

Marina Quarter Ltd

Marine Environmental Surveys for Haggardstown and Marshes Upper Large-scale Residential Development

Attachment 4.4 Risk Assessment for Annex IV Species

Anastasiia Khokhlova



AQUAFACT
APEM Group

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Client: Marina Quarter Ltd

Address: Block C, Maynooth Business Campus,
Straffan Road,
Maynooth,
Co. Kildare

AQUAFACT contact: Aidan Long

Position: Principal Consultant

E-mail: a.long@aquafact.ie

Telephone: +353 (0) 91 756812

Website: www.aquafact.ie

Address: AQUAFACT International Services Ltd,
9A Liosban Business Park,
Tuam Road,
Galway,
Ireland.
H91 K120

Registered in Ireland: No. 493496

Tax Reference Number: 97733840

Tax Clearance Number: 936172

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List of Acronyms/ Glossary

Acronym	Definition
AA	Appropriate Assessment
APEM	APEM Group
CL	Confidence Limit
cSAC	Candidate Special Area of Conservation
cSPA	Candidate Special Protection Area
CV	Coefficient of Variation
DAHG	Department of Arts, Heritage and the Gaeltacht
DDV	Drop-Down Video
DNV	DNV
EC	European Community
EEC	European Economic Community
EEZ	Exclusive Economic Zone
EIAR	Environmental Impact Assessment Report
EPS	European Protected Species
EU	European Union
GIS	Geographic Information System
GPS	Global Positioning System
HF	High-frequency cetacean
Hz	Hertz
IUCN	International Union for Conservation of Nature
IWDG	Irish Whale and Dolphin Group
JNCC	Joint Nature Conservation Committee
kHz	Kilohertz
LAT	Lowest Astronomical Tide
LF	Low-frequency cetacean
MARA	Maritime Area Regulatory Authority
MUL	Maritime Usage Licence
NBDC	National Biodiversity Data Centre
NIS	Natura Impact Statement
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPWS	National Parks and Wildlife Service
OPR	Office of the Planning Regulator
PSA	Particle Size Analysis
PW	Phocid pinniped in water
QI	Qualifying Interest
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SCANS	Small Cetaceans in the European Atlantic and North Sea
SCI	Special Conservation Interest
SPA	Special Protection Area
VHF	Very high-frequency cetacean

1. Introduction

1.1 Background

This report has been prepared by AQUAFACT, part of the APEM Group, on behalf of Marina Quarter Ltd. It provides the information required to assist the competent authority in assessing the potential effects of the proposed maritime usage on species listed in Annex IV of the EU Habitats Directive in connection with the Maritime Usage Licence (MUL) application.

The MUL is sought solely to facilitate temporary intertidal and subtidal marine ecological surveys within the Castletown Estuary and Inner Dundalk Bay. The surveys are associated with the proposed Large-scale Residential Development at Haggardstown and Marshes Upper, Dundalk, Co. Louth. Wastewater from the Proposed Development will enter the existing public wastewater network for treatment at Dundalk Wastewater Treatment Plant and subsequent discharge through the existing treated-effluent outfall at Soldier's Point. The proposed maritime usage does not include the construction or alteration of the outfall or the installation of any permanent marine infrastructure.

The purpose of the survey programme is to characterise current ecological and sediment conditions within the receiving environment of the existing Dundalk WWTP outfall before wastewater flows from the Proposed Development become operational. The resulting data will establish a robust and repeatable baseline for future environmental monitoring and will provide objective ecological information for wider environmental assessment. When considered alongside operational, effluent and water-quality monitoring, the data may also inform separate assessment of WWTP performance and compliance.

The proposed survey programme comprises Phase I and Phase II intertidal surveys, intertidal and subtidal grab sampling, and subsequent laboratory analysis of benthic fauna, particle-size distribution and total organic carbon. The survey programme has been designed to be proportionate to its objectives and limited in spatial extent and duration. Its objectives are:

- To characterise and map intertidal habitats and biotope boundaries within the survey area;
- To characterise subtidal and intertidal benthic communities through quantitative grab sampling;
- To determine the composition and physical characteristics of intertidal and subtidal sediments through particle-size and total organic carbon analysis;
- To identify benthic communities and other ecological features of conservation significance;
- To establish fixed and repeatable survey locations against which potential future ecological changes may be assessed; and

- To undertake all survey activities in accordance with applicable regulatory requirements and in a manner that avoids or minimises disturbance to protected species, sensitive habitats and the seabed.

The purpose of this Annex IV risk assessment is distinct from the objectives of the baseline survey programme. This assessment identifies the Annex IV species that may occur within or adjacent to the MUL application area and examines the potential for the proposed survey activities, including vessel movements, the presence of survey personnel and physical sampling, to cause injury, mortality or disturbance, or to damage or destroy breeding sites or resting places. It also identifies any avoidance or risk-reduction measures required to ensure compliance with the strict-protection provisions applicable to Annex IV species.

Accordingly, this report assesses the potential effects of the proposed maritime survey activities themselves. The location of the MUL application area is shown in Figure 1..

