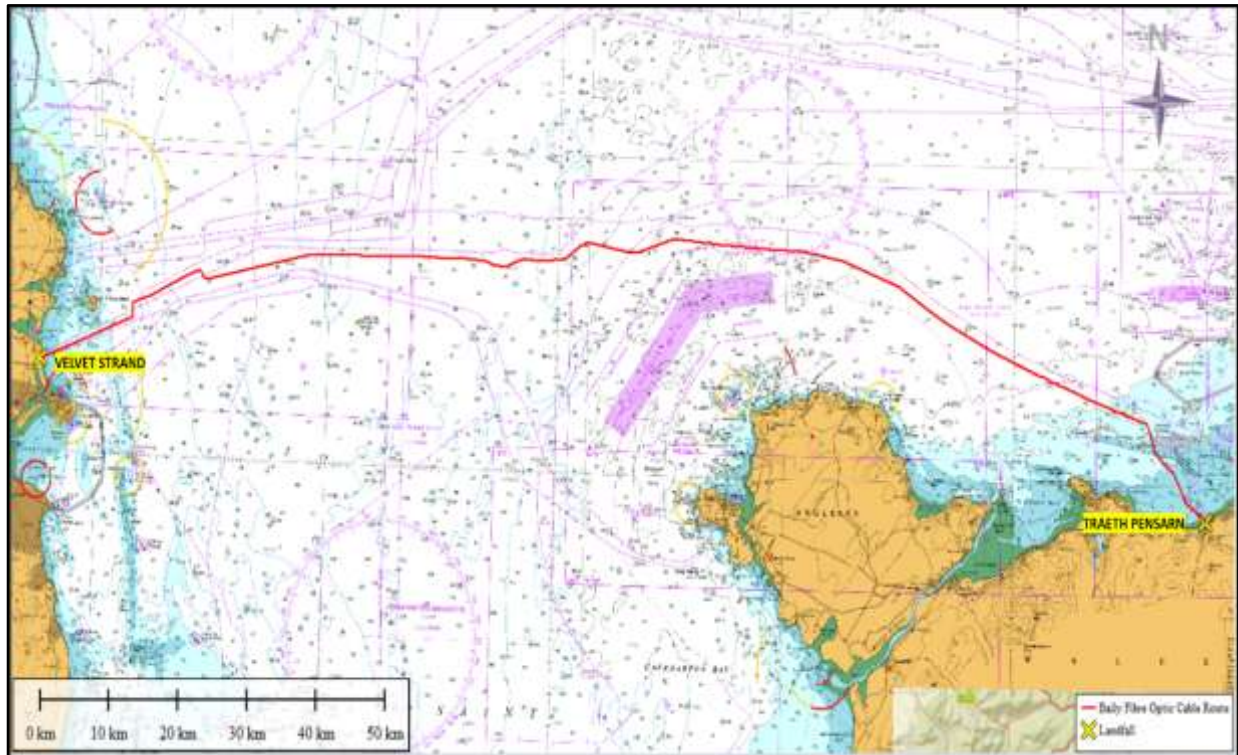


Risk Assessment for Annex IV Species for Marine Survey and Site Investigation Works for a Fibre Optic Cable at Velvet Strand, Portmarnock, Co. Dublin.



01st September 2026

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On behalf of: euNetworks Fiber UK Limited.

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1. Introduction

This Annex IV Risk Assessment has been prepared on behalf of euNetworks Fiber UK Limited to assess whether the proposed survey works will remove the system of strict protection established for Annex IV species. This risk assessment will aid in the application to obtain a Maritime Usage Licence (MUL) for the proposed route of this undersea fibre optic cable. This report will detail the species protected under Annex IV of the Habitats Directive that may be present within the MUL application area. Under Article 12 and 13 of the Habitats Directive, Member States must establish systems of strict protection for animal and plant species which are particularly threatened, and which are listed on Annex IV of the Habitats Directive. Article 16 provides for derogations from these provisions under limited circumstances. Article 12, 13 and 16 of the Habitats Directive are transposed into Irish law by Regulations 51, 52 and 54 of the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. Annex IV species are afforded strict protection throughout their range, both inside and outside of designated protected areas. It is an offence to deliberately kill, injure or disturb a specimen in the wild, or damage or destroy a breeding site or resting place of an Annex IV animal species. This report may also contain species which are protected under Annex II, which are protected within Special Areas of Conservation (SACs). Grey seals (*Halichoerus grypus*) have been recorded in the area, however as this species is protected under Annex II and V, it will not be considered any further in this risk assessment.

1.1 Altemar Ltd.

Since its inception in 2001, Altemar has been delivering ecological and environmental services to a broad range of clients. Operational areas include: residential; infrastructural; renewable; oil & gas; private industry; Local Authorities; EC projects; and, State/semi-State Departments. Bryan Deegan, the managing director of Altemar, is an Environmental Scientist and Marine Biologist with over 30 years' experience working in Irish terrestrial and aquatic environments, providing services to the State, Semi-State and industry. He is currently contracted to Inland Fisheries Ireland as the sole "External Expert" to environmentally assess internal and external projects. Bryan Deegan (MCIEEM) holds a MSc in Environmental Science, BSc (Hons.) in Applied Marine Biology, NCEA National Diploma in Applied Aquatic Science and a NCEA National Certificate in Science (Aquaculture). Bryan Deegan carried out all elements of this Report. Bryan has been involved in twelve international sub marine fibre optic cable projects, many of which involved Horizontal Directional Drills within designated sites and all works required ecological supervision.

