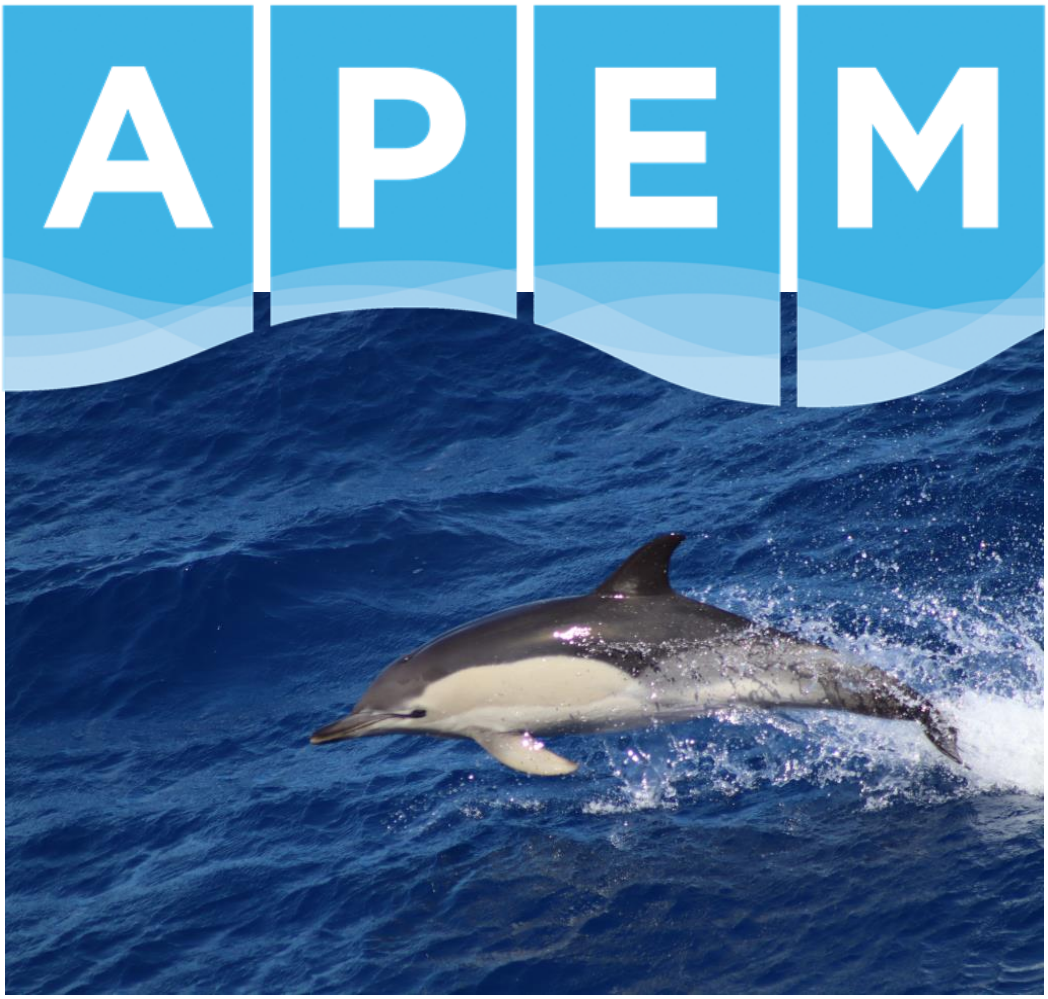

Site Investigation and Dredging Works at Haulbowline Naval Basin

Marine Mammal Risk Assessment

APEM Ref: P00006195

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1. Introduction

ByrneLooby commissioned APEM to conduct a Marine Mammal Risk Assessment (MMRA) for the proposed Site Investigation (SI) and dredging works (herein referred to as the Project) at Haulbowline Naval Base, Co. Cork, Ireland. Aspects of these works could potentially affect marine mammals mainly via generation of underwater noise and vibration in the marine environment. As marine mammals are protected by law any risk of these effects must be assessed. Consequently, this MMRA has assessed the risk of impact throughout all phases of the project with recommendations of any mitigation actions if necessary.

This MMRA for the proposed site investigation and dredging works has been produced in accordance with the National Parks and Wildlife Service (NPWS) guidelines and includes consideration of the Department of Arts, Heritage, and the Gaeltacht 2014 report '*Guidance to manage the risk to marine mammals from man-made sound sources in Irish Waters*.'

