

CMS Family Guidelines on Environmental Impact Assessment for Marine Noise-generating Activities

These **CMS Family Guidelines on Environmental Impact Assessment for Marine Noise-generating Activities** have been developed to present the Best Available Techniques (BAT) and Best Environmental Practice (BEP), as called for in CMS Resolutions 9.19, 10.24 and 10.15, ACCOBAMS Resolution 5.15 and ASCOBANS Resolutions 6.2 and 8.11. In addition to the parent convention, CMS, these guidelines are relevant to:

- Agreement on the Conservation of Cetaceans of the Black Seas Mediterranean Seas and Contiguous Atlantic Area (ACCOBAMS)
- Agreement on the Conservation of Seals in the Wadden Sea (Wadden Sea Seals)
- Agreement on the Conservation of Small Cetaceans in the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS)
- MOU Concerning Conservation Measures for the Eastern Atlantic Populations of the Mediterranean Monk Seal (*Monachus monachus*) (Atlantic Monk Seals)
- MOU Concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa (Atlantic Marine Turtles)
- MOU Concerning the Conservation of the Manatee and Small Cetaceans of Western Africa and Macaronesia (Western African Aquatic Mammals)
- MOU for the Conservation of Cetaceans and their Habitats in the Pacific Islands Region (Pacific Islands Cetaceans)
- MOU on the Conservation and Management of Dugongs (*Dugong dugon*) and their Habitats throughout their Range (Dugong)
- MOU on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA)
- MOU on the Conservation of Migratory Sharks (Sharks)

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I. Introduction

1. These **CMS Family Guidelines on Environmental Impact Assessment for Marine Noise-generating Activities** are designed to provide regulators with tailored advice to apply in domestic jurisdictions, as appropriate, to create EIA standards between jurisdictions seeking to manage marine noise-generating activities. The requirements within each of the modules are designed to ensure that the information being provided by proponents will provide decision-makers with sufficient information to make an informed decision about impacts. The modules should be read in tandem with the **Technical Support Information to the CMS Family Guidelines on Environmental Impact Assessments for Marine Noise-generating Activities** (available at www.cms.int/guidelines/cms-family-guidelines-EIAs-marine-noise). They are structured to stand as one complete unit or to be used as discrete modules, tailored for national and agreement approaches.
2. The sea is the interconnected system of all the Earth's oceanic waters, including the five named 'oceans' - the Atlantic, Pacific, Indian, Southern and Arctic Oceans - a continuous body of salty water that covers over 70 per cent of the Earth's surface. This vast aquatic environment is home to a wider range of higher animal taxa than exists on land. Many marine species have yet to be discovered and the number known to science is expanding annually.
3. The sea also provides people with food—mainly fish, shellfish and seaweed—as well as other marine resources. It is a shared resource for us all.
4. Marine wildlife relies on sound for vital life functions, including communication, prey and predator detection, orientation and for sensing surroundings. The ocean environment is filled with natural sound (ambient noise) from biological (marine animals) and physical processes (earthquakes, wind, ice and rain) (Urick, 1983). Species living in this environment are adapted to these sounds.
5. Over the past century many anthropogenic marine activities have increased levels of noise (Hildebrand 2009; André et.al. 2010; Miksis-Olds and Nichols 2016) These modern anthropogenic noises have the potential for physical, physiological and behavioural impacts (Southall et.al. 2007).
6. Parties to CMS, ACCOBAMS and ASCOBANS have in several resolutions recognized underwater noise as a major threat to many marine species. These resolutions also call for noise-related considerations to be taken into account as early as the planning stages of activities, especially by making effective use of Environmental Impact Assessments (EIAs). The Convention on Biological Diversity Decision XII/23 also encourages governments to require EIAs for noise-generating offshore activities, and to combine acoustic mapping with habitat mapping to identify areas where these species may be exposed to noise impacts. (Prideaux, 2017b)
7. Wildlife exposed to elevated or prolonged anthropogenic noise can suffer direct injury and/or temporary or permanent auditory threshold shifts. Noise can mask important natural sounds, such as the call of a mate, or the sound made by prey or predator. Anthropogenic noise can also displace wildlife from important habitats. These impacts are experienced by a wide range of species including fish, crustaceans, cephalopods, pinnipeds (seals, sea lions and walrus), sirenians (dugong and manatee), sea turtles, the polar bear, marine otters and cetaceans (whales, dolphins and porpoises) (Southall et.al. 2007; Aguilar de Soto, 2017a; 2017b; Castellote, 2017a; 2017b; Frey, 2017; Hooker, 2017; McCauley, 2017; Marsh, 2017; Notarbartolo di Sciara, 2017a; 2017b; 2017c; Parks, 2017; Truda Palazzo, 2017; Vongraven, 2017). Where there is risk, full assessment of impact should be conducted.

8. The propagation of sound in water is complex and requires many variables to be carefully considered before it can be known if a noise-generating activity is appropriate or not. It is inappropriate to generalize sound transmission without fully investigating propagation (Prideaux, 2017a). Often, statements are made in Environmental Impact Assessments that a noise-generating activity is 'X' distance from 'Y' species or habitat and therefore, will have no impact. In these cases, distance is used as a basic proxy for impact but is rarely backed with scientifically modelled information. (Wright et.al. 2013; Prideaux and Prideaux 2015)

9. To present a defensible Environmental Impact Assessment for any noise-generating activity proposal, proponents need to have expertly modelled the noise of the proposed activity in the region and under the conditions they plan to operate. Regulators should have an understanding of the ambient or natural sound in the proposed area. This might require CMS Parties or jurisdictions to develop a metric or method for defining this, by drawing on the range of resources available worldwide. (Prideaux, 2017a)

10. All EIAs should include operational procedures to mitigate impact effectively during activities, and there should be proof of the mitigation's efficacy. These are the operational mitigation procedures that should be detailed in the national or regional regulations of the jurisdictions where the activity is proposed. Operational monitoring and mitigation procedures differ around the world, and may include industry/company best practices. Monitoring often includes, *inter alia*:

- a. periods of visual and other observation before a noise-generating activity commences
- b. passive acoustic monitoring
- c. marine mammal observers
- d. aerial surveys

Primary mitigation often includes, *inter alia*:

- e. delay to start, soft start and shut-down procedures
- f. sound dampers, including bubble curtains and cofferdams; sheathing and jacket tubes
- g. alternative low-noise or noise-free options (such as compiled in the OSPAR inventory of measures to mitigate the emission and environmental impact of underwater noise)

Secondary mitigation, where the aim is to prevent encounters of marine life with noise sources, includes *inter alia*:

- h. spatial & temporal exclusion of activities

11. Approaches to mitigate the impact of particle motion (e.g. reducing substrate or sea ice vibration) should also be investigated. Assessment of the appropriateness and efficacy of all operational procedures should be the responsibility of the government agency assessing Environmental Impact Assessments (EIA).