2. Annex IV Species

All species listed under Annex IV with the potential to be impacted by the proposed works should be included, even if they have been separately assessed in the SISAA, NIS, or EclA process.

Of the animal and plant species on Annex IV known to occur in Ireland, the following species (Table 1) were identified as relevant to the proposed development:

Table 1. Annex IV protected species in Ireland

Classification	Species	Conservation Status	Potential for Effect
<i>Cetacea</i>	Humpback Whale (<i>Megaptera novaeangliae</i>)	Favourable	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	Bottlenose Dolphin (<i>Tursiops truncatus</i>)	Favourable	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	Short-Beaked Common Dolphin (<i>Delphinus delphis</i>)	Favourable	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	Harbour Porpoise (<i>Phocoena phocoena</i>)	Inadequate	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	Killer Whale (<i>Orcinus orca</i>)	Unknown	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	Long-Finned Pilot Whale (<i>Globicephala melas</i>)	Favourable	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	Risso's Dolphin (<i>Grampus griseus</i>)	Favourable	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	Atlantic White-Sided Dolphin (<i>Lagenorhynchus acutus</i>)	Favourable	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	White-Beaked Dolphin (<i>Lagenorhynchus albirostris</i>)	Favourable	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	Striped Dolphin (<i>Stenella coeruleoalba</i>)	Favourable	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	Cuvier's Beaked Whale (<i>Ziphius cavirostris</i>)	Favourable	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	Sowerby's Beaked Whale (<i>Mesoplodon bidens</i>)	Favourable	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required

Classification	Species	Conservation Status	Potential for Effect
<i>Cetacea</i>	Minke Whale (<i>Balaenoptera acutorostrata</i>)	Favourable	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	Fin Whale (<i>Balaenoptera physalus</i>)	Favourable	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	Blue Whale (<i>Balaenoptera musculus</i>)	Unknown	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	Sperm Whale (<i>Physeter macrocephalus</i>)	Favourable	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	Northern Bottlenose Whale (<i>Hyperoodon ampullatus</i>)	Unknown	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea</i>	Sei Whale (<i>Balaenoptera borealis</i>)	Unknown	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea (Vagrant)</i>	Northern Right Whale (<i>Eubalaena glacialis</i>)	Unknown	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea (Vagrant)</i>	False Killer Whale (<i>Pseudorca crassidens</i>)	Unknown	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea (Vagrant)</i>	True's Beaked Whale (<i>Mesoplodon mirus</i>)	Unknown	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea (Vagrant)</i>	Pygmy Sperm Whale (<i>Kogia breviceps</i>)	Unknown	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea (Vagrant)</i>	Beluga/White Whale (<i>Delphinapterus leucas</i>)	Unknown	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Cetacea (Vagrant)</i>	Gervais' Beaked Whale (<i>Mesoplodon europaeus</i>)	Unknown	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Mustelidae</i>	Otter (<i>Lutra lutra</i>)	Favourable	There is potential for this species to be located within the survey area and therefore be effected. Further Assessment Required
<i>Testudines</i>	Leatherback Turtle (<i>Dermochelys coriacea</i>)	Unknown	There is potential for this species to be located within the survey area and

Classification	Species	Conservation Status	Potential for Effect
			therefore be effected. Further Assessment Required
<i>Chiroptera</i>	Lesser Horseshoe Bat (<i>Rhinolophus hipposideros</i>)	Favourable	The works are in the coastal environment where structures are near the HWM. There is no potential for this species to be effected by the proposed survey works. Works at landfall will be carried out during daylight hours only and no artificial lighting is required. The works will not impact on resting or breeding places of bats. No demolition or modifications to buildings are required. No lighting is required. Further Assessment Not Required
<i>Chiroptera</i>	Common Pipistrelle (<i>Pipistrellus pipistrellus</i>)	Favourable	The works are in the coastal environment where structures are near the HWM. There is no potential for this species to be effected by the proposed survey works. Works at landfall will be carried out during daylight hours only and no artificial lighting is required. The works will not impact on resting or breeding places of bats. No demolition or modifications to buildings are required. No lighting is required. Further Assessment Not Required
<i>Chiroptera</i>	Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	Favourable	The works are in the coastal environment where structures are near the HWM. There is no potential for this species to be effected by the proposed survey works. Works at landfall will be carried out during daylight hours only and no artificial lighting is required. The works will not impact on resting or breeding places of bats. No demolition or modifications to buildings are required. No lighting is required. Further Assessment Not Required
<i>Chiroptera</i>	Nathusius' Pipistrelle (<i>Pipistrellus nathusii</i>)	Favourable	The works are in the coastal environment where structures are near the HWM. There is no potential for this species to be effected by the proposed survey works. Works at landfall will be carried out during daylight hours only and no artificial lighting is required. The works will not impact on resting or breeding places of bats. No demolition or modifications to buildings are required. No lighting is required. Further Assessment Not Required
<i>Chiroptera</i>	Natterer's Bat (<i>Myotis nattereri</i>)	Favourable	The works are in the coastal environment where structures are near the HWM. There is no potential for this species to be effected by the proposed survey works. Works at landfall will be carried out during daylight hours only and no artificial lighting is required. The works will not impact on resting or breeding places of bats. No demolition or modifications to buildings are required. No lighting is required.