1.1 Background

ByrneLooby has been commissioned by the Department of Defence to undertake Dredging Consultancy services at the Haulbowline Naval Base, located within Cork Harbour, Haulbowline Island, Co. Cork. To enable these dredging works, ByrneLooby has also identified the requirement of marine ground SI works which will precede the dredging activities.

The proposed dredge site is within an active naval base (Figure 1) and will be operational throughout this project. The SI works will include percussion boring, geophysical survey and surface sampling within the naval basin, the basin approach and the graving dock. The two areas to be dredged are the naval basin and the approach channel to the basin (with potential dredging of the graving dock, if required).

The naval basin and basin approach undergo maintenance dredging at 4 to 5-year intervals. The graving dock does not typically form part of the maintenance dredging campaign; The objective of the works is to dredge the proposed area to a level of -5.5 m CD or, in the graving dock, to the level of the existing solid base (believed to be granite slabs), whichever is the lesser .

The dredge spoil material will be managed in two ways. Any dredge material which is classified as contaminated following the SI works will be removed from site by land and disposed of in a suitably licenced location. All uncontaminated material, presumed to be the bulk of material removed from the site, will be disposed of at sea. Cork County Council will seek a dumping at sea licence from the Environmental Protection Agency. The location of this dumping at sea site will be Roches Point dump site.

Figure 1. Project site for the proposed dredging works at Haulbowline Naval Base in Cork Harbour, on behalf of The Department of Defence.

1.2 Policy and legislation

Marine mammals are protected under a range of national and international legislation, details of which are presented below (Table 1). This section outlines the legislation, policy and guidance that is relevant to the assessment of the potential impacts on marine mammals associated with the Project. In addition, other national, regional, and local policies are considered within this assessment where they are judged to be relevant.

Table 1. Summary of national and international legislation and guidance relevant to marine mammals in the study area.

Key legislation	Receptor
Habitats Directive (European Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora)	All cetaceans, grey and common seals
European Council Directive 2008/56/EC, the Marine Strategy Framework Directive (MSFD)	All cetaceans, grey and common seals
European Communities (Natural Habitats) Regulations, 1997	Grey and common seals
European Communities (Birds and Natural Habitats) 2011	All cetaceans, grey and common seals
Wildlife Act (1976-2021)	All cetaceans, grey and common seals
OSPAR (Convention for the Protection of the Marine Environment of the North-East Atlantic 1998)	Bowhead whale, northern right whale, blue whale, and harbour porpoise
Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention) 1979	All cetaceans
Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention)	All cetaceans, grey and common seals
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).	All cetaceans

2. Site investigation works and dredging methodology

Further detail of the approach for the SI works and dredging are provided below.

2.1 Site investigation works

2.1.1 Percussion boring (shell and auger works)

Eighteen boreholes (all within the naval dockyard) will be drilled using percussion boring. The percussion boring rig will operate from a jack-up barge constructed from modular pontoons. All plant will arrive via road and be constructed onsite, with the exception of the work boat, which will arrive via sea. Plant associated with this activity include:

- safety boat and work boat (small tug);
- mobile crane;
- jack-up barge; and
- percussion boring rig.

The crane will be used to lower the modular pontoons into the dockyard where they will be connected together to form the jack-up barge. The percussion boring rig will then be lowered on to the barge using the crane and the work boat will be used to position the jack-up barge over each borehole location. Borehole samples will be taken by driving a bailer into the sediment using a percussion hammer.

2.1.2 Geophysical survey

Geophysical data will be obtained using a Geode high resolution 24 channel digital seismograph, a 48-channel seismic bay cable with hydrophone spacings of 3.125 m and a 24-channel seismic bay cable with hydrophone spacings of 1 m. The energy source will be a 10 in^3 I/O airgun. Diving cylinders pressurised to 150 bar will be used as the compressed air source. The hydrophone cable will be laid out along the seafloor and towed seaward from the shore. Air gun shots will be taken at end, off end and at mid cable locations. The geophysical survey will be undertaken from a Rigid Inflatable Boat (RIB).

2.1.3 Sediment surface sampling

Surface sampling of sediment will be undertaken from the work boat using a Van Veen Grab sampler. Sediment samples will undergo chemical and radiological analysis.

