MERC Consultants
environmental and conservation services

EU Habitats Directive: Annex IV Risk Assessment

Department of the Environment, Climate and Communications: Geophysical Reconnaissance Survey in support of offshore renewable energy development

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1. Introduction

Ireland has moved to a plan-led approach to deliver our offshore wind targets. The Government is delivering our climate and energy ambitions for offshore wind energy through a number of overlapping phases:

- Phase One, which corresponds to the first offshore renewable electricity auction (ORESS 1)
- Phase Two, an accelerated work programme, focusing on near-term delivery based on technology with proven scalability in other jurisdictions, and which will procure the additional offshore wind capacity required to meet Government's 2030 target, and
- The fully plan-led Future Framework

Ireland's second offshore wind energy auction, ORESS 2.1 will be the first auction to take place in Phase Two and will procure up to 900 Megawatts of capacity from a State-selected designated area known as a Designated Maritime Area Plan (DMAP) off Ireland's south coast.

In support of ORESS 2.1, the Department of Environment Climate and Communications (DECC) is planning a Geophysical Reconnaissance Survey for indicatively 52 days, up to a maximum of 70 days. Specific dates are vessel schedule pending. Data acquired will be made publicly available to participants in the ORESS 2.1 energy auction process.

For this survey, DECC propose to use the Marine Institute R.V. *Tom Crean* to acquire and deliver new offshore geophysical data and knowledge. The primary objective of this survey is to gather data on the sub-surface geology within the upper 100 meters below the seabed. This information will be crucial in assessing the suitability of marine areas for potential offshore wind and grid infrastructure development within the South Coast DMAP.

The area that will be surveyed is a subsection of that outlined in Fig. 1, and will be refined pending the DMAP area published (currently anticipated March 2024). It extends from the 75m bathymetry contour offshore to the 10m bathymetry contour and/or to approximately 300m from the coastline to the western extent, and 7.5km from land on the eastern extent.

The coastal area incorporated in the Cork Harbour approaches is to facilitate potential acquisition of baseline geophysical data in support of power cable routing for grid connection to offshore wind infrastructure. The final survey configuration and plan will be informed by the draft DMAP establishment process ongoing presently.

This report provides an assessment of the potential impact the proposed project might have on Habitats Directive (92/42/EEC) Annex IV species identified as having the potential to be present in the project area.