Classification	Species	Conservation Status	Potential for Effect
			Further Assessment Not Required
<i>Chiroptera</i>	Daubenton's Bat (<i>Myotis daubentonii</i>)	Favourable	The works are in the coastal environment where structures are near the HWM. There is no potential for this species to be effected by the proposed survey works. Works at landfall will be carried out during daylight hours only and no artificial lighting is required. The works will not impact on resting or breeding places of bats. No demolition or modifications to buildings are required. No lighting is required. Further Assessment Not Required
<i>Chiroptera</i>	Whiskered Bat (<i>Myotis mystacinus</i>)	Favourable	The works are in the coastal environment where structures are near the HWM. There is no potential for this species to be effected by the proposed survey works. Works at landfall will be carried out during daylight hours only and no artificial lighting is required. The works will not impact on resting or breeding places of bats. No demolition or modifications to buildings are required. No lighting is required. Further Assessment Not Required
<i>Chiroptera</i>	Brown Long-Eared Bat (<i>Plecotus auritus</i>)	Favourable	The works are in the coastal environment where structures are near the HWM. There is no potential for this species to be effected by the proposed survey works. Works at landfall will be carried out during daylight hours only and no artificial lighting is required. The works will not impact on resting or breeding places of bats. No demolition or modifications to buildings are required. No lighting is required. Further Assessment Not Required
<i>Chiroptera</i>	Leisler's Bat (<i>Nyctalus leisleri</i>)	Favourable	The works are in the coastal environment where structures are near the HWM. There is no potential for this species to be effected by the proposed survey works. Works at landfall will be carried out during daylight hours only and no artificial lighting is required. The works will not impact on resting or breeding places of bats. No demolition or modifications to buildings are required. No lighting is required. Further Assessment Not Required
<i>Chiroptera</i>	Other bat species not listed above if present		The works are in the coastal environment where structures are near the HWM. There is no potential for this species to be effected by the proposed survey works. Works at landfall will be carried out during daylight hours only and no artificial lighting is required. The works will not impact on resting or breeding places of bats. No demolition or modifications to buildings are required. No lighting is required. Further Assessment Not Required

Classification	Species	Conservation Status	Potential for Effect
<i>Mollusca</i>	Kerry Slug (<i>Geomalacus maculosus</i>)	Favourable	There is no potential for this species to be effected by the proposed survey works. Further Assessment Not Required
<i>Anura</i>	Natterjack Toad (<i>Epidalea calamita</i>)	Bad	There is no potential for this species to be effected by the proposed survey works. Further Assessment Not Required
<i>Hymenophyllaceae</i>	Killarney Fern (<i>Vandenboschia speciosa</i>)	Favourable	There is no potential for this species to be effected by the proposed survey works. Further Assessment Not Required
<i>Najadaceae</i>	Slender Naiad (<i>Najas flexilis</i>)	Bad	There is no potential for this species to be effected by the proposed survey works. Further Assessment Not Required
<i>Saxifragaceae</i>	Marsh Saxifrage (<i>Saxifraga hirculus</i>)	Favourable	There is no potential for this species to be effected by the proposed survey works. Further Assessment Not Required

3. Risk Assessment for Relevant Annex IV Species

Cetaceans

A number of the 24 aforementioned cetacean species have been identified proximate to the proposed survey area, including the harbour porpoise (*Phocoena phocoena*), common minke whale (*Balaenoptera acutorostrata*), and bottlenose dolphin (*Tursiops truncatus*) (IWDG, 2017). The harbour porpoise and bottlenose dolphin, in particular, have been recorded frequently within the survey area and surrounding region, the harbour porpoise is also a qualifying interest of the Rockabill to Dalkey Island SAC (survey area located within this SAC). These species of cetacean may be present year-round in the region (Wall et al., 2013). From the (IWDG, 2017) data, many of the cetacean species' sightings in the region, were recorded between spring to late-summer months.

Turtles

The leatherback turtle (*Dermochelys coriacea*) is one of the turtle species that is protected under Annex IV of the Habitats Directive in Ireland. This species has been recorded proximate to the proposed works area (NBDC, 2026). A seasonal visitor, leatherback turtles migrate north during the summer months to more temperate waters. Some visit the northeast Atlantic and Irish waters where they feed on jellyfish before turning south again in Autumn (NPWS, 2019). This species has been recorded in locations proximate to the proposed survey area within the Irish Sea as recently as 2026 (on Velvet Strand, immediately adjacent to the site outline), as well as in 2014 on the southern section of Portmarnock Beach (NBDC 2026). This species has not been recorded within the terrestrial aspects of the proposed survey works (NBDC, 2026). There is, therefore, a remote possibility that the leatherback turtle may be present at the time of survey works.