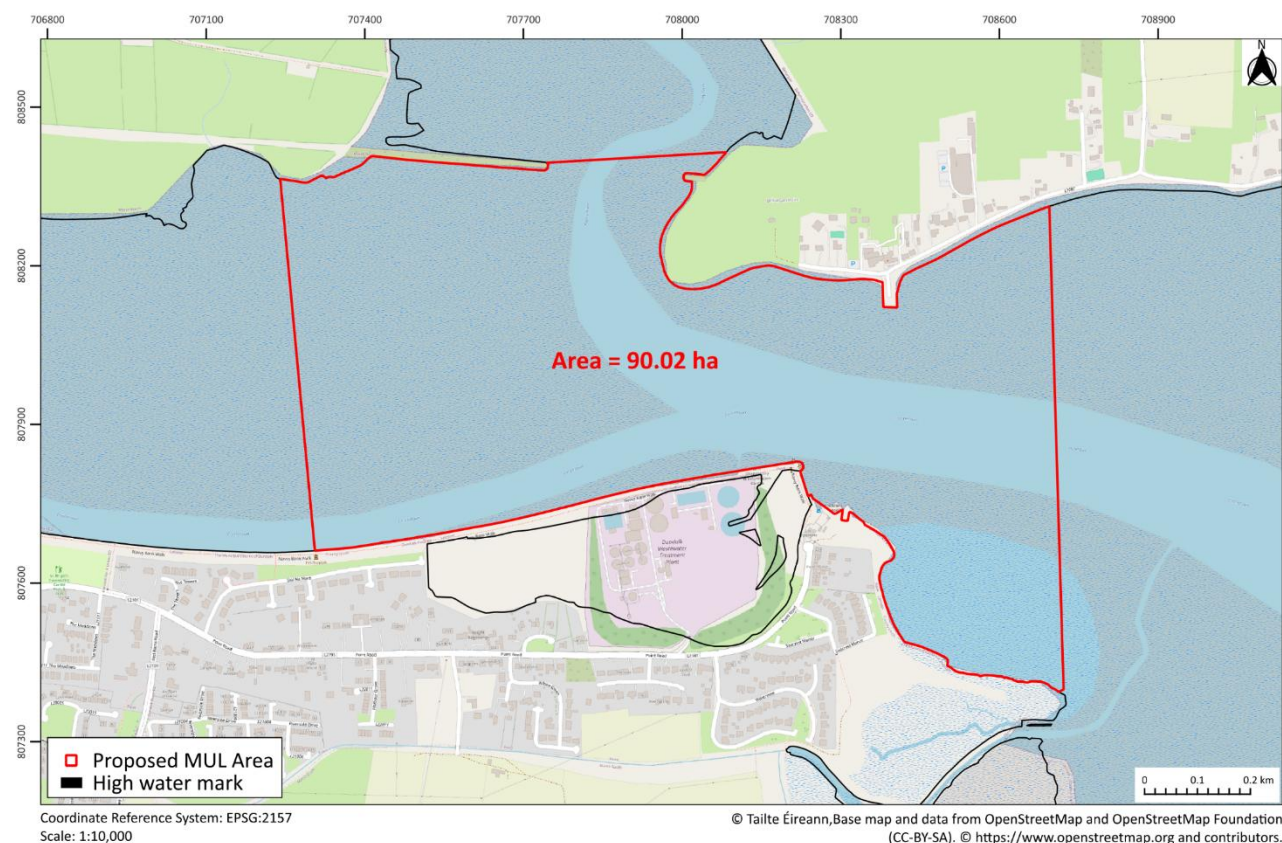


Figure 1: Proposed Survey Area in Dundalk Bay, Co. Louth.

1.2 Proposed Survey Activities

Project Background

AQUAFAC has been appointed by Marina Quarter Ltd. to undertake intertidal and subtidal marine ecological surveys in the Castletown Estuary and Inner Dundalk Bay. The surveys are being undertaken in connection with the proposed Large-scale Residential Development at Haggardstown and Marshes Upper, Dundalk, Co. Louth and will focus on the receiving environment of the existing Dundalk Wastewater Treatment Plant (WWTP) treated-effluent outfall at Soldier's Point.

The proposed development will comprise 502 residential units; a two-storey crèche facility with an associated play area and parking; new vehicular, pedestrian and cycle access infrastructure; surface water and wastewater services; public lighting; roads, footpaths and cycleways; car and cycle parking; and associated landscaping and amenity areas. Wastewater generated by the development will be pumped via a new rising main along Blackrock Road (R172) and Hardy's Lane to Finnabair Crescent, where it will discharge to the existing wastewater drainage network.

The purpose of the surveys is to characterise current intertidal and subtidal ecological conditions in the receiving environment before wastewater flows from the Proposed Development become operational. The

surveys will establish a robust and repeatable baseline against which potential future changes in benthic communities, sediment conditions and the relevant attributes of the Qualifying Interests of Dundalk Bay Special Area of Conservation may be assessed. The resulting data will also provide objective ecological evidence for wider environmental assessment and for separate consideration of WWTP performance and compliance alongside operational, effluent and water-quality information.

The proposed maritime usage is strictly limited to marine ecological survey activities, including vessel-based benthic sampling and intertidal assessment. The survey area lies within a sensitive receiving environment that includes Dundalk Bay Special Area of Conservation, Special Protection Area, Ramsar site and proposed Natural Heritage Area. The SAC Qualifying Interests of particular relevance to the surveys are Estuaries [1130] and Mudflats and sandflats not covered by seawater at low tide [1140]. These habitats support benthic communities that contribute to the ecological functioning of Dundalk Bay and provide important feeding resources for protected waterbird populations.

The survey programme includes the following components:

Intertidal Surveys

The activities described above represent the full extent of the site investigation surveys assessed within this Annex IV Risk Assessment. No construction, demolition, dredging, piling or operational activities are included within the scope of this assessment. The site investigation surveys are intended solely to provide baseline ecological and sediment data to support the proposed Project and associated environmental assessments.

A Phase II quantitative intertidal survey will be conducted along four transects, with sampling undertaken at the upper, middle and lower shore levels of each transect. Phase II surveys will involve quantitative sampling using quadrats and standard ecological recording methods to classify and map intertidal biotopes.