II. Technical Support Information to the CMS Family Guidelines on Environmental Impact Assessment for Marine Noise-generating Activities

12. **Technical Support Information to the CMS Family Guidelines on Environmental Impact Assessments for Marine Noise-generating Activities** is provided as a full document and as stand-alone modules at: www.cms.int/guidelines/cms-family-guidelines-EIAs-marine-noise.

13. This **Technical Support Information** has been specifically designed to provide clarity and certainty for regulators, when deciding to approve or restrict proposed activities. The document provides detailed information about species' vulnerabilities, habitat considerations, impact of exposure levels and proposed assessment criteria for all of the CMS-listed species groups and their prey.

14. The document is structured to cover specific areas, as follows:
- ‘Module A: Sound in Water is Complex’ provides an insight into the characteristics of sound propagation and dispersal. This module is designed to provide decision-makers with necessary foundation knowledge to interpret the other modules in these guidelines and any impact assessments that are presented to them for consideration.
 - ‘Module B: Expert Advice on Specific Species Groups’ presents twelve separate detailed sub-modules covering each of the CMS species groups, focusing on species’ vulnerabilities, habitat considerations, impact of exposure levels and assessment criteria.
 - ‘Module C: Decompression Stress’ provides important information on bubble formation in marine mammals, source of decompression stress, source frequency, level and duration, and assessment criteria.
 - ‘Module D: Exposure Levels’ presents a summary of the current state of knowledge about general exposure levels.
 - ‘Module E: Marine Noise-generating Activities’ provides a brief summary of military sonar, seismic surveys, civil high-powered sonar, coastal and offshore construction works, offshore platforms, playback and sound exposure experiments, shipping and vessel traffic, pingers and other noise-generating activities. Each section presents current knowledge about sound intensity level, frequency range and the activities’ general characteristics. The information is summarized in a table within the module.
 - ‘Module F: Related Intergovernmental or Regional Economic Organization Decisions’ presents the series of intergovernmental decisions that have determined the direction for regulation of anthropogenic marine noise.
 - ‘Module G: Principles of EIAs’ establishes basic principles including strategic environmental assessments, transparency, natural justice, independent peer review, consultation and burden of proof.
 - ‘Module H: CMS-Listed Species Potentially Impacted by Anthropogenic Marine Noise’

15. The evidence presented in the **Technical Support Information** Modules B, C and D establishes that the effective use of EIA for all marine noise-generating activities is in line with CMS Resolutions 9.19, 10.24 and 10.15, ACCOBAMS Resolution 5.15 and ASCOBANS Resolutions 6.2 and 8.11.

16. The **Technical Support Information** was developed before the release of ISO 18405: Underwater acoustics – Terminology that provides valuable consistency to language used. The Guidelines have been slightly adapted to reflect this new ISO standard, without losing the vital connection to the **Technical Support Information**. Decision-makers should refer to both documents wherever possible.

III. Technical Advisory Notes

17. The following advisory notes should be considered in conjunction with the individual EIA Guideline tables, as presented in Modules IV through XI.

III.1. Ambient Sound

18. ISO 18405 refers to ambient sound as “*sound that would be present in the absence of a specified activity*” and “*is location-specific and time-specific*”. These Guidelines more specifically define it as the average ambient (non-anthropogenic) sound levels from biological (marine animals) and physical processes (earthquakes, wind, ice and rain etc) of a given area. It should be measured (including daily and seasonal variations of frequency bands), for each component of an activity, prior to an EIA being developed and presented.

III.2 Sound Intensity

19. ISO 18405 defines sound intensity as “the product of the sound pressure”, which is the contribution to total pressure caused by the action of sound, “and sound particle velocity”, which is the contribution to velocity of a material element caused by the action of sound.

III.3. Exclusion Zones

20. Where exclusion zones are referred to in these Guidelines, these are areas that are designed for the protection of specific species and/or populations. Activities, and noise generated by activities, should not propagate into these areas.

III.4. Independent, Scientific Modelling of Noise Propagation

21. The objective of noise modelling for EIAs is to predict how much noise a particular activity will generate and how it will disperse. The aim is to model the received sound levels at given distances from the noise source. The amount of sound lost at the receiver from the sound source is propagation loss.

22. The intention of EIAs is to assess the impact of proposed activities on marine species and the environment. EIAs should not only present the main output of interest to the activity proponent, but should fully disclose the full frequency bandwidth of a proposed anthropogenic noise source, the intensity/pressure/energy output within that full range, and the principal or mean/median operating frequency of the source(s). (Urlick, 1983, Etter, 2013; Prideaux, 2017a)

23. Many propagation models have been developed such as ray theory, normal modes, multipath expansion, fast field, wavenumber integration or parabolic equation. However, no single model accounts for all frequencies and environments. Factors that influence which propagation model/s should be used include the activity noise frequencies, water depth, seabed topography, temperature and salinity, and spatial variations in the environment. (Urlick, 1983, Etter, 2013; Prideaux, 2017a)

24. The accuracy (i.e. bias) of sound propagation models depends heavily on the accuracy of their input data.

25. Commonly missing in EIAs is the modelling of particle motion propagation. Invertebrates, and some fish, detect sound through particle motion to identify predator and prey. Like sound intensity, particle motion varies significantly close to noise sources and in shallow water. Excessive levels of ensonification of these animal groups may lead to injury (barotrauma). Specific modelling techniques are required to predict the impact on these species.

III.5. Sound Exposure Level cumulative (SEL_{cum})

26. Sound Exposure Level (SEL) is generally referred to as dB 0 to peak or peak to peak (dB 0 to peak or dB p to p) for impulsive noise like air guns or pile driving, and dB Root Mean Squared (dB_{rms}) for non-impulsive noise such as ship noise, dredging or a wind farm’s constant drone. Often this metric is normalized to a single sound exposure of one second (NOAA, 2016). The SEL cumulative (SEL_{cum}) metric allows the cumulative exposure of an animal to a sound field for an extended period (often 24 hours) to be assessed against a predefined threshold for injury. (Southall, 2007; NOAA, 2016)

27. NOAA recommends a baseline accumulation period of 24 hours, but acknowledges that there may be specific exposure situations where this accumulation period requires adjustment (e.g., if activity lasts less than 24 hours or for situations where receivers are predicted to experience unusually long exposure durations). (NOAA, 2016) The limit value for pile driving in Germany is a sound exposure level of SEL₀₅ and the sound pressure level L_{peak} at a distance of 750 metres.