2.2 Dredging

The dredger being used is a backhoe dredger (long reach back-hoe excavator) and the material to be dredged consists mostly of silt. The dredging in the naval basin and basin approach is classed as maintenance dredging at a maximum dredging rate of 500 m^3 per 24-hour period.

It is not anticipated that there will be any requirement to dredge rock from the basin. The base level of the graving dock is unknown; however, the base is believed to be concrete. Dredging shall take place up to the lesser of the concrete base or -5.5 m, whichever is the lesser value.

3. Schedule of works

The SI works are currently in the tendering phase and the final schedule of works will not be known until a contractor has been appointed; however, it is expected that the works will be carried out between January and March 2022 with a duration eight weeks (Table 2).

A pre-condition survey of the site will be carried out by the contractor to determine the suitability of the plant proposed. Dredging will take place at the naval basin and approach channel and is expected to take 12 weeks. Dredging will take place on a 24-hour day basis, seven days per week to achieve the maximum production rates within tidal envelopes.

Maintenance dredging will be undertaken at a maximum dredging rate of 500 m^3 per 24-hour period.

If haulage is required from the site, the haulage contractor will be disposing of contaminated overburden materials to a suitably licenced facility for an estimated 12 hours per day.

Table 2. Proposed work schedule for Haulbowline SI works and dredging 2021

Event	Timeframe
Site Investigation works	8 weeks
DAS Permission lead time	1 year
Mobilisation	2 weeks
Decommissioning and storage of the existing small craft harbour pontoon	3 weeks
Removal of dry dock gate from graving dock	3 weeks
Dredging	12 weeks
Demobilisation	1 week

4. Marine mammals and sound

4.2 Potential effects

It is widely documented that marine mammals are sensitive to underwater noise, with their sensitivity being dependent on the hearing ability of the species. Background information on the auditory ranges of marine mammal species groups is presented below (Table 3 &Table 4).

There is a substantial volume of literature describing the potential effects of sound on marine mammals and this is summarised in e.g. Thomsen *et al.* (2006), Southall *et al.* (2007), OSPAR (2009) and Southall *et al.* (2019). The main types of potential effect are:

- fatal effects caused by significant levels of noise in close proximity to the receptor;
- hearing impairment, which might either be permanent (referred to as a permanent threshold shift; PTS) or temporary (temporary threshold shift; TTS). These can impact on the ability of the marine mammal to communicate, forage or avoid predators;
- behavioural effects such as avoidance, displacement from suitable feeding or breeding areas, changes in travelling routes;
- masking effects (e.g. interference with communications and disruption to return echoes which are used to locate mobile prey and discern environmental structure (Erbe *et al*. 2016); and
- secondary impacts caused by the direct effects of noise on potential prey causing an overall loss of available prey.

Table 3. Auditory range and peak sensitivity for seals and PTS and TTS onset thresholds for non-pulsed noise (PTS = Permanent Threshold Shift, TTS = Temporary Threshold Shift; DAHG 2014; Southall *et al.* 2019).

Frequency	Sound Pressure Level (dB re 1µPa @ 1m)		Species	Estimated Auditory Band Width (Hz)
Phocid carnivores in water	PTS	218	Grey seal and common seal	75-75,000
	TTS	212		
Phocid carnivores in air	PTS	149*	Grey seal and common seal	75-30,000
	TTS	109*		

**Sound Pressure Level, SPL (in air): measured in dB re: 20 µPa (peak) (flat)*

Table 4. Auditory range and peak sensitivity for the three different cetacean hearing groups and PTS and TTS onset thresholds for non-pulsed noise (PTS = Permanent Threshold Shift, TTS = Temporary Threshold Shift; Southall *et al.* 2019).

Frequency	Sound Pressure Level (dB re 1µPa @ 1m)		Species	Est auditory bandwidth (kHz)
High Frequency	PTS	230	Harbour porpoises	0.2 - 180
	TTS	224		
Medium Frequency	PTS	230	Dolphins and orca	0.15 - 160
	TTS	224		
Low Frequency	PTS	230	Humpback whales, minke whales	0.007 – 35
	TTS	224		

The following thresholds have been used for assessing the potential impacts of sound from the proposed site investigation and dredging works on marine mammals.

4.2.1 Lethal Effects and Physical Injury

For marine mammals, lethal effects may occur where peak-to-peak levels exceed 240 dB re 1 µPa, and physical injury may occur where peak-to-peak levels exceed 220 dB re 1 µPa (Parvin *et al.* 2007).