Otters

Ireland continues to be a stronghold for the European otter (*Lutra lutra*). The most recent data shows that otter continues to be widespread across Ireland with a total of 44 SACs being designated with otter as a conservation objective (NPWS, 2019). As detailed by Reid et al. (2013), female otters have territories of $7.5 \pm 1.5\text{km}$ in length along a riverine environment and $6.5 \pm 1.0\text{km}$ in coastal environments, while male otter territory along rivers is approximately $13.2 \pm 5.3\text{km}$ in length with a high degree of variability. The National Biodiversity Data Centre records indicate a previous presence of otters within Malahide Estuary (2014) and south of the proposed survey works area in Baldoyle Bay in 2011, 2012 and 2017 (NBDC, 2026), the most recent sighting noted in 2017. There is, therefore, the possibility that the European otter may be present during the survey works.

4. Potential Impacts on Annex IV Species

Cetaceans

The proposed survey works will be temporary, with inshore works predicted to last between 3-4 days. However, due to the high number of cetacean records within the proposed survey area and surrounding region, it cannot be assumed that there is no risk to marine mammals from the proposed survey works. The survey activity which poses the greatest threat to cetacean species is the underwater noise levels produced by the survey equipment. However, these levels have been kept within an acceptable range as described by (Southall et al., 2019) (see Section 4.1 below for further details). Survey vessels will generate some subsea noise in the marine environment from engine noise and dynamic positioning thrusters. Shipping noise is typically within the 50-300 Hz frequency band and is the dominant noise source in deeper water (DECC, 2011). Propellers on vessels all have the potential to produce cavitation noise. This sound is caused by vacuum bubbles that were generated by the collapse of bubbles created by the spinning of the propellers. There are a large number of cetacean species that have been previously recorded within the proposed survey license area, therefore, the potential for a collision between the survey vessel or equipment and marine mammals must also be factored in as a potential risk. All of this considered, the speed of the survey vessel will be at a low speed at which cetacean species will be able to move away from the area with no pressure from the vessel. Mitigation measures will be put in place to ensure no harm on any cetacean species from the proposed survey works.

Turtles

Although there have been recordings of leatherback turtle proximate to the proposed survey works area, the potential for impact on this species is incredibly low. The only potential for impact to this Annex IV species is by collision with the vessel or equipment over the duration of the survey works, which as previously stated are temporal and spatially restricted. The proposed works do not offend the system of strict protection of turtles under Article 12 of the Habitats Directive.

Otters

Impacts to otters can occur as a result of permanent loss of breeding or resting sites, habitat loss, disturbance/displacement, and injury/mortality. The desk-based study with the aid of NBDC data showed that otters have been sighted in 2014 at the mouth of the Broadmeadow River proximate to the Malahide Estuary and south of the proposed survey works area in Baldoyle Bay in 2011, 2012 and 2017 (NBDC, 2026). Out of an abundance of caution, it is considered that there is the potential for the survey works to impact on otter species. Although the likelihood for potential impact is very low, specific mitigation will be put in place to ensure there are no negative impacts on this species during the proposed survey works.

4.1 Potential Noise Impacts on Cetaceans

All cetaceans are listed under Annex IV of the Habitats Directive, which means that they are protected wherever they occur. Bottle-nosed Dolphin and Harbour Porpoise are also listed under Annex II of the Directive. Annex II species require that core areas of their habitat be designated as sites of Community importance. Grey seals and Harbour seals are also listed under Annex II & Annex V of the Habitats Directive.

The proposed survey would be expected to impact on marine mammals primarily through the emission of noise due to the vessel and from survey equipment, including multibeam. It should be noted that, given the slow speed (4 knots) of the vessel, no significant collision impacts with the proposed works vessel and equipment are foreseen as a result of the proposed works.

As outlined by O'Brien (2005), 'sound travels 4.5 times faster in water than in air and low frequency sounds travel farther underwater than high frequency sounds.' Multi-beam can be defined as Low frequency (<1 kHz), Mid-frequency (1-10 kHz) and High Frequency (>10 kHz).

Southall *et al.* (2019), in their publication "Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects" revised the marine mammal hearing groups, which are seen in Table 2.

Table 2. Marine Mammal Functional Hearing Groups and Estimated Functional Hearing groups Proposed by Southall *et al.* (2019)