Intertidal surveys will be undertaken on foot where safe access conditions allow. In areas where soft sediments or tidal conditions present a safety risk, sampling will instead be carried out from a suitably equipped vessel at high water using a 0.025 m² Van Veen grab. Two replicate faunal samples and one additional sediment sample for Particle Size Analysis and organic carbon analysis will be collected at each relevant shore level, where required.

Subtidal Benthic Surveys

Subtidal surveys will involve initial habitat characterisation at five pre-agreed stations using non-intrusive visual techniques, comprising DDV and/or non-contact ROV survey. The imagery will be used to identify seabed habitats, substrate conditions and notable ecological features, including sensitive habitats such as maërl, and to determine the suitability of each station for subsequent grab sampling.

Where seabed conditions are confirmed as suitable, targeted benthic grab sampling will be undertaken using a stainless steel Van Veen grab sampler of 0.025 m² deployed from a suitably equipped survey vessel. At each station, two replicate faunal samples will be collected to characterise benthic faunal assemblages, together with one additional sediment sample for Particle Size Analysis and organic carbon analysis. Sampling locations may be adjusted to avoid sensitive or unsuitable habitats identified during the DDV/ROV survey. Where grab sampling is not appropriate, DDV and/or ROV imagery will be used to characterise the seabed habitat

Grab sampling represents a very small, point-source disturbance to the seabed at each sampling location. Disturbed sediments are expected to resettle naturally within a short period following sample collection.

Vessels, Equipment and Duration

Site investigation surveys will be undertaken using a suitably equipped survey vessel operating from existing harbour or slipway facilities, where required. Equipment used will be limited to DDV and/or ROV equipment, hand-deployed sampling gear, Global Positioning System (GPS) units, cameras and standard ecological survey equipment. No geophysical equipment, high-energy acoustic sources, piling, dredging, excavation or heavy machinery will be used.

The surveys will be completed over a brief duration of one to two weeks, timed to suitable tidal and weather conditions. Activities will be intermittent and highly localised, with vessel movements and sampling confined to defined survey stations and transects. All site investigation surveys are temporary in nature and will not result in any permanent change to the foreshore, seabed or marine environment.

Scope of Surveys Assessed

The activities described above represent the full extent of the site investigation surveys assessed within this Annex IV Risk Assessment. No construction, demolition, dredging, piling or operational activities are included within the scope of this assessment. The site investigation surveys are intended solely to provide baseline ecological and sediment data to support the proposed Project and associated environmental assessments.

The site investigation surveys will be of short duration, highly localised in extent and will not result in any permanent alteration of the foreshore, seabed or marine environment.

1.3 Purpose of this report

This report has been prepared to assess the impacts of the Project on relevant Annex IV species identified as having potential to be present in the Project, under Article 12 of the European Community (EC) Directive (92/43/EEC) on the conservation of natural habitats and of wild flora and fauna (commonly known as the Habitats Directive).

1.4 Dundalk Bay

Dundalk is situated at the head of the Castletown River estuary, which enters the sea after flowing past Dundalk town. The town and port are situated on the south side of the river, southeast of Dundalk Bridge which marks the Castletown River navigation limit for sailing craft. The harbour has one of the highest tidal ranges on the east coast and largely dries on low tide, requiring vessels to work the tide and take to the ground on soft mud during low tidal stages (eOceanic, 2025). The harbour is used by cargo ships and fishing vessels, but leisure vessels aware of the conditions also occur. The narrow channel to the quay dries to 0.9 m lowest astronomical tide (LAT) and George's Quay dries to 2.5 m LAT; the harbour is navigable for small craft at half tide and above (eOceanic, 2025). The bay is mostly shallow (less than 15 m) and extensive sand banks are present, uncovering at low water from Giles Quay on the northern shore of the bay to Annagassan town on the southern shore.

2. Legislation

2.1 Legislative background

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (commonly known as the Habitats Directive) is European Community legislation regarding nature conservation established to ensure biodiversity is conserved through the conservation of natural habitats and wild fauna and flora in Europe.

The Habitats Directive was originally transposed into Irish law by the *European Communities (Natural Habitats) Regulations, 1997* (S.I. No. 94 of 1997). The 1997 Regulations were subsequently revoked and replaced by the *European Communities (Birds and Natural Habitats) Regulations 2011*, as amended (herein referred to as the 2011 Birds and Natural Habitats Regulations).

A network of sites of conservation importance hosting habitats and species as needing to be either maintained at or restored to favourable conservation status have been identified by each Member State. These sites are known as European sites within the Natura 2000 network.

European sites in Ireland that form part of the Natura 2000 network of protected sites comprise Special Area of Conservation (SAC) sites designated due to their significant ecological importance for habitats and species protected under Annex I and Annex II respectively of the Habitats Directive, and Special Protection Areas (SPA) sites designated for the protection of populations and habitats of bird species protected under the EU Birds Directive (Council Directive 2009/409/EEC). The sites are formally designated by the relevant minister under a statutory instrument. Candidate SAC and candidate SPA sites (*i.e.*, cSAC or cSPA) have the same level of protection as fully designated sites under Irish Law¹. The specific named habitats and/or (non-bird) species for which an SAC or SPA are selected are called the 'Qualifying Interests' (QIs), of the site. The specific named bird species for which a SPA is selected is called the 'Special Conservation Interests' (SCIs). QIs and SCIs are collectively referred to as conservation features (OPR, 2021).

The Habitats Directive requirements are divided in two group chapters. The first includes the Articles 3 to 11, designated as 'Conservation of natural habitats and habitats of species'. The second group includes the Articles 12 to 16, designated as 'Protection of Species', which focus on establishing a system of strict protection for the animal species listed under Annex IV(a) of the Habitats Directive.