III.6. Particle Motion/Displacement

28. Sound exposure levels works well for marine mammals but not well for a number of other marine species, including crustaceans, bivalves and cephalopods, because these species are thought to mainly detect sound through particle motion. Particle motion or particle displacement is the displacement of a material element caused by the action of sound. For these Guidelines the motion concerned is the organism resonating in sympathy with the surrounding sound waves, oscillating back and forth in a particular direction, rather than through the tympanic mechanism of marine mammals or swim-bladders of some fish species. (Mooney, et.al., 2010; André, et.al., 2011; Hawkins and Popper, 2016; NOAA, 2016)

29. The detection of particle motion or particle displacement requires different types of sensors than those utilized by a conventional hydrophone. These sensors must specify the particle motion in terms of the particle displacement, or its time derivatives (particle velocity or particle acceleration).

IV. EIA Guideline for Military and Civil High-powered Sonar

This EIA Guideline should be used in combination with the appropriate modules on species and impact from the **Technical Support Information** (B.1-12, C and D) as required for individual regional and domestic circumstances.

The EIA Guideline for Shipping and Vessels Traffic (V) should be used when the vessel is underway/making way with sonar off.

Component	Detail
Description of area	<ul style="list-style-type: none"> • Detail of the spatial extent and nature of the activity – including seabed bathymetry and composition, description of known stratification characteristics and broad ecosystem descriptions – as well as the spatial area that will experience anthropogenic noise, generated by the proposed activity, above natural ambient sound levels • Detail of the typical weather conditions and day length for the area during the proposed activity period • Identification of previous and simultaneous activities, their seasons and duration in the same or adjoining areas, existence and location of any marine protected areas, and a review of activity findings and implications

Component	Detail
Description of the equipment and activity	<ul style="list-style-type: none"> • Explanation of all activity technologies available and why each proposed technology is chosen • Description of the activity technology including: <ol style="list-style-type: none"> a. name and description of the vessel/s to be used (except where details would risk national security) b. total duration of the proposed activity c. proposed timing of operations – season/time of day/during all weather conditions d. signal duration and sound intensity level (dB peak to peak) in water @ 1 metre, frequency ranges and ping rate • Specification of the activity including anticipated nautical miles to be covered, track-lines, speed of vessels and sonar power setting changes • Identification of other activities having an impact in the region during and after the planned activity, if there is information, accompanied by the analysis and review of potential cumulative or synergistic impacts
Modelling of noise propagation loss	<ul style="list-style-type: none"> • Detail of independent, scientific modelling of noise propagation loss in the same season/weather conditions as the proposed activity accounting for local propagation features (depth and type of sea bottom, local propagation paths related to thermal stratification, SOFAR or natural channel characteristics) from point source out to a radius where the noise levels generated are close to natural ambient sound levels • Identification and mapping of proposed exclusion zones for species and description of how noise propagation into these zones will be minimized, taking into consideration the local propagation features
Species impact	<ul style="list-style-type: none"> • General: <ol style="list-style-type: none"> a. Identification and density of species likely to be present that will experience sound transmission generated by the proposed activity above natural ambient sound levels; and calculated from this, the extent of the impact zones b. Specification of the type of impact predicted (direct and indirect) as well as direct and indirect impacts on prey species c. Information on the behaviour of each species group, and the ability to detect each of the species for mitigation purposes (e.g. for marine mammals this will include diving behaviour, vocal behaviour, and conspicuousness when at the surface). • For each species group, also detail of the following (refer to module B species summaries): <ol style="list-style-type: none"> a. Species vulnerabilities: <ol style="list-style-type: none"> i. specific vulnerabilities to noise ii. lifecycle components of these vulnerabilities b. Habitat: <ol style="list-style-type: none"> i. specific habitat components considered ii. presence of critical habitat (calving, spawning, feeding grounds, resting bays etc.) c. Scientific assessment of impact: <ol style="list-style-type: none"> i. exposure levels ii. total exposure duration iii. determination of precautionary safe/harmful exposure levels (direct impact, indirect impact and disturbance) that account for uncertainty and avoids erroneous conclusions. • Quantification of the effectiveness of proposed mitigation methods

Component	Detail
Mitigation and monitoring plans	<ul style="list-style-type: none"> • Detail of: <ol style="list-style-type: none"> a. Scientific monitoring programmes before the survey to assess species distribution and behaviour, to facilitate the incorporation of monitoring results into the impact assessment. b. Scientific monitoring programmes, conducted during and after the activity, to assess impact c. Transparent processes for regular real-time public reporting of activity progress and all impacts encountered d. Most appropriate methods of species detection (e.g. visual/acoustic) and the range of available methods, and their advantages and limitations, as well their practical application during the activity. e. Impact mitigation proposals: <ol style="list-style-type: none"> i. 24-hour visual or other means of detection, especially under conditions of poor visibility (including high winds, night conditions, sea spray or fog) ii. establishing exclusion zones to protect specific species, accompanied by scientific and precautionary justification for these zones iii. soft start and shut-down protocols iv. spatio-temporal restrictions
Reporting plans	<ul style="list-style-type: none"> • Detail of post operation reporting plans including verification of the effectiveness of mitigation
Consultation and independent review	<ul style="list-style-type: none"> • Description of consultation, prior to EIA submission: <ol style="list-style-type: none"> a. List of stakeholders consulted b. Detail of information provided to stakeholders, opportunities given for appropriate engagement and the timeframe for feedback c. Explanation of what amendments and changes have been made to the proposed activity in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why • Description of independent review of draft EIA: <ol style="list-style-type: none"> a. Detail of the independent reviewers (species experts) including affiliation and qualifications b. Description of the comments, queries, requests and concerns received from each reviewer c. Explanation of what amendments and changes have been made to the proposed activity in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why

V. EIA Guideline for Shipping and Vessels Traffic

This EIA Guideline should be used in combination with the appropriate modules on species and impact from the **Technical Support Information** (B.1-12, C and D) as required for individual regional and domestic circumstances.

This EIA Guideline is directed to shipping regulators, including port and harbour authorities. Cumulative impact of shipping, identifying appropriate exclusion zones and shipping lanes should be the focus.