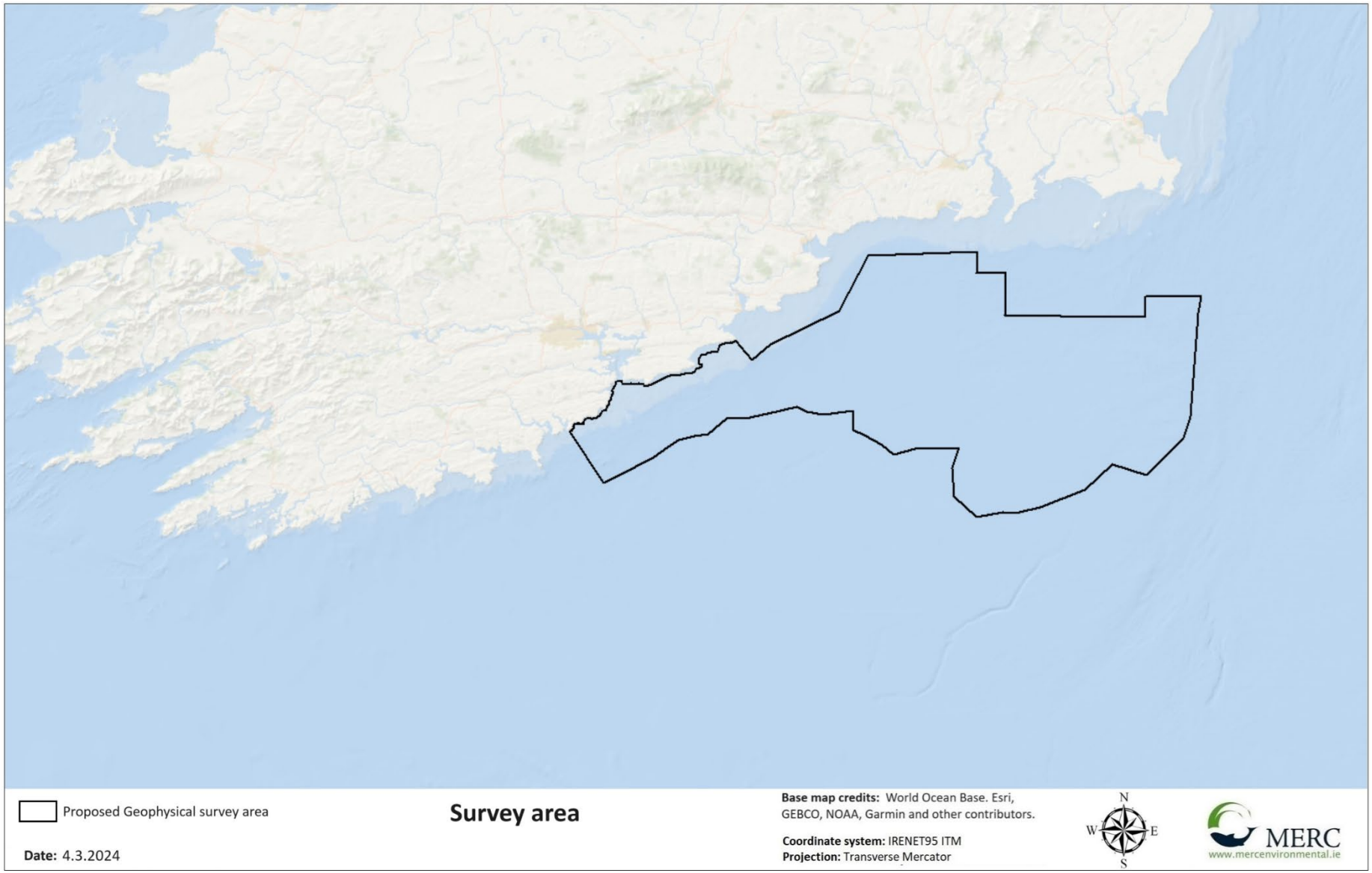

Fig. 1. Overview of proposed survey location.

2. Legislation

Article 12 of the EU Habitats Directive states:

Member States shall take the requisite measures to establish a system of strict protection for the animal species listed in Annex IV (a) in their natural range, prohibiting:
(a) all forms of deliberate capture or killing of specimens of these species in the wild;
(b) deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration;
(c) deliberate destruction or taking of eggs from the wild;
(d) deterioration or destruction of breeding sites or resting places.

2. For these species, Member States shall prohibit the keeping, transport and sale or exchange, and offering for sale or exchange, of specimens taken from the wild, except for those taken legally before this Directive is implemented.

3.The prohibition referred to in paragraph 1(a) and (b) and paragraph 2 shall apply to all stages of life of the animals to which this Article applies.

4. Member States shall establish a system to monitor the incidental capture and killing of the animal species listed in Annex IV (a). In the light of the information gathered, Member States shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned.

3. Scope of work

3.1 Overview

In support of ORESS 2.1, the Department of Environment Climate and Communications (DECC) is planning a Geophysical Reconnaissance Survey to take place between May to September 2024, for approximately 52 days, up to a maximum of 70 days. Specific dates are vessel schedule pending. Data acquired will be made publicly available to participants in the ORESS 2.1 energy auction process.

The reconnaissance survey data collected by this initial and future survey works will provide information in the upper 100 m of sub-surface geology, to inform the potential suitability of marine areas for possible offshore wind and grid infrastructure development, should these areas be identified as suitable for offshore wind and/or grid development within the final South Coast DMAP.

The proposed broad geophysical target survey area is 475,408 Hectares. It encompasses an area from the nearshore out to the 75m contour stretching from approximately 8km east of Carnsore Point off the Wexford coast, west to Oyster Haven, County Cork (figure 1).

A suite of mapping instruments will be used in this geophysical reconnaissance survey. This includes multibeam, sub bottom profiler, deployment of a day or Hammon grab, side scan sonar, a sparker system and if further penetration is required, an air gun source. These will provide appropriate datasets for the various sub-bottom requirements for a ground investigation for offshore wind development. The type of sub-bottom profiler and sparker system to be used to investigate the geology will be determined by a number of factors including:

- Depth of interest below seafloor.
- Nature of shallow soil or rock that are likely to be encountered.
- Desired resolution of the data that are to be used for mapping the shallow materials.

Hence, it is common to utilise a combination of sub-bottom acoustic profilers to image the various depths of interest for engineering. The zones of interest would typically include:

- Shallow sub-seafloor (0-5 m) for inter-array and export cable protection or burial depths.
- Intermediate sub-seafloor (5-10 m) for anchoring and small structure foundations.
- Deeper sub-seafloor: (10-100 m) for large structures (e.g., piled foundations).

The acquisition of deeper sub seafloor geophysical data will be acquired utilising a sparker system and /or air gun to penetrate to the required depth of up to 100m.

See Table 1 for proposed equipment and specifications.