4.2.2 Auditory Injury

Underwater sound can cause injury to the auditory system of marine mammals either following a brief exposure to extremely high sound levels or following more prolonged exposure to lower levels of continuous sound (Richardson *et al*. 1995).

Southall *et al.* (2007) provide indicative thresholds for sound exposure levels (SELs) that have the potential to cause auditory injury, PTS or TTS, in marine mammals. These thresholds are based on unweighted, instantaneous peak sound pressure levels (SPLs) and M-weighted SELs.

Impact ranges for PTS and TTS are based on the functional hearing group-specific thresholds for pulsed and non-pulsed sounds proposed by Southall *et al.* (2019). From the dual criterion, only the unweighted SPL_{peak} threshold is used. This metric generally results in larger and more precautionary impact ranges for non-pulsed sound than weighted SEL (Table 3 & Table 4).

As indicated above, TTS is a temporary shift in the auditory threshold. It may occur suddenly after exposure to a high level of noise, however, prolonged levels of sound that cause TTS may, over time, cause PTS. It is expected that marine mammals will move away from hearing discomfort or when unable to communicate or feed effectively. Should this occur, sound levels received by the animal(s) are reduced, but there is a displacement effect which may be for an extended period and not limited to one individual. If this effect encompasses numerous animals it could result in no mammals in the area in a worst-case scenario.

This assessment considers the well-established Southall *et al.* (2007) thresholds, as well as the more conservative National Oceanic and Atmospheric Administration (NOAA 2016) thresholds and the more recent Southall *et al.* (2019) thresholds provided above.

4.2.3 Behavioural response

Behavioural impacts due to acoustic exposure are generally more variable and less predictable than the effects of noise exposure on hearing or physiology. Responses may arise where an activity is audible and at a level above background sound. Ecological consequences of these responses to underwater noise are yet to quantified. The lack of guidance in this area is due to the variable range of behavioural responses: from no observable response or low ecological consequence responses (e.g. increased alertness, vocal modifications, temporary avoidance behaviour and modification of group structure or activity state), to very rare and significant effects such as cessation of feeding or social interaction and/or habitat abandonment. The latter effects have been observed only in very specific circumstances where spatial and temporal circumstances coincided.

Several factors determine cetacean distribution and abundance, including the availability and distribution of prey (Evans 1990, Ó Cadhla *et al*. 2004) and sea temperature. Seasonal changes in species distribution are evident for several species of cetacean (Pollock *et al.* 1997). These changes may be related to prey availability, migratory movements or breeding requirements. When considering the outer area, the works may affect other species by excluding them from feeding grounds. The baleen whales that frequent these waters do so to feed and it is an important area for these animals.

5. Desk-based study

Haulbowline Naval Base is situated within the lower harbour of Cork Harbour. The basin itself is not regularly visited by marine mammals. The outer harbour area (20 km) is home to a wide variety of marine mammals, examples of which are the harbour porpoise *Phocoena phocoena*, common dolphin *Delphinus delphis*, grey seal *Halichoerus grypus*, as well as the common seal *Phoca vitulina*.

Outside the harbour, in the location of the dump site Roches Point, larger species occur such as the minke *Balaenoptera acutorostrata*, fin *Balaenoptera physalus* and humpback whales *Megaptera novaeangliae*. All of these species have been recorded in the Northern Ireland Mammal Database, Irish Whale and Dolphin Group (IWDG) Casual Cetacean Sightings database or the IWDG Cetacean Standings Database (Table 5 &Table 6).

Table 5. Record data taken from Biodiversity Maps (NBDC) 2021 for marine mammals in the project site location; reference point W76 and W86; both 10 km grid squares.

Species	Record count	Year
Grey seal (*Halichoerus grypus*)	3/9	2018/2020
Common seal (*Phoca vitulina*)	2	2017
Harbour porpoise (*Phocoena phocoena*)*	17/8	2015/2018
Common dolphin (*Delphinus delphis*)	1/6	2018/2020
Long-finned pilot whale (*Globicephala melas*)	3	1995
Bottlenose dolphin (*Tursiops truncatus*)	1/17	2006/2020
Striped dolphin (*Stenella coeruleoalba*)	1	2006
Risso's dolphin (*Grampus griseus*)	1	2002
Orca (*Orcinus orca*)	1	2001
Northern bottlenose whale (*Hyperoodon ampullatus*)	1	2005
Beluga whale (*Delphinapterus leucas*)	1	1988
Minke whale (*Balaenoptera acutorostrata*)	1	2001

** Possible one record in 2018 and seven in 2020, recorded as 'dolphin, possible porpoise'*

Table 6. Record data taken from Biodiversity Maps (NBDC) 2021 for marine mammals in the outer area of the project site location; reference point W85; 10 km grid square.

