing a European Protected Species. In the UK, it will be necessary to assess the likelihood of committing an offence as defined in the Habitat Regulations. The [‘injury offence’](#) (defined in regulation 39 (1a)) applies to individual animals (i.e. it is an offence to injure one animal). The [‘disturbance offence’](#) (defined in regulation 39 1(b)) will be more relevant from the cumulative perspective, as consideration needs to be given to all activities within the species range that have the potential to cause disturbance.
- Determine the distance at which the explosive detonations could cause physical injury to marine mammals. This should enable the operator to establish a suitable mitigation zone (the area where mitigation measures must be in place to ensure that injury is avoided).
- The default mitigation zone for marine mammal observation mitigation should be 1 kilometre, measured from the explosive source and with a circular coverage of 360 degrees.
- The radius of the mitigation zone can be reduced, or increased, from the default 1 kilometre zone if evidence supporting this change is accepted by the regulators following consultation with the appropriate nature conservation agency.
- Assess the mitigation measures that are appropriate to minimise the risk of causing an offence, which should include the following:
 - Only commence explosive detonations during the hours of daylight and good visibility (observers should be able to monitor the full extent of the mitigation zone). Plan explosive detonations so that the scheduling will reduce the likelihood of encounters with marine mammals, for example, this will be an important consideration during seal pupping times especially if activities are planned to be in close proximity to a seal colony.
 - Seek to provide trained Marine Mammal Observers (MMOs) and Passive Acoustic Monitoring (PAM) operatives to implement the requirements of these guidelines (section 2.1 – 2.4).
 - Accurately determine the amount of explosive required for the operation, so that the amount is proportionate to the activity and not excessive.
 - Plan the sequence of multiple explosive charges so that, wherever possible, the smaller charges are detonated first to maximise the ‘soft-start’ or ‘ramp up’ effect.
 - Consider the use of acoustic mitigation devices that could be deployed and left at the detonation site before any explosions are undertaken. The relevant

nature conservation agency will be able to advise on the suitability of Acoustic Deterrent Devices (ADDs) on a case by case basis (section 2.6).

Section 2 - Protocols to follow during the explosive activity

Visual and / or Passive Acoustic Monitoring (PAM) should be provided throughout the operation. The flowchart in figure 1 illustrates the key decision making stages which include the pre-detonation search (section 2.3) conducted by MMOs and PAM operatives and the requirement to delay the detonation (section 2.4) if any marine mammals are detected within the mitigation zone. After any break in detonation, or the end of the detonation sequence, a post-detonation search is carried out (section 2.6).

Figure 1: Decision making flowchart for a Marine Mammal Observer (MMO), If no marine mammals are detected during the pre-detonation search then the detonation commences, if marine mammals are detected a delay to the detonation sequence is recommended, after any break in explosive use a post-detonation search is performed.



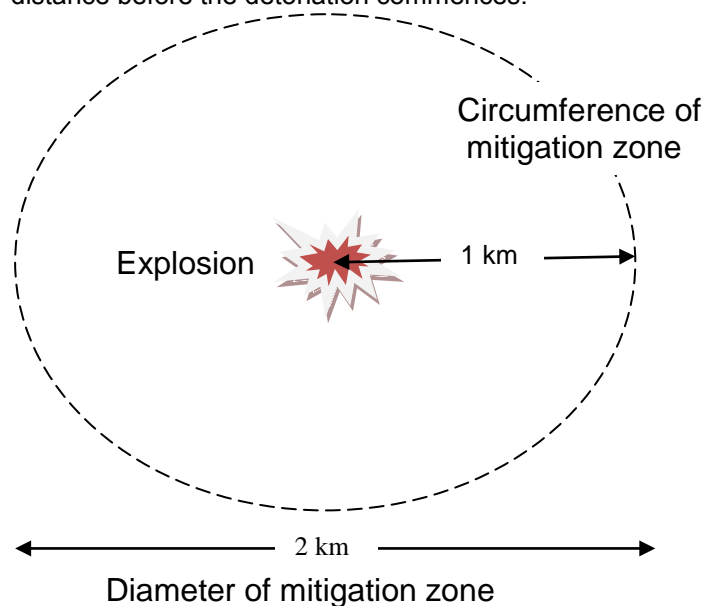
2.1 Visual Monitoring by Marine Mammal Observers

- The use of dedicated and trained Marine Mammal Observers (MMOs) is recommended.
- The MMO(s) should be onboard the vessel that provides the best viewing platform and is likely to be closest to the explosive activities.
- Visual monitoring for marine mammals should be carried out from a platform, for example the ships bridge that will provide a 360 degree coverage of the mitigation zone.

- Depending upon the size of the mitigation zone (figure 2), more than one MMO (and therefore more than more vessel) may be required to ensure the entire mitigation zone can be observed.
- The MMO(s) should be suitably equipped with binoculars and Marine Mammal Reporting forms, and be capable of determining the extent of the mitigation zone in relation to their viewing platform. The ability to determine range is a key skill for MMOs to have, and a useful tool to perform this function is a range finding stick.