Table 1. Acoustic and benthic sampling equipment proposed to be operated on board the R.V. Tom Crean

Acoustic survey equipment				
Equipment	**Model**	**Deployment**	**Company**	**Sound Pressure Level re 1 µPA in water @ 1m from source**
Multibeam Echo sounder	EM2040 (200,300 & 400kHz)	Retractable hull mount	Konsberg Maritime	210
Sparker System & 48 channel hydrophone array	Dura-speak seismic sound source 300Hz to 1.2kHz	Towed system	Subsea Tehnologies	226
Sparker (backup)	Geospark 200	Towed system	Geus	223
Sub-bottom Profiler	Knudsen 3250 CHIRP (3.5-12kHz)	Vessel mount	Knudsen	223
Mini air-gun	Mini G Gun	Towed system	Sercel	230
Side scan Sonar	4205 sidescan 300 to 900 kHz	Towed system	Edgetech	228
Benthic sampling equipment				
Day Grab	N/A	Overboard	N/A	N/A
Hammon Grab	N/A	Overboard	N/A	N/A

Towed equipment will be restricted to a single 48 channel hydrophone and tail buoy, active streamer length approximately 150m, total towed instrumentation length approximately 200m. This will slightly restrict vessel maneuverability.

The reconnaissance data collected by the proposed survey will provide information in the upper 100m of sub-surface geology, to inform the potential suitability of marine areas for possible offshore wind and grid infrastructure development, should these areas be identified as suitable for offshore wind and/or grid development within the final South Coast Designated Maritime Area Plan (DMAP.

Details of the survey vessel and proposed equipment to be used are detailed in sections 3.2 to 3.8.

3.2 Survey vessel

The Irish multi-purpose marine research vessel, the *RV Tom Crean,* will be used for the proposed surveys (figure 2). The RV Tom Crean was commissioned in 2022 and was designed as a silent research vessel, in order to meet the stringent criteria of the ICES 209 noise standard for fisheries research. The vessel specifications are given in Table 2 and the noise profile at a range of speeds given in Figures 3 to 5.

Fig. 2. R.V. Tom Crean

Table 2. RV Tom Crean: Vessel specifications

Vessel size	
Vessel length	52.8m
Beam	14m
Draught	5.2m (maximum)
Tonnage (GRT)	1935 Tonnes
Main diesel generators	
Make	Mitsubishi
Type	S16R-(Z3)MPTAW
Number and power	2 x ~1437kW
Speed	1500 rpm
Mounting	Double resilient
Exhaust silencers	SCR system with 45dB(A) attenuation
Auxiliary diesel generators	
Make	Scania
Type	DI 13-91 M
Power	426 kWm
Speed	1500 rpm
Mounting	Resilient
Exhaust silencers	At least 25 dB(A)
Propulsion motor	
Make	Indar
Type	Squirrel cage – Induction motor IMU-710-X/8
Power	2000 kW at 179rpm
Rated frequency	12.6 Hz

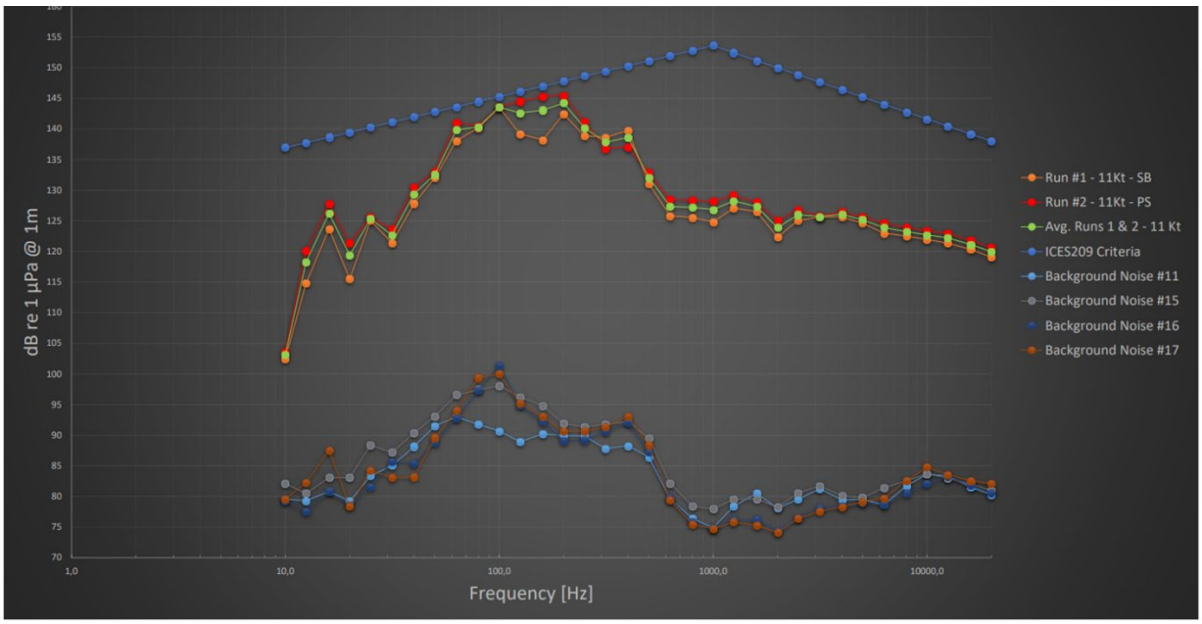

Fig. 3. (Run ID no. 1 and 2). Main verification at 11Kt distance corrected and averaged
Distance correction is based on derived correction factors from the transmission loss function.