¹ Candidate sites are those that have been submitted to the European Commission, but not yet formally adopted under Ministerial Statutory Instrument (S.I.). Legal protection, and therefore, the requirement for AA, arises from the date that the Minister gives notice of his/her intention to designate the site.

Article 12 of the Habitats Directive, under Regulation 51 of the 2011 Birds and Natural Habitats Regulations states:

1. *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.*

Additionally, protection measures implemented under Article 12 of the Habitats Directive should ensure or contribute to the maintenance or restoration, at favourable conservation status, of Annex IV species of Community Interest. In the marine environment, Annex IV animal species of the Habitats Directive include all cetaceans (whales and dolphins), the otter and some marine turtles.

2.2 Guidance

This report has been prepared in accordance with the following guidance:

- Department of Art, Heritage and the Gaeltacht (DAHG) (2014) Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters
- Maritime Area Regulatory Authority (MARA) (2024) Applicant Technical Guidance (V7) for Maritime Area Consents and Licensing.
- EC (2021) Guidance document on the strict protection of animal species of Community interest under the Habitats Directive. Commission Notice (2021) and
- The Joint Nature Conservation Committee (JNCC) *et al.* (2010) The protection of marine European Protected Species from injury and disturbance: Guidance for the marine area in England and Wales and the United Kingdom (UK) offshore marine area' published by the Joint Nature Conservation Committee (JNCC), Natural England and Countryside Council for Wales (now Natural Resources Wales).

An overview of the previous literature regarding the Annex IV species baseline in Irish waters, included the following sources:

- Baseline desk studies and field surveys carried out for the proposed Project area, including National Biodiversity Data Centre (NBDC) records for otter presence and cetacean sightings within Dundalk Bay. These are supported by national surveys such as Reid *et al.* (2013a) National Otter Survey of Ireland 2010/12, Berrow *et al.* (2010) Irish Cetacean Review, and Small Cetaceans in the European Atlantic and North Sea (SCANS) project abundance estimates (Hammond *et al.*, 2013; Gilles *et al.*, 2023), species-specific reviews such as Rogan *et al.*, (2018) along with seal distribution data from Cronin *et al.* (2007) and Morris & Duck (2019).
- Site Synopsis, Conservation Objective Reports and Natura 2000 Forms available from National Parks and Wildlife Service (NPWS),
- Published and unpublished NPWS reports on protected habitats and species including Irish Wildlife Manual reports such as Bailey & Rochford (2006) *Otter Survey of Ireland 2004/2005*, Reid *et al.* (2013a) *National Otter Survey of Ireland 2010/12*, Reid *et al.*, (2025) *Otter Survey of Ireland 2023-24*, and Morris & Duck (2019) *Aerial thermal-imaging survey of seals in Ireland*, Species Action Plans, and Conservation Management Plans and reviewed include NPWS Conservation Status Assessment Report for otter (*Lutra lutra*) [NPWS, 1355].

Existing relevant mapping and databases *e.g.* waterbody status, species and habitat distribution *etc.* (sourced from the Environmental Protection Agency - <http://gis.epa.ie/>, the National Biodiversity Data Centre - <http://maps.biodiversityireland.ie> and the NPWS - <http://www.npws.ie/mapsanddata/>).

3. Annex IV Species in the Project area

Introduction

All cetacean species are listed under Annex IV of the Habitats Directive, which affords them strict protection within Irish waters. To date, 27 species of cetaceans have been recorded in Ireland (NBDC, 2024), ranging from resident populations to wide-ranging migratory species, including the recently confirmed whale species (narwhal) recorded in Ireland for the first time in November 2025.

The NBDC have a tool for generating a species list over 10 km grid squares based on NBDC records, which was used in assessing the marine mammal species likely to be found in the Dundalk Bay area. This includes the following list of grid squares J00, J10, J20, O09, O19, O29. Data was filtered to contain sightings and strandings within the past 10 years. The grid squares included in the assessment cover the entirety of Dundalk Bay, however the site investigation surveys are limited to Inner Dundalk Harbour, which as described in **section 1.4** above, is shallow and largely influenced by the tide, with large sandflats exposed on low tide that results in habitat unsuitable to cetacean species.

Table 3.1: Marine mammals observed in the Dundalk Bay grid squares on the National Biodiversity Data Centre (NBDC). Species with an asterisk(*) are found on Annex II (i.e., not Annex IV) of the Habitats Directive. Accessed January 2026.

Pinnipeds
Grey Seal (<i>Halichoerus grypus</i>)*
Harbour Seal (<i>Phoca vitulina</i>)*
Odontocetes (toothed whales and dolphins)
Bottle-nosed Dolphin (<i>Tursiops truncatus</i>)
Common Dolphin (<i>Delphinus delphis</i>)
Common Porpoise (<i>Phocoena phocoena</i>)
Killer Whale (<i>Orcinus orca</i>)
Mysticetes (baleen whales)
Minke Whale (<i>Balaenoptera acutorostrata</i>)

The proposed marine and intertidal surveys are located within Inner Dundalk Bay and the Castletown Estuary, an area that supports a range of marine and estuarine habitats and which may be used by Annex IV species on a resident, transient or occasional basis. The assessment of Annex IV species presented in this section has been informed by a review of available baseline information, including National Biodiversity Data Centre (NBDC) records, National Parks and Wildlife Service (NPWS) datasets, relevant site synopses and conservation objectives for European sites, and published literature relating to the distribution and ecology of Annex IV species in Irish coastal waters.

Given the temporary, small-scale and localised nature of the proposed site investigation surveys, the zone of influence for potential effects on Annex IV species is expected to be limited to the immediate vicinity of survey vessels, DDV/ROV operations and sampling locations within Inner Dundalk Bay. Mobile marine species such as

cetaceans are capable of avoiding areas of activity, and any potential interactions would be short-lived and reversible. For more site-associated species such as otter, the assessment considers the availability of suitable habitats within and adjacent to the survey footprint, including the presence or absence of breeding or resting sites.