Species	Record count	Year
Grey seal (*Halichoerus grypus*)	156	2012
Harbour porpoise (*Phocoena phocoena*)*	1/32	2019
Common dolphin (*Delphinus delphis*)	21	2020
Bottlenose dolphin (*Tursiops truncatus*)	50	2020
Striped Dolphin (*Stenella coeruleoalba*)	1	1987
Risso's dolphin (*Grampus griseus*)	1	2012
Long-finned pilot whale (*Globicephala melas*)	1	1996
Orca (*Orcinus orca*)	3	2001
Minke whale (*Balaenoptera acutorostrata*)	10	2017
Humpback whale (*Megaptera novaeangliae*)	2	2020
Fin whale (*Balaenoptera physalus)*	6	2016
Whale species	3//1/4	2016/2017/2020

** Possible one record in 2019, recorded as 'dolphin, possible porpoise'*

All species listed above have been frequently recorded along the eastern and southern coastline of Ireland. All marine mammals should be considered during the SI works and dredging activities in Haulbowline with the most common being pinnipeds (grey seals and common seals), harbour porpoise and possibly, bottlenose dolphin.

Grey seal and common seal have established themselves in terrestrial colonies (or haul-outs) along all coastlines of Ireland. They often leave these sites when foraging or moving between

areas; however, they return to rest, breed and rear young. The haul-out groups of common seals have tended historically to be found among inshore bays and islands, coves and estuaries (Lockley 1966, Summers 1980), particularly around the hours of lowest tide. There are three common seal haul-outs around the Project, these are situated on the south of Haulbowline island itself, and on Rocky Island. Grey seals tend to breed on exposed rocky shores, on sand bars or in sea caves with ready access to deep water. Records indicate that 12 grey seals have been recorded from 2018-2020 and two common seals were recorded in 2017 in close proximity to the naval base. In the outer area 156 grey seals have been observed with 32 common seals recoded in 2012 and 2019, respectively.

The harbour porpoise is abundant inshore along the south and southwest coasts, and they are known to breed in Irish waters. During the summer months there are large aggregations noted off the southwest coast, however, they are observed in the Celtic Sea throughout the year. IWDG (2010) have presented evidence for possible calving in spring (March to June) as many individuals move offshore.

Bottlenose dolphins are observed throughout the year-with peaks between in the summer (May to September). Evidence suggest that this species breeds in Irish waters (Ingram & Rogan 2003).

Other species indicated below are less frequently encountered.

Common dolphins are most abundant off the south and southwest coasts from July to October (Reid *et al*. 2003), however, they are observed throughout the year. They are known to breed in Irish waters. Individuals make an eastward movement along the south coast from October to February with sighting peaking in Co. Cork from September to January (Berrow *et al.* 2010), these movements are thought to be due to prey availability.

Risso's dolphins are recorded throughout the year in Irish waters with a wide distribution (AECOM & Metoc 2010). They are regularly observed inshore and in bays along the southwest and southeast coasts (NPWS 2008) and they breed in Irish waters.

Orca are regularly observed in Irish waters, though the record here (Table 5) has been cited as a rare event, and they are not usually seen in Cork Harbour (IWDG 2001).

Several baleen whale species have been recorded in the Co. Cork area. The minke whale is the most widespread and frequently recorded baleen whale in Irish waters. Along the Irish coast they are more commonly observed from April to November with most records off the south and southwest of Ireland (Reid *et al.* 2003, Berrow *et al.* 2010).

Humpback whales have been recorded year-round in Irish waters and small numbers are observed inshore, off all coasts, with most sightings occurring along the Cork coast (Berrow *et al.* 2002). Berrow *et al.* (2010) highlighted that data from 2009 and 2010 indicated that this species was mostly present off the south coast from June to December. Humpback song acoustic data indicates a south-westerly movement from October to March, suggesting a regular migratory route in the offshore waters of the west coast (Charif *et al*. 2001, Charif & Clark 2009).