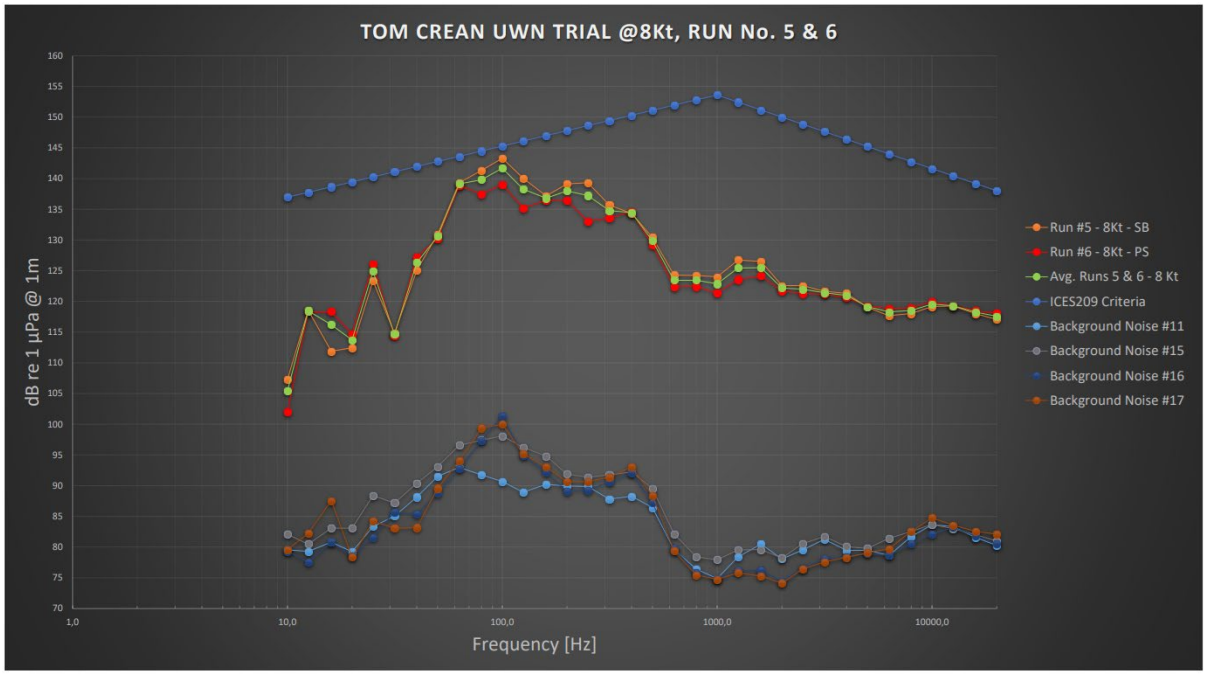

Fig. 4. Run Id no. 5 and 6 at 8Kt distance corrected and averaged.
Distance correction is based on derived correction factors from the transmission loss function.