All MMO forms, including a guide to completing the forms, and instructions on how to make and use a range finding stick are available on the JNCC website.

Figure 2: A representation of the mitigation zone, this is measured from the location of the explosive source out to a distance of 1 kilometre. The MMO will be required to move away from the detonation to a safe 'stand-off' distance before the detonation commences.



2.2 Passive Acoustic Monitoring (PAM)

Visual observation is an ineffective mitigation measure during periods of darkness or poor visibility (such as fog), or during periods when the sea state is not conducive to visual mitigation, as marine mammals in the vicinity of explosive sources will not be detected. JNCC views PAM as the only available mitigation technique that can be used under these conditions to enhance the detection of certain marine mammal species.

PAM systems consist of hydrophones that are deployed into the water column, and the detected sounds are processed using specialised software. PAM operatives are needed to set up and deploy the equipment and interpret the detected sounds.

The PAM hydrophones should be situated as close as possible to the site of detonation, and sacrificial hydrophones may therefore be required. Hydrophones deployed from standby vessels can be used for acoustic monitoring, but a disadvantage of these systems is that they will move away from the site of detonation when the vessel towing them moves to the 'stand off' position prior to the detonation,

and may then be too far away to be capable to detect any marine mammal vocalisations within the mitigation zone.

Remotely operated static PAM systems, which can be left at the detonation site, may be an option (e.g. for well abandonment campaigns), but they may not always be commercially available, or best suited for operations in shallow coastal environments.

2.2.1 Use of PAM as mitigation tool

PAM can provide a useful supplement to visual observations undertaken by MMOs and JNCC may recommend that it is used as a mitigation tool when commenting on applications for explosive consents. However, in many cases it is not as accurate as visual observation for determining range, and this will mean that the mitigation zone will reflect the range accuracy of the system. For example, if the range accuracy of a system is estimated at +/-300 metres, animals detected and calculated to be within 1000 metres from the source could, in reality, be $1000 + 300 = 1300$ metres, but their detection would still lead to a delay in the commencement of the detonation. Although, at present it is not possible to express the range accuracy of most PAM systems in numerical terms, this example serves to illustrate that it is in the operator's best interests to use the most accurate system available, and for the PAM operative to factor in a realistic estimate of the range accuracy.

Some PAM systems do not have a reliable range determination facility, or can only calculate the range for some species. In such cases, the detection of a confirmed cetacean vocalisation should still be used to initiate postponement of the detonation if the PAM operator is to make a judgement about the range of the marine mammal from the vessel, because of their experience gained in differentiating between distant and close vocalisations. In the absence of PAM systems capable of range determination, this expert judgement will constitute the basis for deciding whether an area is free from cetaceans prior to the soft-start.

2.3 Pre-detonation search for marine mammals

At least 1 hour before any type of detonation, a visual search and, if required, acoustic monitoring, known as the 'pre-detonation search', should be carried out in the mitigation zone. The pre-detonation search should continue until the MMO advises that the mitigation zone is clear of marine mammals, and the detonation can start.

2.4 Delay if a marine mammal detected in the Mitigation Zone

- Explosive detonation should not be undertaken within 20 minutes of a marine mammal being sighted within the mitigation zone.
- If a marine mammal is observed, or acoustically detected, within the mitigation zone, it should be monitored and tracked until it moves out of range. The MMO should notify the relevant chain of command of the detection, and advise that the operation should be delayed. If the marine mammal is not detected again within 20 minutes, it can be assumed that it has left the area and the detonation may commence.

- If an animal has been detected acoustically, the PAM operative should use a range indication and their judgement to determine whether the marine mammal is within the zone.
- If an MMO or PAM operative is uncertain whether marine mammals are present within the mitigation zone, they should advise that the activity should be delayed as a precaution until they are certain that no animals are present.

2.5 Sequencing of the explosive charges

Whenever possible, the order in which the explosive charges are detonated should be controlled, with the aim of reducing the environmental impact. A progressive increase in charge size (generally referred to as 'soft-start' or 'ramp up') may be effective as a means of reducing the risk of injury by allowing time for marine mammals to move away from the area.

Where practical, the sequence of detonations should start with the smaller charges and leave the larger charges until last. Where the work scope dictates that groups of charges must be detonated together, consideration should be given to appropriate fusing to fractionally delay the detonation of the second and subsequent charges (only by milliseconds), thus reducing the cumulative effect of the charges and lessening the impact of the shock wave.

2.6 Acoustic Deterrent Devices (ADDs)

The use of devices that have the potential to exclude animals from the mitigation zone should be considered. The use of ADDs should only ever be used in conjunction with visual and / or acoustic monitoring and for as short period as necessary to minimise the introduction of additional noise in the area.