Two species are classified by the IUCN Red List Categories and Criteria as 'Critically Endangered', 'Endangered' 'Vulnerable', or 'Near Threatened', the northern bottlenose whale and the fin whale which are 'Near Threatened' and 'Vulnerable', respectively. The northern bottlenose whale record originates from the IWDG stranding database; therefore, the animal may not have visited this area if healthy. The fin whale sightings were incidental sightings from a casual survey; however, they have been considered in this MMRA. Fin whales have been observed foraging off the south coast of Ireland from June to February. They then move eastwards in the following months. Whooley *et al.* (2011) suggested that the high level of site fidelity and inter-annual occurrence of individuals along the southern Irish coast indicates that these inshore waters are an important foraging habitat for fin whales.

6. Risk identification

Ambient sound in the ocean is sound that is always present and cannot be attributed to an identifiable localised source. Examples of ambient sound sources include rain falling on the ocean, bubbles in the ocean, breaking waves, seismic disturbances of the sea floor, marine wildlife and anthropogenic sounds.

Anthropogenic sound is produced by human activity and has the potential to affect marine mammals occurring in Haulbowline if the frequencies generated lie within their auditory range. Sound travels much further underwater compared to airborne sound. Therefore, resulting effects on marine mammals may be evident at considerable distances from the sound source. The risks associated with site investigation, dredging and disposal are detailed below.

During the site investigation works multiple activities will take place as indicated in Section 2. Percussion boring will be completed to reach the desired depth. Geophysical data will be collected using a Geode high resolution 24-channel digital seismograph (a 48-channel seismic bay cable and a RIB will be utilised and diving cylinders pressurised to 150 bar will be used as the compressed air source). Surface sampling of materials will be taken using the work boat and a Van Veen Grab Sampler.

Cork Harbour and the area around Haulbowline has a lot of vessel traffic, therefore, there is a considerable amount of transient and ambient noise. The basin itself contains naval ships and boats, including ferries, which emit continuous anthropogenic sounds such as engine noise, sonar etc. The basin is also home to a ship maintenance yard and there is constant land and sea activity.

Finally, the disposal of materials may increase noise, there could be sediment overload in the water column and direct injury from materials being offloaded onto an individual animal.

Consequently, there is potential for marine mammals to be impacted during the proposed work on the Haulbowline dredging works. The main potential routes to impact are:

- Increased anthropogenic noise from percussion boring and dredging;
- Increased anthropogenic noise from the geophysical, surface sampling, positioning, monitoring and navigational equipment carried by the vessels;
- Increased vessel noise;

- Increased noise associated with disposal; and
- Collision with vessels.

7. Risk assessment

This risk assessment is to assess the risk to marine mammals during the SI works, dredging and works.

SI works are due to take place from January to March 2022; therefore, they are unlikely to affect marine mammals during certain activities e.g. breeding. Results from the desk study suggest most marine mammal peak sightings occur during the summer period in the immediate area surrounding the site, with only humpbacks being observed in the outer area during this time. Due to the structure of the naval basin, sound is likely to be contained within the site, with lower levels experienced in the surrounding area. It is therefore unlikely that sound will be at a high enough level to affect humpback whales. SI works will not take place during the breeding season for grey or common seals. Grey seal pups, born between September and December, would be independent by this time, having been abandoned at three weeks of age; however grey seals are not known to haul-out near the project site.

The dredging activities will take place one year after the SI works to allow for the DAS permission; therefore, they will be starting at a similar time of year (i.e. winter and progressing into the summer months). Decommissioning and storage of the small craft harbour pontoon and removal of dry dock gate will take place in the winter months with the dredging starting before spring and leading into summer. As the dredging will have been active for a number of weeks before marine mammal numbers peak, the disturbance and noise (albeit minimal and contained (see below)), will have been introduced into the environment. As pinnipeds are more likely to be in the Project area, they will be habituated to the current level of noise during this time, although novel sources of noise will be introduced to the environment due to the Project as detailed below.

7.1 Noise

SI works are due to be short-term and given the nature of this enclosed basin are likely to be localised as noise propagation will be restricted by a narrow entrance. Percussion boring will take place in the basin and will create additional noise and vibration but it is likely that it will be contained within the Project area. This would mean the impacts of noise on the outer area are also reduced as noise radiation is minimised and will be reflected and absorbed by the structures within the basin. During these works it is unlikely that a marine mammal will be in the basin as the area is already busy with multiple vessels in the area which would be using the basin.