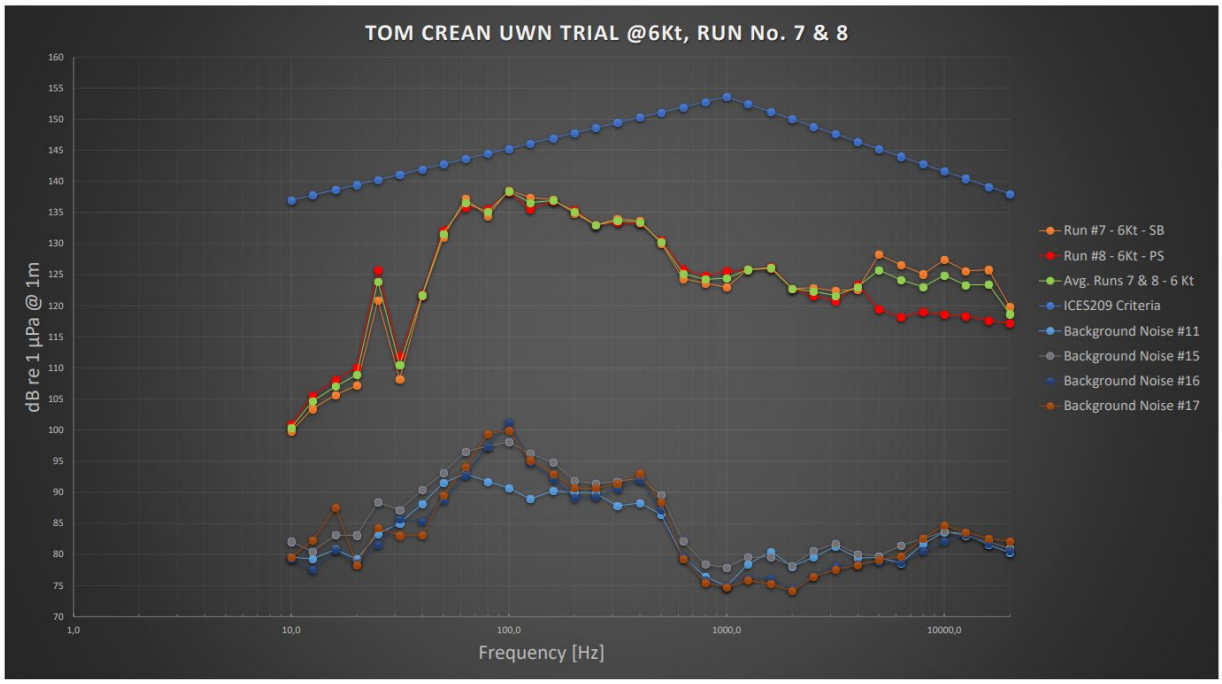

Fig. 5. Run Id No. 7 and 8 at 6Kt distance corrected and averaged.
Distance correction is based on derived correction factors from the transmission loss function.

3.3 Multibeam echosounder

A multibeam echosounder (MBES) is a type of sonar frequently used to map bathymetry. It operates by emitting an acoustic wave in a fan shape beneath the point of its transceiver attached to the hull of the vessel. The time it takes for the sound waves to bounce off the seabed and return to the transceiver is used to calculate the water depth within the arc of the fan. The proposed MBES operates at a sound pressure level of 210 dB re 1µPa at 1m with a peak frequency between 200-400 kHz.

3.4 Sparker system and hydrophone array

A sparker is a device used for sub-seabed investigations where deeper acoustic penetration is required. It is generally more powerful than a Sub-bottom profiler and used to explore very coarse/compacted sea beds. The sound source is generated by an electrical arc that creates a bubble. As it collapses the bubble produces a broad band (500 Hz – 4 kHz) omnidirectional pulse which penetrates a few hundred meters into the subsurface. Hydrophone arrays towed near the acoustic source receive the returning signals.

3.5 Mini airgun

A mini airgun emits a blast of compressed air resulting in an acoustic signal consisting of an initial high-amplitude pressure pulse followed by a decaying series of “bubble pulses” formed by oscillations of the resulting air bubble.

3.6 Sub-bottom profiler

A Sub-bottom profiler employs an acoustic signal, to provide the information required to identify and measure marine sediment layers that exist below the sediment/water interface. The proposed

equipment comprises a Knudsen Chirp system which transmit a sweep of frequencies (e.g. 2-10 kHz) in a single pulse. Depending on the profile of the seabed (rock, sand, mud etc.) and level of compaction, the energy reflected back can be related to the sub-bottom composition.

3.7 Side scan

Side scan Sonar (SSS) is another device that transmits sound pulses that provide the information required to map the seabed. It differs from MBES in that SSS has a finer beam width and smaller footprint to MBES and therefore higher resolution. It is generally towed behind the vessel very close to the seabed and emits fan-shaped acoustic pulses down toward the seafloor which are recorded as a series of cross-tracks. The sound frequencies used by side-scan sonar range generally range from 100 to 1000kHz; higher frequencies yielding better resolution but less range.

3.8 Day grab and Hammon Grab

A day grab is an instrument used for sampling soft seabed sediments. When deployed overboard it is lowered on a winch to the seabed where the jaws open to take a small (approx. 15L) sample of the surface sediment (top 20cm). A Hammon grab is a very similar type of sampler, but the jaw mechanism is slightly different which allows it to sample coarser sediments (e.g. gravel and shelly sediments). The samples retained can then be analysed to obtain an overview of the sediment fauna, and particle size. Both samplers are routinely used for surveillance monitoring to support a number of EU Directives such as the Habitats Directive and Water Framework Directive.

4. Receiving environment: Annex IV Species

4.1 Cetaceans

Under Article 12 of the Directive, all cetaceans should receive strict protection within the Exclusive Economic Zone. A total of 26 cetacean species have been recorded in Ireland. A marine Mammal Database compiled and managed by the National Biodiversity Data Centre has collated data from numerous sources (e.g. Irish Whale and Dolphin Group, ObSERVE project) on the distribution of cetaceans off the coast of Ireland. These data sources show that the area in and surrounding the proposed project area are used by a wide range of cetacean species. The density and distribution of which varies over time and season.