Component	Detail
Description of area	<ul style="list-style-type: none"> • Detail of the spatial extent and nature of the activity – including seabed bathymetry and composition, description of known stratification characteristics and broad ecosystem descriptions – as well as the spatial area that will experience anthropogenic noise, generated by the proposed shipping, above natural ambient sound levels • Detail of the typical weather conditions and day length for the area during the proposed activity period • Existence and location of any marine protected areas
Description of vessels and equipment	<ul style="list-style-type: none"> • Description of vessel/s (tonnage, propulsion and displacement) and equipment activity • Detail of all activities including sound intensity levels (dB_{rms}) @ 1 metre and frequency ranges (all frequencies to encompass, <i>inter alia</i>, propeller resonance, harmonics, cavitations, engine and hull noise) • Identification of other activities having an impact in the region accompanied by the analysis and review of potential cumulative or synergistic impacts
Modelling of noise propagation loss	<ul style="list-style-type: none"> • Detail of independent, scientific modelling of noise propagation loss in confined areas (harbours and channels) and accounting for local propagation features (depth and type of sea bottom, local propagation paths related to thermal stratification, SOFAR or natural channel characteristics) from point source out to a radius where the noise levels generated are close to natural ambient sound levels • Identification and mapping of proposed species exclusion zones and description of how noise propagation into these zones will be minimized, taking into consideration the local propagation features

Component	Detail
Species impact	<ul style="list-style-type: none"> • General: <ol style="list-style-type: none"> a. Identification and density of species likely to be present that will experience sound transmission generated by the proposed activity above natural ambient sound levels. Calculated from this, the extent of the impact zones, and the number of animals affected by the activity. b. Specification of the type of impact predicted (direct and indirect) as well as direct and indirect impacts on prey species c. Information on the behaviour of each species group, and the ability to detect each of the species for mitigation purposes (e.g. for marine mammals this will include diving behaviour, vocal behaviour, and conspicuousness when at the surface). • For each species group, also detail of the following (refer to module B species summary): <ol style="list-style-type: none"> a. Species vulnerabilities: <ol style="list-style-type: none"> i. specific vulnerabilities to noise ii. lifecycle components of these vulnerabilities b. Habitat: <ol style="list-style-type: none"> i. specific habitat components considered ii. presence of critical habitat (calving, spawning, feeding grounds, resting bays etc.) c. Scientific assessment of impact: <ol style="list-style-type: none"> i. exposure levels ii. total exposure duration iii. determination of precautionary safe/harmful exposure levels (direct impact, indirect impact and disturbance) that account for uncertainty and avoids erroneous conclusions
Monitoring plans	<ul style="list-style-type: none"> • Explanation of access to the evaluation of ongoing scientific monitoring data to assess impacts • Quantification of the effectiveness of proposed mitigation methods • Spatio-temporal restrictions
Consultation and independent review	<ul style="list-style-type: none"> • Description of consultation, prior to EIA submission: <ol style="list-style-type: none"> a. List of stakeholders consulted b. Detail of information provided to stakeholders, opportunities given for appropriate engagement and the timeframe for feedback c. Explanation of what amendments and changes have been made to the proposed activity in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why • Description of independent review of draft EIA: <ol style="list-style-type: none"> a. Detail of the independent reviewers (species experts) including affiliation and qualifications b. Description of the comments, queries, requests and concerns received from each reviewer c. Explanation of what amendments and changes have been made to the proposed activity in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why

VI. EIA Guideline for Seismic Surveys (Air Gun and Alternative Technologies)

This EIA Guideline should be used in combination with the appropriate modules on species and impact from the **Technical Support Information** (B.1-12, C and D) as required for individual regional and domestic circumstances.

Component	Detail
Description of area	<ul style="list-style-type: none"> • Detail of the spatial extent and nature of the survey – including seabed bathymetry and composition, description of known stratification characteristics and broad ecosystem descriptions – as well as the spatial area that will experience anthropogenic noise, generated by the proposed survey, above natural ambient sound levels • Detail of the typical weather conditions and day length for the area during the proposed activity period • Identification of previous and simultaneous activities, their seasons and duration in the same or adjoining areas, existence and location of any marine protected areas, and a review of activity findings and implications
Description of the equipment and activity	<ul style="list-style-type: none"> • Explanation of all survey technologies available (including low-noise or noise-free options) and why the proposed technology has been chosen. If low-noise options have not been chosen, an explanation should be provided about why these technologies are not preferred • Description of the survey technology including: <ol style="list-style-type: none"> a. name and description of the vessel/s to be used b. total duration of the proposed survey, date, timeframe c. proposed timing of operations – season/time of day/during all weather conditions d. sound intensity level (dB peak to peak) in water @ 1 metre and all frequency ranges and discharge rate e. if an air gun technology is proposed: <ol style="list-style-type: none"> i. number of arrays ii. number of air guns within each array iii. air gun charge pressure to be used iv. volume of each air gun in cubic inches v. official calibration figures supplied by the survey vessel to be charted, for noise modelling vi. depth the air guns to be set vii. number and length of streamers, distance set apart and depth the hydrophones are set • Specification of the survey including anticipated nautical miles to be covered, track-lines, speed of vessels, start-up and shut-down procedures, distance and procedures for vessel turns including any planned air gun power setting changes • Identification of other activities having an impact in the region during the planned survey, accompanied by the analysis and review of potential cumulative or synergistic impacts

Component	Detail
<p>Modelling of noise propagation loss</p>	<ul style="list-style-type: none"> • Detail of independent, scientific modelling of noise propagation loss in the same season/weather conditions as the proposed activity accounting for local propagation features (depth and type of sea bottom, local propagation paths related to thermal stratification, SOFAR or natural channel characteristics) from point source out to a radius where the noise levels generated are close to natural ambient sound levels • Identification and mapping of proposed species exclusion zones and description of how noise propagation into these zones will be minimized, taking into consideration the local propagation features
<p>Species impact</p>	<ul style="list-style-type: none"> • General: <ol style="list-style-type: none"> a. Identification and density of species likely to be present that will experience sound transmission generated by the proposed activity above natural ambient sound levels. Calculated from this, the extent of the impact zones, and the number of animals affected by the activity. a. Specification of the type of impact predicted (direct and indirect) as well as direct and indirect impacts to prey species b. Information on the behaviour of each species group, and the ability to detect each of the species for mitigation purposes (e.g. for marine mammals this will include diving behaviour, vocal behaviour, and conspicuousness when at the surface). • For each species group, also detail of the following (refer to module B species summary): <ol style="list-style-type: none"> a. Species vulnerabilities: <ol style="list-style-type: none"> i. specific vulnerabilities to noise ii. lifecycle components of these vulnerabilities b. Habitat: <ol style="list-style-type: none"> i. specific habitat components considered ii. presence of critical habitat (calving, spawning, feeding grounds, resting bays etc.) c. Scientific assessment of impact: <ol style="list-style-type: none"> i. exposure levels ii. total exposure duration iii. determination of precautionary safe/harmful exposure levels (direct impact, indirect impact and disturbance) that account for uncertainty and avoids erroneous conclusions