This section provides an overview of the Annex IV species that are known or considered likely to occur within or in proximity to the Project area and that could, in principle, interact with the proposed site investigation surveys. The assessment focuses on those species for which a plausible pathway exists for interaction with the site investigation surveys, taking account of species ecology, habitat use and the characteristics of the proposed surveys. Species with no credible risk pathway are screened out at an early stage or addressed briefly to ensure a proportionate and focused assessment.

Overview of the Annex IV species distribution and abundance estimations are summarised in **Section 3.1** to **Section 3.8**, while **Section 3.9** provides a brief summary of other (non-Annex IV) species.

3.1 Otter (*Lutra lutra*)

The Eurasian otter is a top predator in freshwater systems; thus, its presence has a significant role in the well-being of these ecosystems (Reid *et al.*, 2013a). Aquatic prey and shelter availability are two basic requirements in the growth of otter populations. This species is strictly protected under Annex II and IV of the Habitats Directive; thus, its listing under Annex II requires Member States to designate Special Areas of Conservation (SACs) for its protection. Otters are designated as a species of conservation concern and high priority in Europe, due to historical and ongoing population declines associated with deterioration in water quality (including eutrophication), habitat loss and fragmentation, and the introduction of invasive alien species (Reid *et al.*, 2013a; Gutleb & Kranz 1998; Leppakoski *et al.*, 2002). Consequently, otters have been identified as ‘sentinel species’ for the dynamics and diversity of pesticides in certain aquatic food webs (Lemarchand *et al.*, 2011; Reid *et al.*, 2013a). The Eurasian otter is currently listed as Near Threatened on the International Union for Conservation of Nature (IUCN) Red List global assessment of the species (Loy *et al.*, 2022). However, in Ireland, otter are currently listed as Least Concern under Ireland’s Red List (No. 12) indicating otter are under less negative pressure in Ireland compared to mainland Europe.

In Ireland, the species is widespread throughout the country and there are 44 SACs (NPWS, 2009) with otter as a QI, with associated habitats ranging from estuaries, lakes, coastal lagoons, dunes and alluvial forests (Bailey and Rochford, 2006). For the proposed Project area, the closest SAC which includes the otter as a QI are the River Boyne and River Blackwater SAC (002299), located approx. 30 km hydrologically to the south of the Project area. Within the Dundalk Bay and Castletown Estuary area, suitable otter habitat is present along riverbanks, estuarine margins and sections of the sheltered coastline. Records from the National Biodiversity Data Centre (NBDC) confirm the presence of otter in the wider Dundalk Bay area, reflecting the species’ widespread distribution along the east coast of Ireland. Otter use of the bay is likely to be primarily associated with shoreline foraging and commuting between freshwater and coastal habitats, rather than regular use of subtidal areas. Records of European otters in the vicinity of the proposed site investigation surveys were obtained from the NBDC online database (NBDC, 2025a).

According to the NBDC database (NBDC, 2025a) the most recent evidence of otter activity in the Dundalk Bay area was in 2023, documented in Mammals of Ireland 2016-2025 at the Ramparts, Dundalk; records in 2014 and 2018 are also present along the Castletown River as it runs through Dundalk town. River Forkhill, which enters the Irish sea at Dundalk Bay, also has records from 2002. Recent data from the NPWS National Otter Survey 2023–2024 (Reid *et al.*, 2025) confirms that otters may utilise rocky shorelines and intertidal zones within Dundalk Bay, especially during dawn and dusk periods. Dundalk Bay lies within the Neagh–Bann River Basin District, which recorded the lowest otter occurrence within the study area and a decline relative to previous surveys; this trend may reflect localised impacts, potentially associated with harmful algal blooms in Lough Neagh (Reid *et al.*, 2025).

The proposed site investigation surveys are limited to Phase I and Phase II intertidal surveys, DDV and/or ROV survey, and targeted subtidal and intertidal grab sampling undertaken from a suitably equipped survey vessel where required. Intertidal survey activities will be of short duration and confined to small, defined areas. No excavation, dredging, piling, construction or operational works will be undertaken, and no permanent alteration of shoreline habitats will occur. Importantly, no otter holts, couches or other resting or breeding sites have been identified during the desktop study within or immediately adjacent to the proposed survey footprints or access points.

3.2 Common bottlenose dolphin (*Tursiops truncatus*)

Common bottlenose dolphins are one of the most studied delphinid species and are widely distributed in both temperate and tropical marine waters worldwide with the species currently classified as Least Concern on the IUCN Red List (Wells and Scott, 2009; Wells *et al.*, 2019). Bottlenose dolphins are among the most commonly recorded cetaceans in Irish waters (NPWS, 2019), where they are observed year-round. The species is strictly protected under Annex II and IV of the Habitats Directive and therefore require Member States to designate SACs for their protection, with ten SACs designated for this QI in Ireland. At least three genetically distinct populations occur in the waters off the west coast of Ireland including the resident group from the Shannon Estuary of which a small group of individuals utilise outer Cork Harbour, a more mobile population moving along the west coast referred to as the Connemara-Mayo-Donegal population and a less defined more oceanic population primarily represented by stranded animals (Rogan *et al.*, 2018). Large-scale movements reported for dolphins occurring between the west, south, and east coasts of Ireland indicate that dolphins outside the Shannon Estuary are more transient and mobile.