This includes frequent live sightings of Common dolphin (*Delphinus delphis*), Common Porpoise (*Phocoena phocoena*), Fin Whale (*Balaenoptera physalus*), Humpback Whale (*Megaptera novaeangliae*) and Minke Whale (*Balaenoptera acutorostrata*) within the Zone of Influence of the proposed project. While occasional records for live sightings of additional cetacean species including Bottle-nosed Dolphin (*Tursiops truncates*) and Risso's Dolphin (*Grampus griseus*) are also available.

4.2 Otter

Coastal otters are known to utilise the marine habitat for foraging, feeding on a variety of fish and shellfish species depending on the time of year. The proposed project area is, at minimum distance 300 meters from the shore and is therefore considered to be outside of the general range of otter commuting and foraging habitat. There are no records for otter within the proposed survey area. In the sections where the survey area extends to within 300m of the shore there is no recorded otter commuting habitat.

4.3 Reptiles (marine turtles)

Leathery Turtle (*Dermochelys coriacea*) are recorded occasionally from around the entire coast of Ireland. However, no records for this species were found for the area within or adjacent to the proposed project site.

4.4 Bats

All bat species in Ireland are listed in Annex IV of the EU Habitats Directive. These include:

- Common pipistrelle (*Pipistrellus pipistrellus*)
- Soprano pipistrelle (*Pipistrellus pygmaeus*)
- Nathusius' pipistrelle (*Pipistrellus nathusii*)
- Leisler's bat (*Nyctalus leisleri*)
- Brown long-eared bat (*Plecotus auritus*)
- Daubenton's bat (*Myotis daubentonii*)
- Whiskered bat (*Myotis mystacinus*)
- Natterer's bat (*Myotis nattereri*)
- Lesser horseshoe bat (*Rhinolophus hipposideros*)

With the exception of Whiskered bat and Lesser horseshoe bat, records for all of the aforementioned species are available for the south coast of Ireland within the 100km grid squares that cover the coastline

and their adjacent waters. While bats are typically classed as terrestrial mammals, some evidence suggests they may follow prey insects into coastal water depending on the prevailing weather conditions. Recent evidence also notes that bats can migrate considerable distances over open marine waters. However, it is considered highly unlikely they would make use of the proposed project area for foraging due to its highly exposed nature.

5. Risk assessment

5.1 Cetaceans

The effects of underwater noise on marine mammals can lead to disturbance, harm or injury depending on the type and frequency of the noise and distance of the receptor.

Cetacean sensory systems are adapted to life in the water. They rely on sound to navigate, to communicate with one another and to sense and interpret their surroundings. Behavioural responses of marine mammals, including cetaceans, to a sound are known to be strongly influenced by the context of the event and individual factors such as the animal's experience, motivation, conditioning and activity (Southall *et al*, 2007). Such features and variability may also require consideration in the case-specific assessment of impact on marine mammals from introduced sound sources (NPWS 2014). Sound waves dissipate through the water with distance from the source. While local oceanographic conditions affect the path of the sound and its transmission.

Depending on the exposure levels from underwater noise, auditory injury to marine mammals can occur. This may result in temporary loss in hearing sensitivity, known as Temporary Threshold Shift (TTS) or more permanent damage, known as Permanent Threshold Shift (PTS). The potential for auditory injury is related to the noise frequency relative to the hearing bandwidth of the marine mammal, and is also influenced by the duration of exposure. The level of impact on an individual is a function of the Sound Exposure Level (SEL) that an individual receives as a result of underwater noise.

Table 3 details the various functional groups relative to hearing for the majority of cetaceans encountered in Irish waters.

Table 3. Cetacean functional groups relative to hearing at different sound frequencies.

Low frequency 7 Hz-22 kHz	**Mid-frequency** 150 Hz-160 kHz	**High frequency** 200 Hz–180 kHz
Baleen whales	Most toothed whales, dolphins	Certain toothed whales, porpoise
Species- Ireland Humpback whale Blue whale Fin whale Sei whale Minke whale	**Species– Ireland** Sperm whale Killer whale Long-finned pilot whale Beaked whale species Dolphin species	**Species– Ireland** Pygmy sperm whale Harbour porpoise

After: NPWS (2014). Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters.

Southall *et al* (2007) describes the sound pressure levels associated with the various functional groups as detailed in table 4. This has been revised (Southall *et al,* 2019) to further refine functional hearing groups but similar injury criteria as relevant to the proposed project apply.