Component	Detail
Mitigation and monitoring plans	<ul style="list-style-type: none"> • Detail of: <ol style="list-style-type: none"> a. Scientific monitoring before the survey to assess baselines, species distribution and behaviour to facilitate the incorporation of monitoring results into the impact assessment b. Scientific monitoring programmes, conducted during and after the survey, to assess impact, including noise monitoring stations placed at specified distances c. Transparent processes for regular real-time public reporting of survey progress and all impacts encountered d. Most appropriate methods of species detection (e.g. visual/acoustic) and the range of available methods, and their advantages and limitations, as well their practical application during the activity. e. Impact mitigation proposals: <ol style="list-style-type: none"> i. 24-hour visual or other means of detection, especially under conditions of poor visibility (including high winds, night conditions, sea spray or fog) ii. establishing exclusion zones to protect specific species, including scientific and precautionary justification for these zones iii. soft start and shut-down protocols iv. protocols in place for consistent and detailed data recording (observer/PAM sightings and effort logs, survey tracks and operations) v. detailed, clear, chain of command for implementing shut-down mitigation protocols vi. spatio-temporal restrictions • Quantification of the effectiveness of proposed mitigation methods
Reporting plans	<ul style="list-style-type: none"> • Detail of post operation reporting plans including verification of the effectiveness of mitigation, and any shut-down procedures occurring and reasons why
Consultation and independent review	<ul style="list-style-type: none"> • Description of consultation, prior to EIA submission: <ol style="list-style-type: none"> a. List of stakeholders consulted b. Detail of information provided to stakeholders, opportunities given for appropriate engagement and the timeframe for feedback c. Explanation of what amendments and changes have been made to the proposed survey in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why • Description of independent review of draft EIA: <ol style="list-style-type: none"> a. Detail of the independent reviewers (species experts) including affiliation and qualifications b. Description of the comments, queries, requests and concerns received from each reviewer c. Explanation of what amendments and changes have been made to the proposed survey in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why

VII. EIA Guideline for Construction Works

This EIA Guideline should be used in combination with the appropriate modules on species and impact from the **Technical Support Information** (B.1-12, C and D) as required for individual regional and domestic circumstances. This guideline should be applied to all forms of marine construction, including dredging and similar vessel based activities where ships may be stationary, but under way. All commissioning and decommissioning activities should also follow these guidelines.

Component	Detail
Description of area	<ul style="list-style-type: none"> • Detail of the spatial extent and nature of the activity – including seabed bathymetry and composition, description of known stratification characteristics and broad ecosystem descriptions – as well as the spatial area that will experience anthropogenic noise, generated by the proposed activity, above natural ambient sound levels • Detail of the typical weather conditions and day length for the area during the proposed activity period • Identification of previous and simultaneous activities, their seasons and duration in the same or adjoining areas, existence and location of any marine protected areas, and a review of activity findings and implications
Description of the equipment and activity	<ul style="list-style-type: none"> • Explanation of all activity technologies available and why each proposed technology is chosen, including consideration of noise-free installation methods • Specification of: <ol style="list-style-type: none"> a. total duration of the proposed activity b. proposed timing of operations – season/time of day/during all weather conditions c. sound intensity level (dB peak to peak) in water @ 1 metre and frequency ranges d. If explosives are proposed: <ol style="list-style-type: none"> i. what type of explosive and what charge weight is proposed, also whether the explosive is going to be used on the seabed or subsurface ii. specification of sound intensity level (dB 0 to peak) in water @ 1 metre, frequency range and number of detonations and interval time • Description of noise counter measures e.g.: bubble curtains, noise dampers and cofferdams, including a description of state-of-the-art technology, Best Environmental Practice (BEP) or Best Available Technology (BAT) • Identification of other activities having an impact in the region during the planned activity, accompanied by the analysis and review of potential cumulative or synergistic impacts
Modelling of noise propagation loss	<ul style="list-style-type: none"> • Detail of independent, scientific modelling of noise propagation loss in the same season/weather conditions as the proposed activity accounting for local propagation features (depth and type of sea bottom, local propagation paths related to thermal stratification, SOFAR or natural channel characteristics) from point source out to a radius where the noise levels generated are close to natural ambient sound levels • Identification and mapping of proposed exclusion zones for species and description of how noise propagation into these zones will be minimized, taking into consideration the local propagation features

Component	Detail
Species impact	<ul style="list-style-type: none"> • General: <ol style="list-style-type: none"> a. Identification and density of species likely to be present that will experience sound transmission generated by the proposed activity above natural ambient sound levels; and calculated from this, the extent of the impact zones b. Specification of the type of impact predicted (direct and indirect) as well as direct and indirect impacts to prey species c. Information on the behaviour of each species group, and the ability to detect each of the species for mitigation purposes (e.g. for marine mammals this will include diving behaviour, vocal behaviour, and conspicuousness when at the surface). • For each species group, also detail of the following (refer to module B species summary): <ol style="list-style-type: none"> a. Species vulnerabilities: <ol style="list-style-type: none"> i. specific vulnerabilities to noise ii. lifecycle components of these vulnerabilities b. Habitat: <ol style="list-style-type: none"> i. specific habitat components considered ii. presence of critical habitat (calving, spawning, feeding grounds, resting bays etc.) c. Scientific assessment of impact: <ol style="list-style-type: none"> i. exposure levels ii. total exposure duration iii. determination of precautionary safe/harmful exposure levels (direct impact, indirect impact and disturbance) that account for uncertainty and avoids erroneous conclusions
Mitigation and monitoring plans	<ul style="list-style-type: none"> • Detail of: <ol style="list-style-type: none"> a. Scientific monitoring programmes, conducted before, during and after the activity, to assess impact, including noise monitoring stations placed at specified distances b. Transparent processes for regular real-time public reporting of activity progress and all impacts encountered c. Most appropriate methods of species detection (e.g. visual/acoustic) and the range of available methods, and their advantages and limitations, as well their practical application during the activity. d. Impact mitigation proposals: <ol style="list-style-type: none"> i. 24-hour visual or other means of detection, especially under conditions of poor visibility (including high winds, night conditions, sea spray or fog) ii. establishing exclusion zones to protect specific species, including scientific and precautionary justification for these zones iii. soft start and shut-down protocols iv. spatio-temporal restrictions • Quantification of the effectiveness of proposed mitigation methods
Reporting plans	<ul style="list-style-type: none"> • Detail of post operation reporting plans including verification of the effectiveness of mitigation, and any shut-down procedures occurring and reasons why