Records from the National Biodiversity Data Centre (NBDC) indicate that bottlenose dolphins have not been recorded within inner Dundalk Bay, likely reflecting the bay's shallow, intertidal nature, which dries extensively at low tide and is not suitable for cetacean foraging. The nearest NBDC recorded sightings of bottlenose dolphin to the proposed MUL area are from adjacent coastal waters approximately 9 km from the Project, recorded in 2010 and 2012. Compared to areas such as the Shannon Estuary or the west coast of Ireland, sightings are relatively infrequent. Where present, individuals are considered likely to be transient, using the bay as part of a broader foraging or transit range rather than as a core area for breeding, calving, or other key life-history functions.

Dundalk Bay does not support a Special Area of Conservation (SAC) designated for bottlenose dolphin, and no areas within the bay are known to be of particular importance for the species. The nearest SAC for which bottlenose dolphin is a qualifying interest is Hook Head SAC, located approximately 269 km from the Project; there are no other SACs designated for the species along the east coast. Given the extremely shallow and highly tidal nature of the inner bay and harbour, which are subject to extensive drying at low tide, the Project

area is considered largely unsuitable for bottlenose dolphin use. As a result, the occurrence of bottlenose dolphins in proximity to the Project area is considered unlikely, with any presence within the wider bay expected to be occasional and transient.

In 2022, Small Cetaceans in the European Atlantic and North Sea project (SCANS-IV) carried out shipboard and aerial surveys to estimate cetacean abundance in the continental shelf waters in the Northeast Atlantic (Gilles *et al.*, 2023). Within the SCANS-IV survey framework, Dundalk Bay lies in survey Block CS-D, which extends from approximately Co. Wexford to Co. Belfast. The estimated abundance of bottlenose dolphins was 15,117 individuals (95% CL: 4,966-29,157, CV = 0.406) corresponding to a predicted density of 0.4195 bottlenose dolphins per km².

3.3 Minke whale (*Balaenoptera acutorostrata*)

Minke whales are the most frequently recorded baleen whale in Irish waters (Berrow *et al.*, 2010, IWDG, 2015). They can be observed off most coasts of Ireland year-round; most sightings of the species are recorded from the south and west coast between May and October when a seasonal inshore movement of the species occurs in summer and autumn (Wall *et al.*, 2013; IWDG, 2015). While they are mostly observed in shallow waters of depths of 35 - 205 m (Wall *et al.*, 2004), a lack of records of the species in coastal waters in winter suggests an inshore-offshore movement and supporting this, they are more often observed in deeper offshore waters around continental shelf areas during winter (Rogan *et al.*, 2018). Records from the NBDC (NBDC, 2025) indicate that minke whales are infrequently recorded within Dundalk Bay, the most recent record of an individual in 2011, and are less common in the Irish Sea in the vicinity of the Project area compared to the west. There are no records of Minke whale within Inner Dundalk harbour. Where present, individuals are expected to be transient, passing through coastal waters rather than utilising the bay as a foraging or resting area. Dundalk Bay, and particularly Inner Dundalk Bay (the Project area), does not provide suitable habitat for key life-history functions of the species, such as feeding aggregation, breeding or calving. During the SCANS-IV surveys, the estimated abundance of minke whales in CS-D was 447 individuals (95% CL: 85-1,425, CV = 0.632) corresponding to a predicted density of 0.0137 minke whales per km².

3.4 Harbour Porpoise (*Phocoena phocoena*)

Harbour Porpoises are one of the most widely distributed and observed cetacean species in European waters (Hammond *et al.*, 2002), inhabiting shallow waters around the northern hemisphere (Todd *et al.*, 2020). This species is strictly protected under Annex II and Annex IV of the Habitats Directive, thus requires Member States to designate SACs for their protection. There are sixteen SACs designated for harbour porpoises in Ireland. Rockabill to Dalkey Island SAC (003000), Lambay Island SAC (000204) and Codling Fault Zone SAC (003015) are the closest SACs with harbour porpoise listed as a QI and are located approximately 48 km, 61 km and 84 km respectively from the proposed Project. Additionally, Broadhaven Bay located in the northwest of Ireland, was also identified as a site of high diversity for cetacean species, including harbour porpoises, and has the longest marine mammal monitoring programme in Ireland (Anderwald *et al.*, 2012; Todd *et al.*, 2020). Harbour porpoise occur around all coasts of Ireland throughout the year but are more commonly recorded along the east coast. The Irish Whale and Dolphin Group (IWDG) identify the area between Howth Head and Dalkey, off County Dublin, as being of particular significance for the species, with the highest counts recorded anywhere in Ireland based on boat-based survey data.

Within Dundalk Bay, harbour porpoise are the most frequently recorded cetacean according to the NBDC (NBDC, 2025), reflecting the species' preference for shallow, productive coastal waters with strong tidal currents and abundant prey. However, these records are predominantly from the outer bay and adjacent coastal waters, rather than from Inner Dundalk Bay and Dundalk Harbour itself. Data from SCANS IV further support this interpretation, with distribution mapping for harbour porpoise showing no records within Dundalk Bay or in immediately adjacent inshore waters (Gilles *et al.*, 2023). During the SCANS-IV surveys, the estimated abundance of harbour porpoise in CS-D was 9,773 individuals (95% CL: 4,764 – 18,125, CV = 0.316) corresponding to a predicted density of 0.2803 harbour porpoise per km². Given the extremely shallow and highly tidal nature of Dundalk Bay, which is subject to extensive drying at low tide, harbour porpoise are therefore unlikely to enter or regularly use the Inner Bay are where the proposed site investigation surveys are located.

3.5 Short-beaked common dolphin (*Delphinus delphis*)

Short-beaked common dolphins (referred to as common dolphins) are one of the most abundant dolphin species around the Irish coast, inhabiting both continental shelf and offshore waters (Murphy *et al.*, 2013). Records from the National Biodiversity Data Centre (NBDC, 2025) indicate that sightings of short-beaked common dolphin within Dundalk Bay and adjacent coastal waters are infrequent; the majority of records on the database within the confines of Dundalk Bay are through stranding records.