Dredging operations are known to produce non-pulsed low-frequency omnidirectional sounds of 20 Hz to 20 kHz at sound pressure levels of 135–186 dB re 1 µPa (e.g. Richardson *et al*. 1995, OSPAR 2009 cited in DAHG 2012). Richardson *et al.* (1995) recorded source levels from 160 to 180 dB re 1 µPa at 1 m with a maximum *ca*. 100 Hz from a backhoe dredger. The bandwidth was between 20 Hz and 1 kHz, with most energy below 500 Hz. More recently, for backhoe dredging Reine *et al*. (2012) recorded the maximum measurement of engine and/or

generator noise of 167 dB re 1 µPa at 1m rms and of the noise generated by the bottom scoop action was 179.4 dB re 1 µPa at 1m rms.

During operation the vessel will be underway whilst dredging with main engines, generators and other machinery operating. Tests carried out by World Organisation of Dredging Associations (WODA) indicate that noise levels produced by engines/machinery when a vessel is underway exceed those produced by the pump or drag head (de Jong *et al.* 2010). Nedwell *et al.* (2008) measured a large backhoe dredger at Lerwick, Shetland (UK). Based on a 'conservative' 10 log (R/1 m) scaling, the estimated 'affected or equivalent' source level during excavation was 163 dB re 1 $\mu Pa^2 m^2$. Underwater sound was recorded at frequencies from 20 Hz to *ca*. 20 kHz, with consistent sound being recorded over the low frequency range from 20 to 80 Hz and peak spectral levels of sound occurring between 35 and 45 Hz.

Soft silt dredging is generally at the lower level of sound output as opposed to gravel dredging; however, as dredging often occurs over a period of days or weeks it has the potential to introduce continuous anthropogenic sound at levels that may impact marine mammal individuals and/or local populations.

The potential for cetaceans to be present within the basin during dredging is low, however seals have been noted in and around the dredging area. However, as indicated above, the sound level produced by a backhoe dredger is well below the TTS and PTS levels given in Table 3 & Table 4. Any animals outside of the site would receive even lower levels than this.

The sound pressure levels of the dredging, vessels and disposal are considered highly unlikely to result in mortality of any cetacean or seal and the operating dredger frequencies are at the lower reported auditory range of cetaceans. The likelihood of seals being present in the basin is low, especially considering the existing traffic and noise level; therefore, the risk of auditory injury and disturbance effects are considered to be low. Behavioural responses by cetaceans and seals in the area would be limited to avoidance or habituation over the 12-week dredging phase. Consequently, these effects are considered to be low risk and in the outer area would be of even lower risk as the sound will likely remain in the basin itself due to the contained area and narrow passage.

During disposal operations the vessel will be moving at a slow speed (*ca*. 1 knot), and there will be a short timeframe involved (*ca*.12 weeks). Also, the dredging pumps will be turned off; therefore, the risks of disturbance to marine mammals during the disposal operations are low. Resident marine mammals will be habituated to local noise from ship traffic and would likely remain in or temporarily vacate the area surrounding the site but are unlikely to enter or stay in the site.

7.2 Other impacts

Marine mammals suffering from vessel collisions is apparent globally; however, as dredgers operate at a slow speed the risk is lowered (NOAA 2008). The marine mammal species potentially present in the vicinity of the project site are common and grey seal, harbour porpoise and bottlenose dolphin. These species are agile and have fast swimming speeds

which could help them evade collisions with vessels and vessel propellers. Yet, when collisions do happen, this can lead to physical injury and in some cases fatalities.

Despite being fast and agile, grey seals can collide with anthropogenic structures such as fishing gear and vessels (Scottish Government 2013). Reduced perception levels of a collision threat through distraction, whilst undertaking other activities such as foraging and social interactions, are possible reasons for collisions (Wilson *et al*. 2007) and seals can also be very curious of new foreign objects placed in their environment which could also increase the risk of collision. Seals are relatively robust to potential strikes as they have a thick sub-dermal layer of blubber which can defend their vital organs from the worst of any blows (Wilson *et al.* 2007). In general, incidents of mortality or injury of grey seals caused by vessels remain a very rare occurrence in UK waters, although numerous instances are expected to remain unreported (Thompson *et al*. 2013, CSIP 2015).