Marine mammal hearing group	Auditory weighting function	Genera (or species) included
Low-frequency cetaceans	LF	<i>Balaenidae</i> (<i>Balaena</i> , <i>Eubalaenidae</i> spp.); <i>Balaenopteridae</i> (<i>Balaenoptera physalus</i> , <i>B. musculus</i>)
		<i>Balaenopteridae</i> (<i>Balaenoptera acutorostrata</i> , <i>B. bonaerensis</i> , <i>B. borealis</i> , 1 <i>B. edeni</i> , <i>B. omurai</i> ; <i>Megaptera novaeangliae</i>); <i>Neobalenidae</i> (<i>Caperea</i>); <i>Eschrichtiidae</i> (<i>Eschrichtius</i>)
High-frequency cetaceans	HF	<i>Physeteridae</i> (<i>Physeter</i>); <i>Ziphiidae</i> (<i>Berardius</i> spp., <i>Hyperoodon</i> spp., <i>Indopacetus</i> , <i>Mesoplodon</i> spp., <i>Tasmacetus</i> , <i>Ziphius</i>); <i>Delphinidae</i> (<i>Orcinus</i>)
		<i>Delphinidae</i> (<i>Delphinus</i> , <i>Feresa</i> , <i>Globicephala</i> spp., <i>Grampus</i> , 2 <i>Lagenodelphis</i> , <i>Lagenorhynchus acutus</i> , <i>L. albirostris</i> , <i>L. obliquidens</i> , <i>L. obscurus</i> , <i>Lissodelphis</i> spp., <i>Orcaella</i> spp., <i>Peponocephala</i> , <i>Pseudorca</i> , <i>Sotalia</i> spp., <i>Sousa</i> spp., <i>Stenella</i> spp., <i>Steno</i> , <i>Tursiops</i> spp.); <i>Montodontidae</i> (<i>Delphinapterus</i> , <i>Monodon</i>); <i>Plantanistidae</i> (<i>Plantanista</i>)
Very high frequency cetaceans	VHF	<i>Delphinidae</i> (<i>Cephalorhynchus</i> spp.; <i>Lagenorhynchus cruciger</i> , <i>L. australis</i>); <i>Phocoenidae</i> (<i>Neophocaena</i> spp., <i>Phocoena</i> spp., <i>Phocoenoides</i>); <i>Iniidae</i> (<i>Inia</i>); <i>Kogiidae</i> (<i>Kogia</i>); <i>Lipotidae</i> (<i>Lipotes</i>); <i>Pontoporiidae</i> (<i>Pontoporia</i>)
Phocid carnivores in water	PCW	<i>Phocidae</i> (<i>Cystophora</i> , <i>Erignathus</i> , <i>Halichoerus</i> , <i>Histriophoca</i> , <i>Hydrurga</i> , <i>Leptonychotes</i> , <i>Lobodon</i> , <i>Mirounga</i> spp., <i>Monachus</i> , <i>Neomonachus</i> , <i>Ommatophoca</i> , <i>Pagophilus</i> , <i>Phoca</i> spp., <i>Pusa</i> spp.)

The Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NOAA, 2018) outlined the hearing groups of marine mammals, including the generalised hearing range of these cetacean groups (Table 3). They also noted that "Exposures exceeding the specified respective criteria level for any exposure metric are interpreted as resulting in predicted temporary threshold shift (TTS) or permanent threshold shift (PTS) onset." The onset of PTS in marine mammals was also outlined in NOAA 2018 (Table 4). The updated figures for PTS and TTS are outlined in Table 5.

The hearing ranges and sensitivity of marine mammals differ from one species to another depending on their audiogram. "For example, harbour porpoises are sensitive from 3 kHz to 130 kHz, with peak sensitivity at 125-130 kHz, and bottlenose dolphins from 5-110 kHz, with peak sensitivity at 40 and 60-116 kHz" (Southall *et al.*, 2007). Common seals are sensitive 4-45 kHz (peak sensitivity at 32 kHz) and grey seals 8-40 kHz. Humans are sensitive only to frequencies from 20 Hz to 16-18 kHz but with peak sensitivity from 2-4 kHz.

Table 3. Hearing Groups of Marine Mammals (NOAA, 2018)

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, Kogia, river dolphins, cephalorhynchid, Lagenorhynchus cruciger & L. australis)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz

* Represents the generalized hearing range for the entire group as a composite (i.e., all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall et al. 2007) and PW pinniped (approximation).

Table 4. Onset of PTS in Marine mammals

	PTS Onset Thresholds (Received Level)	
Hearing Group	Impulsive ¹	Non-impulsive ²
Low-Frequency (LF) Cetaceans	Cell 1 <i>Lpk,flat</i> : 219 dB <i>LE,LF,24h</i> : 183 dB	Cell 2 <i>LE,LF,24h</i> : 199 dB
Mid-Frequency (MF) Cetaceans	Cell 3 <i>Lpk,flat</i> : 230 dB <i>LE,MF,24h</i> : 185 dB	Cell 4 <i>LE,MF,24h</i> : 198 dB
High-Frequency (HF) Cetaceans	Cell 5 <i>Lpk,flat</i> : 202 dB <i>LE,HF,24h</i> : 155 dB	Cell 6 <i>LE,HF,24h</i> : 173 dB
Phocid Pinnipeds (PW) (Underwater)	Cell 7 <i>Lpk,flat</i> : 218 dB <i>LE,PW,24h</i> : 185 dB	Cell 8 <i>LE,PW,24h</i> : 201 dB
Otariid Pinnipeds (OW) (Underwater)	Cell 9 <i>Lpk,flat</i> : 232 dB <i>LE,OW,24h</i> : 203 dB	Cell 10 <i>LE,OW,24h</i> : 219 dB

¹Impulsive: produce sounds that are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI 1986; NIOSH 1998; ANSI 2005).

²Non-impulsive: produce sounds that can be broadband, narrowband or tonal, brief or prolonged, continuous or intermittent) and typically do not have a high peak sound pressure with rapid rise/decay time that impulsive sounds do (ANSI 1995; NIOSH 1998).

Table 5. Southall *et al.* (2019) TTS- and PTS-onset thresholds for marine mammals exposed to impulsive noise: SEL thresholds in dB re 1 $\mu\text{Pa}^2\text{s}$ under water and dB re (20 μPa)²s; and peak SPL thresholds in dB re 1 μPa under water.