This species is strictly protected under Annex II and IV of the Habitats Directive, thus requiring Member States to designate SACs for their protection. To this day, there are no SACs designated for common dolphins in Ireland, however previous literature has assessed that they are mostly sighted in water temperatures above 15°C at depths of 400-1000 meters (Cañadas *et al.*, 2009). Cañadas *et al.*, (2009) also calculated an average group size of 15 ± 2.2 individuals ($\pm$ standard error; range 1-239), which showed an increasing trend with depth from 8.0 ± 1.44 individuals in waters under 400 m of depth to 18.6 ± 2.76 individuals for water depths more than 2000 m. In western European waters, Reid *et al.* (2003) reported high numbers of common dolphins in the Celtic Sea, St. George's Channel, west of the English Channel and off southern and western Ireland during the summer months between 1978 and 1998. During the SCANS-IV surveys, the estimated abundance of common dolphin in CS-D was 949 individuals (95% CL: 32 – 2,990, CV = 0.814) corresponding to a predicted density of 0.0272 common dolphins per km². The shallow, sheltered and estuarine nature of Inner Dundalk Bay does not represent typical habitat for the species, and the area is not considered to support important life-history functions such as feeding aggregations, breeding or calving.

3.6 Killer whale (*Orcinus oca*)

Killer whale are the largest dolphin species and are the most widespread cetacean species on earth (Wall *et al.*, 2013). In Ireland, they are recorded predominantly in inshore waters around the northeast, north, west, and south coasts. In Wall *et al.*, (2013), there were no records of killer whale in the Irish Sea. During the Scans IV surveys, killer whale were sighted but were not included in subsequent analysis as the sighting rate was too low. In Wall *et al.*, (2013), the Scottish West Coast Community was a group that consisted of ten animals, however it is apparent that only two bulls remain, presumed to be the last surviving members (IWDG, 2026). Records from NBDC near Dundalk Bay are infrequent and sparse.

Where present, individuals are expected to be transient, passing through coastal waters rather than utilising the bay as a foraging or resting area. Dundalk Bay, and particularly Inner Dundalk Bay (the Project area), does not provide suitable habitat for key life-history functions of the species, such as feeding aggregation, breeding or calving.

3.7 Leatherback turtle (*Dermochelys coriacea*) and Loggerhead turtle (*Caretta caretta*)

The most up-to-date information on marine turtle distribution in Ireland is available from the National Biodiversity Data Centre (NBDC, 2025a), specifically through the *Irish Marine Turtle Records* dataset (last updated 8 May 2025). This dataset contains validated sightings, strandings, and captures from 1884 to 2023, contributed by researchers, citizen scientists, and verified expert observations. Records are dominated by the leatherback turtle (*Dermochelys coriacea*). The loggerhead turtle (*Caretta caretta*) is also recorded, albeit far

less frequently, with the most recent validated occurrence in November 2023. Occasional records also exist for other species such as the Green Turtle (*Chelonia mydas*), Hawksbill Turtle (*Eretmochelys imbricata*), and Kemp's Ridley (*Lepidochelys kempii*), though these are considered exceptional vagrants. The NBDC dataset integrates historic literature records (King and Berrow, 2009) with modern verified submissions, ensuring a comprehensive record of turtle presence in Irish waters.

Table 3.2: NBDC Marine turtle records.

Species	Total Records	Most Recent Record	Approx. Location
Leatherback Turtle	974	28 Nov 2021	Coastal waters – Irish Exclusive Economic Zone
Loggerhead Turtle	19	23 Nov 2023	Coastal and inshore waters
Other Marine Turtle Species	Cumulative (all species) 1,180 records across 421 sites (1884–2023)		

The leatherback turtle is the most frequently recorded marine turtle species in Irish waters (King & Berrow, 2009) and has a wide distribution in temperate waters during the summer and autumn months (Houghton *et al.*, 2006). The species is strictly protected under Annexes II and IV of the Habitats Directive, requiring Member States to designate Special Areas of Conservation (SACs) where appropriate; however, no SACs are currently designated for leatherback turtles in Ireland.

Data from the National Biodiversity Data Centre (NBDC) indicate that leatherback turtle records are primarily concentrated along the south and southwest coasts of Ireland, with few records from the Irish Sea and enclosed estuarine environments, including Dundalk Bay. Available records suggest that sightings in the vicinity of Dundalk Bay are rare and sporadic, with no evidence that the bay supports regular use or key life-history functions such as foraging habitat. Marine turtles do not breed in Ireland and do not typically come ashore except when in distress. King and Berrow (2009) compiled 1,069 records of marine turtles in Irish waters, of which 863 records related to leatherback turtle. Sightings were strongly seasonal, with 90.8% occurring in summer between June and September.

The loggerhead turtle is the second most frequently recorded marine turtle species in Irish waters (King & Berrow, 2009). This species has a wide distribution across temperate and tropical regions of the Atlantic, Pacific, and Indian oceans and is strictly protected under Annexes II and IV of the Habitats Directive, requiring Member States to designate Special Areas of Conservation (SACs) where appropriate; however, no SACs are currently designated for loggerhead turtles in Ireland. Loggerhead turtle records in Irish waters are far less frequent than those of leatherback turtle, though the NBDC database includes a small number of strandings along the east coast of Ireland. Of the 1,069 marine turtle records compiled by King and Berrow (2009), 56 records were attributed to loggerhead turtle. Loggerhead turtle has been recorded in every month, showing a peak in March representing 23.6% of all records and, 60% occurring between January to April.