Table 4. Sound pressure levels associated with Temporary Threshold Shift (TTS) and Permanent Threshold Shift (PTS)

Functional group	Injury Criteria (based on single pulse)	
	TTS	PTS
Low frequency cetaceans	224dB re: 1µPa (peak	230dB re: 1µPa (peak
Mid frequency cetaceans	224dB re: 1µPa (peak)	230dB re: 1µPa (peak)
High frequency cetaceans	224dB re: 1µPa (peak)	230dB re: 1µPa (peak
Pinnipeds (in water)	212dB re: 1µPa (peak)	218 dB re: 1µPa (peak

The noise modelling and environmental risk assessment (Thomsen *et al*, 2023) carried out for the proposed project indicated that the use of the sparker would have a limited area of impact on minke whales, and therefore other marine mammals with a functional hearing range that includes all or part of the frequency range emitted by the sparker (e.g. other baleen whale species, Bottlenose dolphin and Harbour porpoise). The results (Table 5) indicated that the impact distance from source would be a maximum of 1.1km relative to a behavioural response and 0.9km relative to cumulative TTS.

With regard to the use of the mini-airgun, the results (Table 6) show that area of impact would increase to 1.9km relative to behavioural response and 2.9km relative to cumulative TTS with an impact area of 19.7km.

Table 5. Threshold distances and impact areas obtained for the minke whale, resulting from operation of sparker in the study area. (from Thomsen et al, 2023).

Impact on minke whales when the sparker is on operation			
Noise effect	**Average distance all transects [km]**	**Max. distance [km]**	**Impact area [km²]**
Behavioural response	0.9	1.1	2.7
TTS single strike	0.1	0.1	0.03
TTS cumulative	0.9	1.1	2.5
PTS single strike	0.1	0.1	0.03
PTS cumulative	0.2	0.2	0.12

Table 6. Threshold distances and impact areas obtained for the minke whale, resulting from operation of mini airgun in the study area. (from Thomsen et al, 2023).

Impact on minke whales when the mini airgun is on operation			
Noise effect	**Average distance all transects [km]**	**Max. distance [km]**	**Impact area [km²]**
Behavioural response	1.4	1.9	6.3
TTS single strike	0.1	0.1	0.03
TTS cumulative	2.5	2.9	19.7
PTS single strike	0.1	0.1	0.03
PTS cumulative	0.3	0.3	0.3

5.2 Otter

Otter hearing is not adapted for life underwater however, one study did record behavioural responses in otters in experimental trails. While otters utilise the marine environment for foraging, they would not be impacted by the proposed project as they are known to forage close inshore, generally less than 100m. Although records for otter 2-300m from shore have been recorded in the UK this is considered to be an unusual occurrence. East of Knockadoon Head the proposed project area is between 6km and 30km from the shore. West of Knockadoon Head to Oyster Haven it is closer to the shore but never less than 300m at any point. Therefore, otter foraging habitat would be generally outside of the underwater noise range modelled for the proposed project by Thomsen *et al* 2020.

5.3 Reptiles (marine turtles)

Relative to the scale and scope of the project and absence of recorded marine reptiles (marine turtles) in the proposed project area, impacts on marine reptiles are not considered possible.

5.4 Bats

Vessel based acoustic surveys do not have the potential to impact bats, their habitats or roost sites in any way.

6. Conclusion

Based on the results of the noise modelling (Thomsen *et al*, 2023), and taking a worst case scenario for the use of the mini air gun and sparker, the proposed project has the potential to lead to behavioural responses and TTS to a range of cetaceans should they be present within 1.9 to 2.9km of the proposed

project area when the mini airgun is being used and a lesser (0.9-1.1km) distance when the sparker is being used. Based on the review of the receiving environment (section 4) the species included with potential for impact are:

- Minke whale (*Balaenoptera acutorostrata*)
- Humpback whale (*Megaptera novaeangliae*)
- Fin whale (*Balaenoptera physalus*),
- Killer whale (*Orcinus orca*)
- Bottlenose Dolphin (*Tursiops truncates*)
- Harbour porpoise (*Phocoena phocoena*)
- Rosso's dolphin (*Grampus griseus*)
- Potentially other cetacean species known to occur in Irish waters

Article 12 of the EU Habitats Directive requires member states to take requisite measures to prohibit "deliberate disturbance of these [Annex IV] species, particularly during the period of breeding, rearing, hibernation and migration". While the range of potential impact is relatively small (2.9km maximum distance) it is nonetheless considered that, based on the precautionary principle, mitigation to avoid disturbance to the aforementioned species should be implemented should be implemented should the proposed project proceed. No impacts on any additional Annex IV species known to occur in Ireland are considered possible.

7. Proposed mitigation

NPWS (2014) provides guidance to manage the risk to marine mammals from man-made sound sources in Irish waters. This document provides guidance and mitigation measures to address key potential sources of anthropogenic sound that may impact negatively on marine mammals in Irish waters. The mitigation methods should follow the guidance prescribed by the National Parks and Wildlife Service. Specifically, in relation to Geophysical acoustic surveys, such as proposed in this project, the guidance set out in NPWS (2014), as stated below, should be fully implemented.