Component	Detail
<p>Consultation and independent review</p>	<ul style="list-style-type: none"> • Description of consultation, prior to EIA submission: <ol style="list-style-type: none"> a. List of stakeholders consulted b. Detail of information provided to stakeholders, opportunities given for appropriate engagement and the timeframe for feedback c. Explanation of what amendments and changes have been made to the proposed activity in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why e. If it is decided that BEP or BAT is not used, this should be justified • Description of independent review of draft EIA: <ol style="list-style-type: none"> a. Detail of the independent reviewers (species experts) including affiliation and qualifications b. Description of the comments, queries, requests and concerns received from each reviewer c. Explanation of what amendments and changes have been made to the proposed activity in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why

VIII. EIA Guideline for Offshore Platforms

This EIA Guideline should be used in combination with the appropriate modules on species and impact from the **Technical Support Information** (B.1-12, C and D) as required for individual regional and domestic circumstances.

All commissioning and decommissioning activities should also follow these guidelines. Where impulsive activities, such as offshore platforms being constructed through impact driven piles, the guidelines for VII: Construction Works should also be applied.

Component	Detail
<p>Description of area</p>	<ul style="list-style-type: none"> • Detail of the spatial extent and nature of the activity – including seabed bathymetry and composition, description of known stratification characteristics and broad ecosystem descriptions – as well as the spatial area that will experience anthropogenic noise, generated by the proposed activity, above natural ambient sound levels • Detail of the typical weather conditions and day length for the area during the proposed activity period • Identification of previous and simultaneous activities, their seasons and duration in the same or adjoining areas, existence and location of any marine protected areas, and a review of activity findings and implications

Component	Detail
Description of the equipment and activity	<ul style="list-style-type: none"> • Explanation of all activity technologies available and why each proposed technology is chosen, including consideration of alternatives • Description of the activity technology including name and description of the vessel/s and sea floor equipment to be used • Specification of: <ol style="list-style-type: none"> a. total duration of the proposed activity b. sound intensity level (dB_{rms}) in water @ 1 metre (from noise source e.g.: platform caissons or drill ship's hull etc.) and frequency ranges c. sound intensity levels (peak and rms) during planned maintenance schedules • Identification of other activities having an impact in the region during the planned activity, accompanied by the analysis and review of potential cumulative or synergistic impacts
Modelling of noise propagation loss	<ul style="list-style-type: none"> • Detail of independent, scientific modelling of noise propagation loss in the same season/weather conditions as the proposed activity accounting for local propagation features (depth and type of sea bottom, local propagation paths related to thermal stratification, SOFAR or natural channel characteristics) from point source out to a radius where the noise levels generated are close to natural ambient sound levels • Identification and mapping of proposed exclusion zones for species and description of how noise propagation into these zones will be minimized, taking into consideration the local propagation features
Species impact	<ul style="list-style-type: none"> • General: <ol style="list-style-type: none"> a. Identification and density of species likely to be present that will experience sound transmission generated by the proposed activity above natural ambient sound levels; and calculated from this, the extent of the impact zones b. Specification of the type of impact predicted (direct and indirect) as well as direct and indirect impacts to prey species c. Information on the behaviour of each species group, and the ability to detect each of the species for mitigation purposes (e.g. for marine mammals this will include diving behaviour, vocal behaviour, and conspicuousness when at the surface). • For each species group, also detail of the following (refer to module B species summary): <ol style="list-style-type: none"> a. Species vulnerabilities: <ol style="list-style-type: none"> i. specific vulnerabilities to noise ii. lifecycle components of these vulnerabilities b. Habitat: <ol style="list-style-type: none"> i. specific habitat components considered ii. presence of critical habitat (calving, spawning, feeding grounds, resting bays etc.) c. Scientific assessment of impact: <ol style="list-style-type: none"> i. exposure levels ii. total exposure duration: iii. determination of precautionary safe/harmful exposure levels (direct impact, indirect impact and disturbance) that account for uncertainty and avoids erroneous conclusions

Component	Detail
Mitigation and monitoring plans	<ul style="list-style-type: none"> • Detail of: <ol style="list-style-type: none"> a. Scientific monitoring programmes, conducted before, during and after the activity, to assess impact, including noise monitoring stations placed at specified distances b. Transparent processes for regular real-time public reporting of activity progress and all impacts encountered c. Most appropriate methods of species detection (e.g. visual/acoustic) and the range of available methods, and their advantages and limitations, as well their practical application during the activity. d. Impact mitigation proposals e. 24-hour visual or other means of detection, especially under conditions of poor visibility (including high winds, night conditions, sea spray or fog) f. Spatio-temporal restrictions • Quantification of the effectiveness of proposed mitigation methods
Reporting plans	<ul style="list-style-type: none"> • Detail of post operation reporting plans including verification of the effectiveness of mitigation
Consultation and independent review	<ul style="list-style-type: none"> • Description of consultation, prior to EIA submission: <ol style="list-style-type: none"> a. List of stakeholders consulted b. Detail of information provided to stakeholders, opportunities given for appropriate engagement and the timeframe for feedback c. Explanation of what amendments and changes have been made to the proposed activity in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why • Description of independent review of draft EIA: <ol style="list-style-type: none"> a. Detail of the independent reviewers (species experts) including affiliation and qualifications b. Description of the comments, queries, requests and concerns received from each reviewer c. Explanation of what amendments and changes have been made to the proposed activity in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why

IX. EIA Guideline for Playback and Sound Exposure Experiments

This EIA Guideline should be used in combination with the appropriate modules on species and impact from the **Technical Support Information** (B.1-12, C and D) as required for individual regional and domestic circumstances.