Hearing Group	Impulsive Noise		Non-impulsive Noise
	Unweighted SPLpeak(dB re 1 μPa)	Weighted SELcum (dB re 1 $\mu\text{Pa}^2\text{s}$)	Weighted SELcum (dB re 1 $\mu\text{Pa}^2\text{s}$)
PTS Criteria			
Low-frequency (LF) cetaceans	219	183	199
High-frequency (HF) cetaceans	230	185	198
Very-High frequency cetaceans (VHF)	202	155	173
Phocid carnivores in water (PCW)	218	185	201
TTS Criteria			
Low-frequency cetaceans	213	168	179
High-frequency cetaceans	224	170	178
Very high-frequency cetaceans	196	140	153
Phocid carnivores in water	212	170	181

Most small cetaceans, excluding harbour porpoise, have an auditory bandwidth of 150 Hz to – 160 kHz, while harbour porpoise have an auditory bandwidth within 200 Hz to 180 kHz. Pinnipeds in water are thought to have an auditory bandwidth of between of 75 Hz to 75 kHz and from 75 Hz to 30 kHz in air (Southall et al. 2007)."

The proposed survey equipment and the noise frequency emissions are seen in Table 6.

Equipment Type	Purpose	Frequency Range	Duration	Maximum Source Pressure Level (re 1µPa at 1 m)	Reference
Multibeam Echo Sounder (MBES)	Measure detailed bathymetry by transmitting sound pulses (active sonar).	200 kHz to 500 kHz	0.05 - 10 ms	210 - 245 dB.	Danson 2005, Hopkins 2007, DECC 2011, Lurton and DeReutier 2011, Lurton 2016, BEIS 2020, Crocker & Fratantonio 2016
Side Scan Sonar (SSS)	Determine surficial nature of the seabed and detect objects by transmitting sound pulse.	200 kHz to 700 kHz	0.4 - 1.0 ms	200 - 240 dB.	BOEM 2016, BEIS 2020, DAHG 2014, Crocker & Fratantonio 2016
Sub-bottom Profiler (SBP) - Pinger	Identify different geological layers encountered in the shallow sediments and sediment thicknesses beneath the seabed.	2 kHz to 15 kHz	0.5 - 30 ms	214 dB.	Hartley Anderson 2020
Sub-bottom Profiler (SBP) - Chirper	Identify different geological layers encountered in the shallow sediments and sediment thicknesses beneath the seabed.	2 kHz to 13 kHz	5 - 40 ms	185 - 215 dB.	Crocker & Fratantonio 2016, Hartley Anderson 2020
Sub-bottom Profiler (SBP) - Boomer	Identify different geological layers encountered in the shallow sediments and sediment thicknesses beneath the seabed.	500 Hz to 15 kHz	0.5 - 1.0 ms	205 - 215 dB.	Crocker & Fratantonio 2016
Sub-bottom Profiler (SBP) - Parametric	Identify different geological layers encountered in the shallow sediments and sediment thicknesses beneath the seabed.	4 to 15 kHz, 85 to 115 kHz	0.2 - 30 ms	238 - 247 dB. 200 - 206 dB.	Hartley Anderson 2020
Ultra-Short Base Line (USBL)	Subsea positioning.	20 kHz to 50 kHz	5 - 10 ms	194 - 207 dB.	Kongsberg
Magnetometer	Identify ferrous anomalies for metal obstructions, shipwrecks, etc. on and under the seabed.	Passive	N/A	Passive	N/A
Survey Vessels	Carry out the survey and deploy the equipment.	50 Hz to 300 Hz	N/A	160 - 190 dB.	DECC 2011

Table 6a. Details of the proposed types of acoustic equipment which emit sound.

Equipment Type	Purpose	Number of locations within Licence Application Area (up to)	Frequency Range	Maximum Source Pressure Level (re 1µPa at 1 m)	Reference
Cone Penetration Test (CPT)	Determine geotechnical engineering properties of seabed sediments.	15	28 Hz	118 - 145 dB.	BOEM 2012, EIRGRID 2014
Gravity Corer	Retrieve a seabed sediment sample by penetrating seabed with a steel core barrel under self-weight	12	N/A	N/A	N/A
Vibrocorer	Retrieve a seabed sediment sample by penetrating seabed with a vibrating steel core barrel	12	30 Hz	187.4 dB.	LGL 2010
Grab Samples	Collect small sediment samples from seabed surface with clamshell mechanism	11	N/A	N/A	N/A

Table 6b. Details of the proposed types of geophysical equipment which emit sound.