1. A qualified and experienced marine mammal observer (MMO) shall be appointed to monitor for marine mammals and to log all relevant events using standardised data forms (Appendix 6, NPWS, 2014).
2. Unless information specific to the location and/or plan/project is otherwise available to inform the mitigation process (e.g., specific sound propagation and/or attenuation data) and a distance modification has been agreed with the Regulatory Authority, acoustic surveying using the above equipment shall not commence if marine mammals are detected within a 500m radial distance of the sound source intended for use, i.e., within the Monitored Zone.

Pre-Start Monitoring

3. Sound-producing activities shall only commence in daylight hours where effective visual monitoring, as performed and determined by the MMO, has been achieved. Where effective visual monitoring, as determined by the MMO, is not possible the sound-producing activities shall be postponed until effective visual monitoring is possible.

4. An agreed and clear on-site communication signal must be used between the MMO and the Works Superintendent as to whether the relevant activity may or may not proceed, or resume following a break (see below). It shall only proceed on positive confirmation with the MMO.
5. In waters up to 200m deep, the MMO shall conduct pre-start-up constant effort monitoring at least 30 minutes before the sound-producing activity is due to commence. Sound-producing activity shall not commence until at least 30 minutes have elapsed with no marine mammals detected within the Monitored Zone by the MMO.
6. This prescribed Pre-Start Monitoring shall subsequently be followed by a Ramp-Up Procedure which should include continued monitoring by the MMO.

Ramp-up Procedure

7. In commencing an acoustic survey operation using the proposed acoustic equipment, the following Ramp-up Procedure (i.e., "soft-start") must be used, including during any testing of acoustic sources, where the output peak sound pressure level from any source exceeds 170 dB re: 1µPa @1m:
   (a) Where it is possible according to the operational parameters of the equipment concerned, the device's acoustic energy output shall commence from a lower energy start-up (i.e., a peak sound pressure level not exceeding 170 dB re: 1µPa @1m) and thereafter be allowed to gradually build up to the necessary maximum output over a period of 20 minutes.
   (b) This controlled build-up of acoustic energy output shall occur in consistent stages to provide a steady and gradual increase over the ramp-up period.
   (c) Where the acoustic output measures outlined in steps (a) and (b) are not possible according to the operational parameters of any such equipment, the device shall be switched "on" and "off" in a consistent sequential manner over a period of 20 minutes prior to commencement of the full necessary output.
8. In all cases where a Ramp-Up Procedure is employed the delay between the end of ramp-up and the necessary full output must be minimised to prevent unnecessary high-level sound introduction into the environment.
9. Once the Ramp-Up Procedure commences, there is no requirement to halt or discontinue the procedure at night-time, nor if weather or visibility conditions deteriorate nor if marine mammals occur within a 500m radial distance of the sound source, i.e., within the Monitored Zone.

Line Changes

10. Where the duration of a survey line or station change will be greater than 40 minutes the activity shall, on completion of the line/station being surveyed, either
    (a) shut down and undertake full Pre-Start Monitoring, followed by a Ramp-Up Procedure for recommencement, or
    (b) undergo a major reduction in seismic energy output to a lower energy state[1] where the output peak sound pressure level from any operating source is 165-170 dB re: 1µPa @1m, and then undertake a full Ramp-Up Procedure for recommencement.

[1] *It is important that this significant reduction in sound output is to a minimum point (i.e., minimum peak sound pressure level) that in theory remains audible above most ambient sound and shipping noise and yet is also consistent with the Ramp-up Procedure.*

11. Where the duration of a survey line or station change will be less than 40 minutes the activity may continue as normal (i.e., under full seismic output)

Breaks in sound output

12. If there is a break in sound output for a period greater than 30 minutes (e.g., due to equipment failure, shut-down, survey line or station change) then all Pre-Start Monitoring and a subsequent Ramp-up Procedure (where appropriate following Pre-Start Monitoring) must be undertaken.

13. For higher output survey operations which have the potential to produce injurious levels of underwater sound (see sections 2.4, 3.2) as informed by the associated risk assessment, there is likely to be a regulatory requirement to adopt a shorter 5–10-minute break limit after which period all Pre-Start Monitoring and a subsequent Ramp-up Procedure (where appropriate following Pre-Start Monitoring) shall recommence as for start-up.

Reporting

14. Full reporting on MMO operations and mitigation undertaken must be provided to the Regulatory Authority as outlined in Appendix 6 of NPWS (2014).

8. Assessment of residual risk

Provided the mitigation proposed in section 7 of this document is implemented in full no residual risk is considered possible.

9. References

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