Component	Detail
Description of area	<ul style="list-style-type: none"> • Detail of the spatial extent and nature of the activity – including seabed bathymetry and composition, description of known stratification characteristics and broad ecosystem descriptions – as well as the spatial area that will experience anthropogenic noise, generated by the proposed activity, above natural ambient sound levels • Detail of the typical weather conditions and day length for the area during the proposed activity period • Identification of previous and simultaneous activities, their seasons and duration in the same or adjoining areas, existence and location of any marine protected areas, and a review of activity findings and implications
Description of the equipment and activity	<ul style="list-style-type: none"> • Noting that the scale of the noise needed to elicit a response (with respect to level and duration) may be much lower than in industry activities; and that noise can be controlled in order to affect only a small area or small number of individuals, the noise control measures of the experimental design should be described in detail. • Explanation of all technologies available for the activity and why each proposed technology is chosen • Description of the chosen technology including name and description of the vessel/s to be used • Specification of: <ol style="list-style-type: none"> a. lowest practicable sound intensity level required b. total duration of the proposed activity c. proposed timing of operations – season/time of day/during all weather conditions d. sound intensity level (dB peak to peak) in water @ 1 metre and all frequency ranges and discharge rate e. if an air gun technology is proposed refer to VI f. if explosives are proposed refer to VII • Specification of the activity including anticipated nautical miles to be covered, track-lines, speed of vessels, start-up and shut-down procedures, distance and procedures for vessel turns including any planned air gun power setting changes • Identification of other activities having an impact in the region during the planned activity, accompanied by the analysis and review of potential cumulative or synergistic impacts
Modelling of noise propagation loss	<ul style="list-style-type: none"> • Detail of independent, scientific modelling of noise propagation loss in the same season/weather conditions as the proposed activity accounting for local propagation features (depth and type of sea bottom, local propagation paths related to thermal stratification, SOFAR or natural channel characteristics) from point source out to a radius where the noise levels generated are close to natural ambient sound levels • Identification and mapping of proposed exclusion zones for species and description of how noise propagation into these zones will be minimized, taking into consideration the local propagation features

Component	Detail
Species impact	<ul style="list-style-type: none"> • General: <ol style="list-style-type: none"> a. Identification and density of species likely to be present that will experience sound transmission generated by the proposed activity above natural ambient sound levels; and calculated from this, the extent of the impact zones b. Specification of the type of impact predicted (direct and indirect) as well as direct and indirect impacts to prey species c. Information on the behaviour of each species group, and the ability to detect each of the species for mitigation purposes (e.g. for marine mammals this will include diving behaviour, vocal behaviour, and conspicuousness when at the surface). • For each species group, also detail of the following (refer to module B species summary): <ol style="list-style-type: none"> a. Species vulnerabilities: <ol style="list-style-type: none"> i. specific vulnerabilities to noise ii. lifecycle components of these vulnerabilities b. Habitat: <ol style="list-style-type: none"> i. specific habitat components considered ii. presence of critical habitat (calving, spawning, feeding grounds, resting bays etc.) c. Scientific assessment of impact: <ol style="list-style-type: none"> i. exposure levels ii. total exposure duration iii. determination of precautionary safe/harmful exposure levels (direct impact, indirect impact and disturbance) that account for uncertainty and avoids erroneous conclusions iv. how the experiment design will monitor target and non-target species and the steps that will be taken to halt sound emission if adverse response or behavioural changes are observed v. how exposures that are expected to elicit particular behavioural responses (e.g. responses elicited by predator sounds, conspecific signals) will inform specific mitigation and monitoring protocols. In such cases, impact assessment should also articulate what responses may not be related to the loudness of the exposure but to the behavioural significance of the signal/noise used.

Component	Detail
Mitigation and monitoring plans	<ul style="list-style-type: none"> • Detail of: <ol style="list-style-type: none"> a. Scientific monitoring programmes, conducted before, during and after the activity, to assess impact b. Transparent processes for regular real-time public reporting of activity progress and all impacts encountered c. Most appropriate methods of species detection (e.g. visual/acoustic) and the range of available methods, and their advantages and limitations, as well their practical application during the activity. d. Impact mitigation proposals: <ol style="list-style-type: none"> i. 24-hour visual or other means of detection, especially under conditions of poor visibility (including high winds, night conditions, sea spray or fog) ii. establishing exclusion zones to protect specific species, including scientific and precautionary justification for these zones iii. soft start and shut-down protocols iv. spatio-temporal restrictions • Quantification of the effectiveness of proposed mitigation methods
Reporting plans	<ul style="list-style-type: none"> • Detail of post operation reporting plans including verification of the effectiveness of mitigation
Consultation and independent review	<ul style="list-style-type: none"> • Description of consultation, prior to EIA submission: <ol style="list-style-type: none"> a. List of stakeholders consulted b. Detail of information provided to stakeholders, opportunities given for appropriate engagement and the timeframe for feedback c. Explanation of what amendments and changes have been made to the proposed activity in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why • Description of independent review of draft EIA: <ol style="list-style-type: none"> a. Detail of the independent reviewers (species experts) including affiliation and qualifications b. Description of the comments, queries, requests and concerns received from each reviewer c. Explanation of what amendments and changes have been made to the proposed activity in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why

X. EIA Guideline for Pingers (Acoustic Deterrent/Harassment Devices, Navigation)

This EIA Guideline should be used in combination with the appropriate modules on species and impact from the **Technical Support Information** (B.1-12, C and D) as required for individual regional and domestic circumstances.

Component	Detail
Description of area	<ul style="list-style-type: none"> • Detail of the spatial extent and nature of the activity – including seabed bathymetry and composition, description of known stratification characteristics and broad ecosystem descriptions – as well as the spatial area that will experience anthropogenic noise, generated by the proposed activity, above natural ambient sound levels. • Detail of the typical weather conditions and day length for the area during the proposed activity period • Identification of previous and simultaneous activities, their seasons and duration in the same or adjoining areas, existence and location of any marine protected areas, and a review of activity findings and implications
Description of the equipment and activity	<ul style="list-style-type: none"> • Explanation of all technologies available for the activity and why the proposed technology is chosen, including the description should also contain the consideration of alternatives • Specification of sound intensity level (dB peak to peak) in water @ 1 metre, frequency ranges and ping rate, sound exposure level (SEL), as well as proposed spacing of pingers • Identification of other activities having an impact in the region accompanied by the analysis and review of potential cumulative or synergistic impacts
Modelling of noise propagation loss	<ul style="list-style-type: none"> • Detail of independent, scientific modelling of noise propagation loss in the same season/weather conditions as the proposed activity accounting for local propagation features (depth and type of sea bottom, local propagation paths related to thermal stratification, SOFAR or natural channel characteristics) from point source out to a radius where the noise levels generated are close to natural ambient sound levels • Identification and mapping of proposed exclusion zones for species and description of how noise propagation into these zones will be minimized, taking into consideration the local propagation features