Incidents of mortality and injury of harbour porpoise caused by vessels are uncommon in UK waters. Out of 439 post-mortem examinations on stranded harbour porpoise between 2010 and 2015, 13 deaths (2.9%) were attributed to probable effect of a boat collision (CSIP 2015). A further 25 harbour porpoises died of acute physical trauma of unknown origin which maybe the result of vessel strike but could also be undiagnosed bycatch or caused by bottlenose dolphin attacks (CSIP 2015). A total of 21 post-mortem examinations were carried out on stranded bottlenose dolphins between 2010 and 2015. Of these, none were a result of vessel strike and one was the result of physical trauma of an unknown origin.

To evade a strike, marine mammals tend to require acoustic information to be able to determine in which direction and at what speed a vessel is moving. Where there is erratic movement of watercraft (e.g., private personal watercraft) the risk of collision is considerably greater than that associated with other watercraft (e.g., a dredger) travelling on a direct course. The vessels involved in the works for the Project would be anticipated to transit relatively slowly and would travel in a direct course as far as possible.

Once on site, the vessels involved in the dredging are anticipated to remain relatively stationary just moving short distances as required. Consequently, the risk of a collision with marine mammals is considered to be extremely low. The potential significance of collision risks is assessed to be negligible.

Direct dumping on a marine mammal must also be considered but this is highly unlikely due to their mobile nature. Dumping will take place at sea; therefore, the risk is to all marine mammals. BynreLooby intend on applying for a DAS licence to dump eligible materials at the Roches Point dump site. At this site, the risk is limited to seals. Although it must be noted that seals do not typically haul-out near the dumping location and are not likely to be disturbed by the presence of the dumping equipment and vessel; therefore, the risk is considered to be negligible.

Sedimentation and altered mixing during dredging and disposal activities may affect seals through impeding their visual range or indirectly affect cetaceans and seals by altering their prey distribution. There is also a risk of chemicals in sediment being dredged and mixed into the water column. However, the risk is considered negligible for each of these effects as

plumes of suspended sediments will be short-term and highly localised and any chemicals released into the water column would be rapidly diluted and dispersed.

Overall, the potential effects on marine mammals due to all aspects of the Project are considered to be **Low Risk**.

8. Mitigation

The risks to marine mammals and the potential impacts due to the Project are low and temporary. This is considered to be the case without Project-specific mitigation; however, it is recommended that best practice guidance outlined in '*Guidance to Manage the Risk to Marine Mammals from Man-Made Sound Sources in Irish Waters'* (DAHG 2014) is applied to further reduce risk as far as possible. These measures include recommendations for the provision of a qualified and experienced Marine Mammal Observer (MMO) to monitor the works when underwater noise could be generated. Specific recommendations are provided in DAHG (2014) along with monitoring proformas. As the basin is enclosed, the monitored zone would be contained within the basin itself as it is unlikely that sound will propagate far beyond the narrow passage.

9. Cumulative effects

It is recognised that other similar activities may be ongoing in Cork Harbour, *ca.* 1 km from the project site, and that the programmes have the potential to overlap. Based on the considerations above; however, the conclusions of low risk for marine mammals it is not likely to be changed as a result of other projects in the area.

10. Conclusion

An evidence-based risk assessment has been conducted with information on the duration and specification of vessels and activities, and the sound source(s), and potential impacts have been highlighted. Using information on site location provided, methods for the works were summarised and considered (SI and dredging activity), baseline information was then reviewed to determine which species could be present in close proximity to the works and the outer area.

Examining data from Biodiversity Maps (2021), it was apparent that four species of marine mammal are commonly recorded along the coastline around Haulbowline. These were pinnipeds (grey seals and common seals), harbour porpoise and to a lesser extent bottlenose dolphin. Impacts considered were underwater noise and vibration, vessel collision, direct dumping and sedimentation. Potential effects considered were fatality, physical injury, hearing impairment and behavioural responses. These were assessed looking at both direct and indirect effects.

Given the known spatial and/or temporal activity patterns of species in the area and the fact that this is an area of high vessel traffic, it was considered that there will be minimal to no displacement of marine mammals from key functional areas during SI and dredging works. The main project site is in an enclosed area, surrounded by an area of high traffic and relatively

high ambient noise. The short-term effect of the disposal of dredge material is also expected to have minimal impact.

Overall, an assessment of the impacts and risk to marine mammals from the project SI works and dredging, concluded that there was a low risk of adverse effects on marine mammals. It is still recommended; however, that best practice mitigation measures in DAHG (2014) are applied.

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