Activity	Typical Time Period Required for Activity	Total Number of SI Locations	Total Time for SI	Foot Print Affected per SI	Foot Print Affected per SI (ha)	Total Foot Print (ha)	Area Directly Affected as % of Licence Application Area
Inshore Geophysical Survey	3 to 4 days (weather and sea state dependent)	400 - 500 m cable route corridor	3 to 4 days (weather and sea state dependent)	N/A	N/A	560 ha	18.66667%
Offshore Geophysical Survey	8 to 10 days (weather and sea state dependent)	500 m cable route corridor	10 to 12 days (weather and sea state dependent)	N/A	N/A	2441 ha	81.3667%
CPT	30 minutes - 2 hours in any one location	15	30 hours within total 8 days of Site Investigations campaign (weather and sea state dependent)	8m ²	0.0008 ha	0.012 ha	<1%
Gravity Corer	30 minutes - 2 hours in any one location	12	24 hours within total 8 days of Site Investigations campaign (weather and sea state dependent)	1m ²	0.0001 ha	0.0012 ha	<1%
Vibro Corer	30 minutes - 2 hours in any one location	12	24 hours within total 8 days of Site Investigations campaign (weather and sea state dependent)	8m ²	0.0008 ha	0.0096 ha	<1%
Grab Samples	20 minutes - 45 minutes in any one location	11	9 hours within total 8 days of Site Investigations campaign (weather and sea state dependent)	0.5m ²	0.00005 ha	0.0006 ha	<1%

Table 6c. Estimated Time and Duration of Survey Activities (Source: MDM)

The cetacean species observed in the survey area are high-frequency, mid-frequency and low-frequency cetaceans. Grey and Common Seals may also be present. The proposed survey equipment and the noise frequency emissions are seen in Table 6. The high frequencies emitted from the equipment are above the auditory range of mid-frequency (150Hz-160 kHz) but within the hearing range of high-frequency cetaceans (275Hz- 160 kHz)- observed in and on the proposed survey area.

The Multibeam Echo Sounder (MBES) (200 kHz to 500 kHz) and Side Scan Sonar (SSS)(200 kHz to 700 kHz), single beam echo sounder and Multibeam Echo Sounder (MBES) will emit noise above the hearing frequency of marine mammals. The hull-mounted Sub-bottom Profiler (SBP) – Pinger (2 kHz to 15 kHz), Sub-bottom Profiler (SBP) - Chirper (2 kHz to 13 kHz), Sub-bottom Profiler (SBP) – Boomer (500 Hz to 15 kHz), Sub-bottom Profiler (SBP) – Parametric (4 to 15 kHz, 85 to 115 kHz) and Ultra-Short Base Line (USBL) Subsea positioning. (20 kHz to 50 kHz) emits low and mid-frequency noise, within the auditory range of all marine mammals, including harbour porpoise, grey seal and harbour seal. However, all of the equipment (peak noise) at 1m from the source emits noise above the onset of PTS for non-impulsive sounds for high, medium, low frequency cetaceans and Phocid Pinnipeds outlined by NOAA (2018) was 173 dB, 198 dB, 199 dB and 201 dB, respectively, and the 198dB proposed injury levels indicated by Southall et al. (2019). As a result, negative impacts may be foreseen if marine mammals are close enough to the equipment to receive sound levels above this indicative threshold. As outlined in Table 6c, the inshore Geophysical Survey is predicted to take 3 to 4 days (weather and sea state dependent), and the offshore Geophysical Survey 10 to 12 days (weather and sea state dependent).

Lurton (2016) modelled the sound field radiated by multibeam echosounders for acoustical impact assessment. He stated that *“considering the injury criteria, the results illustrate that injury hazards are possible only at very short distances from the source: e.g. about 5 m for maximum Sound Pressure Level and 12 m for cumulative Sound Exposure Level in the case of a 240-dB source level, considering cetaceans. For behavioural response criteria, the corresponding values are 9 m and 70 m.”*

As previously outlined, the estimated time that the survey would take (excluding SI) within the Rockabill to Dalkey SAC would be approx. 63.3 hrs. The operations would comply with the NPWS (2014) *“Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters”*.

These guidelines would be deemed adequate to mitigate the negative impacts of the proposed works. Cetaceans in the vicinity of the vessel during start-up procedures would be given ample time to leave the site with the soft start procedures outlined in the guidelines. In addition, vessel speeds are extremely slow, which would give marine mammals ample opportunity to move from the area.

Note: in relation to consistency between Southall (2019) and NOAA (2018)

The Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NOAA, 2018) (or National Marine Fisheries Service, 2018 (as quoted in Southall 2019)), outlines the hearing groups of marine mammals, including the generalised hearing range of these cetacean groups (Annex II). NOAA (2018) also noted that *“Exposures exceeding the specified respective criteria level for any exposure metric are interpreted as resulting in predicted temporary threshold shift (TTS) or permanent threshold shift (PTS) onset.”* The thresholds for the onset of PTS in marine mammals were also outlined in NOAA 2018. The updated Southall (2019) figures for PTS and TTS are outlined in Annex IV.