In theory, ADDs have the potential to reduce the risk of causing injury to marine mammals and are relatively cost effective. However, evidence relating to the efficacy of acoustic deterrents such as "scrammers" or "pingers" is currently limited and there is a need for studies to quantify the efficacy of candidate devices in order to determine the applicability as suitable mitigation measures.

When planning to use ADDs, the potential effectiveness of candidate devices on the key marine mammal species likely to be present in the area should be assessed as part of the EIA process for the activity. This assessment should feed into the site specific Environmental Management Plan (EMP) or equivalent. It should be noted that a wildlife licence under the Wildlife and Countryside Act 1981 (within 12 nm) might be required to authorise a potential intentional disturbance. However, it is expected that these devices would always be used in accordance with recommended conditions that would prevent the exposure of animals to disturbance that would constitute an offence under regulation 39 of the Habitat Regulations and the Offshore Marine Regulations.

The use of ADDs will be subject to a number of recommended conditions, for example:

- ADDs should be positioned in the water in close proximity to the explosive source installed; the vessel with the MMOs and PAM operatives may not be a suitable mooring location for these devices.
- ADDs should be switched on throughout the pre-detonation search and turned off immediately after the detonations have been completed.

2.7 Post-detonation search

The MMO should maintain a post-detonation search within the mitigation zone for at least 5 minutes after the last detonation, to look for any evidence of injury to marine life, for example fish kills. Any unusual observations should be noted in the report.

2.8 Communication

It is vital that clear communication channel exists between MMO(s) / PAM operators and those personnel detonating the explosives. As each explosive use is likely to be different, it is recommended that communication channels should be established before the activity commences, and ideally these matters should be discussed at a pre-mobilisation meeting. For example, the MMO or PAM operator might communicate directly with the engineers detonating the explosive, or via another member of the crew.

Section 3 - Reporting

Reports detailing the marine mammal mitigation activities, the 'MMO report' should be sent to the JNCC, or appropriate nature conservation agency, after the explosives operation has been completed. Ideally the MMO report should be sent to the JNCC by e-mail to seismic@jncc.gov.uk or posted to the address at the top of these guidelines.

Important information to record in the MMO report:

- Completed 'Marine Mammal Observation Forms'. These forms were developed for the seismic industry but can be used for other activities, such as explosive use. The Marine Mammal Observation form is an EXCEL document and contains embedded worksheets named 'Cover Page' 'Operations' and 'Effort and Sighting'. 'A Word document named 'Deckforms' is available, and MMOs may prefer to use this when observing before transferring the details to the Excel spreadsheets. A guide to completing the forms is also available. All the forms are available from the JNCC website: <http://www.jncc.gov.uk/page-1534>
- Where relevant, the reference number for the activity provided by the regulatory authority.
- Date and location of the activity.
- Details of the proposed operation, including information on the size of charges used, the start times of explosive detonations, the start and end times of watches by MMOs, the start and end times of any acoustic monitoring using PAM, and details of all explosive activity during the relevant watches.
- Details of any ADDs used, and any relevant observations on their efficacy.
- Details of any problems encountered during the activity, including instances of non-compliance with the JNCC guidelines and any variations from the agreed procedure.

Section 4 - Background information and applicable legislation

4.1 Existing protection to cetaceans

Section 9 of the Wildlife and Countryside Act 1981 (CRoW amended) prohibits the intentional or reckless killing, injuring or disturbance of any cetacean. The UK is also a signatory to the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS), and has applied its provisions in all UK waters. Amongst other actions required to conserve and manage populations of small cetaceans, ASCOBANS requires range states to "work towards...the prevention of ...disturbance, especially of an acoustic nature".

Reflecting the requirements of the Convention on the Conservation of European Wildlife and Habitats (the Bern Convention) and Article 12 of the EC Habitats and Species Directive (92/43/EEC). The UK has the following legislation in place:

- The Conservation (Natural Habitats, etc.) Regulations 1994 (2007 and 2009 amendments) (England & Wales)

- The Conservation (Natural Habitats, etc.) Regulations 1995 (Northern Ireland) (and 2009 amendments)
- The Conservation (Natural Habitats, &c.) Amendment (No. 2) Regulations 2008 (Scotland) (and 2009 amendments)
- The Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001 (and 2007 Amendments),
- The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (and 2009 amendments) (Beyond 12 nautical miles UKCS)

4.2 The offences of deliberate injury and disturbance

Regulation 39(1) of both the Habitat Regulations and the Offshore Marine Regulations (as amended in 2009) state the following:

(1) Subject to regulations 40 and 49, a person is guilty of an offence if he—

- (a) deliberately captures, injures, or kills any wild animal of a European protected species;
- (b) deliberately disturbs wild animals of any such species

(1A) For the purposes of paragraph (1)(b), disturbance of animals includes in particular any disturbance which is likely—

- (a) to impair their ability—
 - (i) to survive, to breed or reproduce, or to rear or nurture their young; or
 - (ii) in the case of animals of a hibernating or migratory species, to hibernate or migrate; or
- (b) to affect significantly the local distribution or abundance of the species to which they belong