Component	Detail
Species impact	<ul style="list-style-type: none"> • General: <ol style="list-style-type: none"> a. Identification and density of species likely to be present that will experience sound transmission generated by the proposed activity above natural ambient sound levels; and calculated from this, the extent of the impact zones a. Specification of the type of impact predicted (direct and indirect) as well as direct and indirect impacts to prey species b. Information on the behaviour of each species group, and the ability to detect each of the species for mitigation purposes (e.g. for marine mammals this will include diving behaviour, vocal behaviour, and conspicuousness when at the surface). • For each species group, also detail of the following (refer to module B species summary): <ol style="list-style-type: none"> a. Species vulnerabilities: <ol style="list-style-type: none"> i. specific vulnerabilities to noise ii. lifecycle components of these vulnerabilities b. Habitat: <ol style="list-style-type: none"> i. specific habitat components considered ii. presence of critical habitat (calving, spawning, feeding grounds, resting bays etc.) c. Scientific assessment of impact: <ol style="list-style-type: none"> i. exposure levels ii. total exposure duration iii. determination of precautionary safe/harmful exposure levels (direct impact, indirect impact and disturbance) that account for uncertainty and avoids erroneous conclusions
Monitoring plans	<ul style="list-style-type: none"> • Detail of scientific monitoring programmes, conducted before, during and after the activity, to assess impact • Spatio-temporal restrictions • Quantification of the effectiveness of proposed mitigation methods
Reporting plans	<ul style="list-style-type: none"> • Detail of post operation reporting plans including verification of the effectiveness of mitigation
Consultation and independent review	<ul style="list-style-type: none"> • Description of consultation, prior to EIA submission: <ol style="list-style-type: none"> a. List of stakeholders consulted b. Detail of information provided to stakeholders, opportunities given for appropriate engagement and the timeframe for feedback c. Explanation of what amendments and changes have been made to the proposed activity in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why • Description of independent review of draft EIA: <ol style="list-style-type: none"> a. Detail of the independent reviewers (species experts) including affiliation and qualifications b. Description of the comments, queries, requests and concerns received from each reviewer c. Explanation of what amendments and changes have been made to the proposed activity in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why

XI. EIA Guideline for Other Noise-generating Activities (Acoustic Data Transmission, Wind, Tidal and Wave Turbines and Future Technologies)

This EIA Guideline should be used in combination with the appropriate modules on species and impact from the **Technical Support Information** (B.1-12, C and D) as required for individual regional and domestic circumstances.

All commissioning and decommissioning activities should also follow these guidelines.

Component	Detail
Description of area	<ul style="list-style-type: none"> • Detail of the spatial extent and nature of the activity – including seabed bathymetry and composition, description of known stratification characteristics and broad ecosystem descriptions – as well as the spatial area that will experience anthropogenic noise, generated by the proposed activity, above natural ambient sound levels • Detail of the typical weather conditions and day length for the area during the proposed activity period • Identification of previous and simultaneous activities, their seasons and duration in the same or adjoining areas, existence and location of any marine protected areas, and a review of activity findings and implications
Description of the equipment and activity	<ul style="list-style-type: none"> • Explanation of all technologies available for the activity • Specification of sound intensity level (dB) in water @ 1 metre, and frequency ranges. This should include dB peak to peak for acoustic data transmission for example, dB_{rms} for wind, tidal and wave turbines and future technologies categorized accordingly • Identification of other activities having an impact in the region during the planned activity, accompanied by the analysis and review of potential cumulative or synergistic impacts
Modelling of noise propagation loss	<ul style="list-style-type: none"> • Detail of independent, scientific modelling of noise propagation loss in the same season/weather conditions as the proposed activity accounting for local propagation features (depth and type of sea bottom, local propagation paths related to thermal stratification, SOFAR or natural channel characteristics) from point source out to a radius where the noise levels generated are close to natural ambient sound levels • Identification and mapping of proposed exclusion zones for species and description of how noise propagation into these zones will be minimized, taking into consideration the local propagation features

Component	Detail
Species impact	<ul style="list-style-type: none"> • General: <ol style="list-style-type: none"> a. Identification and density of species likely to be present that will experience sound transmission generated by the proposed activity above natural ambient sound levels; and calculated from this, the extent of the impact zones b. Specification of the type of impact predicted (direct and indirect) as well as direct and indirect impacts to prey species c. Information on the behaviour of each species group, and the ability to detect each of the species for mitigation purposes (e.g. for marine mammals this will include diving behaviour, vocal behaviour, and conspicuousness when at the surface). • For each species group, also detail of the following (refer to module B species summary): <ol style="list-style-type: none"> a. Species vulnerabilities: <ol style="list-style-type: none"> i. specific vulnerabilities to noise ii. lifecycle components of these vulnerabilities b. Habitat: <ol style="list-style-type: none"> i. specific habitat components considered ii. presence of critical habitat (calving, spawning, feeding grounds, resting bays etc.) c. Scientific assessment of impact: <ol style="list-style-type: none"> i. exposure levels ii. total exposure duration iii. determination of precautionary safe/harmful exposure levels (direct impact, indirect impact and disturbance) that account for uncertainty and avoids erroneous conclusions • Quantification of the effectiveness of proposed mitigation methods
Monitoring plans	<ul style="list-style-type: none"> • Explanation of ongoing scientific monitoring programmes to assess impact • Most appropriate methods of species detection (e.g. visual/acoustic) and the range of available methods, and their advantages and limitations, as well their practical application during the activity. • Spatio-temporal restrictions
Consultation and independent review	<ul style="list-style-type: none"> • Description of consultation, prior to EIA submission: <ol style="list-style-type: none"> a. List of stakeholders consulted b. Detail of information provided to stakeholders, opportunities given for appropriate engagement and the timeframe for feedback c. Explanation of what amendments and changes have been made to the proposed activity in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why • Description of independent review of draft EIA: <ol style="list-style-type: none"> a. Detail of the independent reviewers (species experts) including affiliation and qualifications b. Description of the comments, queries, requests and concerns received from each reviewer c. Explanation of what amendments and changes have been made to the proposed activity in response to the comments, queries, requests and concerns d. Explanation of which comments, queries, requests and concerns have not been accommodated and why

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Additional references are detailed in the Technical Support Information at www.cms.int/guidelines/cms-family-guidelines-EIAs-marine-noise.