Southall (2019) outlined the main differences between their publication and previous publications, including NOAA (2018), which was referenced as NMFS (2018) in Southall (2019). Southall (2019) states that *“The noise criteria here represent the next step in a sequential process of evolution of the criteria proposed by Southall et al. (2007), substantially modified with new analytical methods by Finneran (2016), and recently adopted as U.S. regulatory guidance by the NMFS (2016, 2018). While the quantitative process described herein and the resulting exposure criteria here are based on, and in many respects are identical to, those derived by Finneran (2016) and adopted by the NMFS (2016, 2018), there are a number of significant distinctions. The exposure criteria here appear in a peer-reviewed publication and include all marine mammal species for all noise exposures, both underwater and in air for amphibious species. NMFS (2016, 2018) provides regulatory guidance only for the subset of marine mammals under their jurisdiction and does not include criteria for aerial noise exposures, an important consideration in many locations for which some earlier assessments were made (Finneran & Jenkins, 2012). The exposure criteria here, while based on the Finneran (2016) quantitative method and consistent with the NMFS (2016, 2018) guidance where they overlap, are thus more broadly relevant, peer-reviewed, and less subject to potential changes in national regulatory policy.”*

Southall (2019) also stated that *“It should be noted that this results in some proposed differences in the terminology of hearing groups relative to those used in Finneran (2016) and NMFS (2016, 2018). These proposed differences in nomenclature may be confusing, but we believe they are justified (see the “Marine Mammal Hearing Groups and Estimated Group Audiograms” section and Appendices 1-6) and will support future criteria as new information emerges.”*

The difference in nomenclature between NOAA 2018 and Southall (2019) is that NOAA (2018) classified cetaceans as Low-frequency (LF) cetaceans (baleen whales), Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales) and High-frequency (HF) cetaceans (true porpoises, Kogia, river dolphins, cephalorhynchid, Lagenorhynchus cruciger & L. australis) while Southall reclassified these groups to Low-frequency cetaceans, High-frequency cetaceans, Very high-frequency cetaceans. As outlined in Southall (2019) *“The distinction between HF and VHF cetacean groups (as opposed to mid- and high-frequency) reflects the regions of best hearing sensitivities within these groups, often including frequencies approaching or exceeding 100 kHz; these frequencies would be more appropriately described within marine bioacoustics as high to very high. Further, as discussed in more detail below, a number of anatomical and sound production properties suggest a potential distinction of very low-(VLF) and LF cetaceans among mysticetes. Some evidence also suggests a potential segregation of mid-frequency (MF) and HF cetaceans in addition to the distinction of HF and VHF cetaceans.”* This is, in effect, a relabelling of Mid-Frequency (MF) Cetaceans and High-Frequency (HF) Cetaceans to High-frequency cetaceans and Very high-frequency cetaceans, respectively. It should be clearly noted that the PTS values within the updated groups were identical between NOAA, 2018 and Southall, 2019, and it was, in effect, a renaming of the groups.

5. Mitigation Measures

Cetaceans

The following mitigation measures will be implemented;

1. A certified Marine Mammal Observer (MMO) will be onboard the vessel at all times in Irish waters to implement standard NPWS marine mammal mitigation measures. “Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters” (NPWS, 2014) will be applied to ensure noise introduced into the marine environment have minimum effect.
2. Mitigation measures will include the presence of a MMO onboard the vessel. The purpose of the MMO is to ensure that there is no disturbance of seal /cetacean or other Annex IV species e.g. marine turtles, to ensure that project anthropogenic noise is minimised.
3. In line with “Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters” (NPWS, 2014) “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” and “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”.
4. . Sufficient resources will be made immediately available on the vessel to deal with accidental oil spills, including hydraulic hoses bursting etc. and reported to the on board ecologist

The levels of noise produced from the survey works will be kept within an acceptable range as described by (Southall et al., 2019) and the vessel will travel at speed at which cetacean species will be able to deviate course and move away with ease and under no pressure from the survey vessel. If calves are sighted, all survey works must stop immediately for a minimum of 45 minutes from the last sighting to ensure the calves safety. The application of these proposed mitigation measures will ensure no significant impacts on cetacean species from the proposed survey works in or in proximity to the proposed survey works area.

Turtles

The potential risk of impact on a leatherback turtle from the proposed survey works are extremely low, however, out of an abundance of caution, the possible impacts must be mitigated against. An experienced ecologist (MMO) will be present for the duration of the survey works in both the marine and terrestrial stages. An ecologist will be present on-site during intertidal survey works.

Otters

The European otter (*Lutra lutra*) has been previously recorded within NBDC records in proximity to the proposed survey works area – at the mouth of the Broadmeadow River proximate to the Malahide Estuary and south of the proposed survey works area in Baldoyle Bay (NBDC, 2026). Therefore, there is potential for this species to be located foraging within the intertidal zone. To mitigate any potential impact on this species an experienced ecologist (MMO) will be on board and present at all times during the terrestrial and marine phases of the proposed survey works. This mitigation is important even though the potential for impact is low and the works are temporary and will be implemented for the duration of the survey works.

6. Conclusion

This Risk Assessment of Annex IV has taken all species under this annex of the Habitats Directive into consideration. All species have been assessed on whether there is a potential of impact. Any species in which this was possible were further assessed. This narrowed the list down to all cetacean species (including vagrant species), otter, and leatherback turtles. The presence of these species within the region was discussed using historical data (NBDC 2026), the use of this data in combination with the proposed works, potential impacts were assessed and finally mitigation measures were specifically designed to protect the species protected under Annex IV of the Habitats Directive (EC, 2023).

There is potential for impact on all of the discussed species from the proposed works, however, out of an abundance of caution and with the strict implementation of the specific mitigation measures provided, the risk of potential impact of these species or their interests has been significantly lowered.

There is no significant risk for potential impact on Cetacean, Turtle, or Otter from the proposed works.

7. References

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