Overall, marine turtle records in Ireland are most frequent along the south coast and off headlands in west Cork, which together account for 41.5% of all records. The distribution of marine turtle records by county in Ireland is presented in **Table 3.3**.

The proposed site investigation surveys comprise Phase I and Phase II intertidal surveys, DDV and/or ROV survey, and short-term vessel activity related to targeted subtidal and intertidal grab sampling using standard ecological survey equipment. These activities will generate only low-level underwater noise, primarily associated with vessel movements, DDV and/or ROV operations, and brief sampling operations. Dundalk Bay, and particularly Inner Dundalk (the Project area), does not represent suitable habitat for key life-history functions of the species, such as feeding aggregation, *etc.*, and marine turtles do not breed in Ireland. In the unlikely event that a marine turtle is in the vicinity of Project activities, any behavioural response would be limited to movement away from the source and expected to be minor, temporary and fully reversible.

There is no pathway for injury, long-term disturbance, or displacement from important habitat, and no potential for the deterioration or destruction of breeding or resting sites as a result of the proposed site investigation surveys, noting that marine turtles do not breed in Ireland. On this basis, while marine turtles are included in this assessment as Annex IV species, the proposed Project is not expected to result in any significant disturbance or adverse effects on marine turtle species or to contravene the strict protection provisions of Article 12 of the Habitats Directive.

Table 3.3: Distribution of turtle species logged around Ireland, adapted from Table-2 King & Berrow (2009). The proposed site investigation surveys are along the Co. Louth coast, highlighted in bold.

County/Sea	Turtle species				
	Leatherback	Loggerhead	Kemp's Ridley	Hawksbill	Green
Derry	4	1	0	0	0
Antrim	10	0	0	0	0
Down	12	0	0	0	0
Louth	3	0	0	0	0
Dublin	10	1	1	0	0
Wicklow	4	0	0	0	0
Wexford	25	1	0	0	0
Waterford	63	3	0	0	0
Cork	378	12	1	1	1
Kerry	113	15	2	0	0
Clare	18	3	1	0	0
Galway	21	11	2	0	0
Mayo	49	5	1	0	0
Sligo	14	2	0	0	0
Leitrim	1	0	0	0	0
Donegal	109	2	2	0	0
Celtic Sea	9	0	0	0	0
Irish Sea	4	0	0	0	0
Offshore	16	0	0	0	0

Total	863	56	10	1	1
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3.8 Bats

There are nine species of bats established in Ireland (Roche *et al.*, 2014; Aughney, 2022). All nine bat species resident in Ireland are protected under Annex IV of the Habitats Directive. Records from the National Biodiversity Data Centre (NBDC) confirm the presence of several bat species within the wider Dundalk area, including common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), Leisler's bat (*Nyctalus leisleri*), Daubenton's Bat (*Myotis daubentonii*) and brown long-eared bat (*Plecotus auritus*) (NBDC, 2025). These species are typically associated with inland habitats, including woodland edges, hedgerows, watercourses and built structures, rather than open coastal or estuarine environments.

The proposed site investigation surveys are confined to marine and intertidal environments within Dundalk Bay and comprise short-duration vessel activity, intertidal ecological surveys, DDV and/or ROV survey, and intertidal and subtidal benthic grab sampling using small, hand-deployed equipment. No surveys will take place within terrestrial habitats, and no structures with potential bat roosting suitability will be affected. The surveys will not involve lighting, tree removal, building works or other activities typically associated with disturbance to bats.

Given the offshore subtidal and intertidal location of the survey activities, and the absence of suitable roosting or foraging habitat within the survey footprint, bats are not considered likely to interact with the proposed site investigation surveys. There is no pathway for injury, disturbance or deterioration of breeding or resting sites for bats, and no potential for effects on bat commuting or foraging behaviour. On this basis, while bats are included in this assessment as Annex IV species, the proposed survey activities are not expected to result in any significant effects on bats or to contravene the strict protection provisions of Article 12 of the Habitats Directive.

3.9 Other (Non-Annex IV) Species

The species included in this section are:

- Harbour seal (*Phoca vitulina*) [1365]
- Grey seal (*Halichoerus grypus*) [1364]
- Basking shark (*Cetorhinus maximus*)

Although these species are not listed in Annex IV of the Habitats Directive, they are known for their foraging range which makes them a potential species to occur in the Project area. An overview of the distribution abundance of these species is summarised in the **Section 3.9.1** through **Section 3.9.3**.

3.9.1 Harbour seal (*Phoca vitulina*)

Harbour seals (also referred to as Common seals) are semi-aquatic marine mammal from the Pinnipeds group with a wide distribution in the northern hemisphere (Cronin *et al.*, 2007). Harbour seals are one of two seal species that are indigenous to Irish waters, predominantly on the west coast of Ireland. This species is included under Annex II of the Habitats Directive, thus requires Member States to designate SACs for their protection. There are 13 SACs designated for this species in Ireland, with the closest one (Lambay Island SAC [000204]) is located approximately 61 km from the Project area. In Ireland, harbour seals are most abundant along the west and north-west coasts, with smaller and more scattered populations occurring along the east coast (Cronin *et al.*, 2007; Morris & Duck, 2019). Records from the NBDC indicate that harbour seals are occasionally recorded within Dundalk Bay and adjacent coastal waters, including evidence of a group of nine harbour seals hauled out in 2018, resting on the sandbanks exposed at low tide. Other records support that some individuals are likely to be transient or seasonal visitors using the area for foraging. Morris and Duck (2019) carried out thermal-imaging surveys along the coastline of Ireland in August 2017 and August 2018, which also compiled the counts of harbour seals from surveys in 2003, in 2011/2012 and in 2017/2018. Dundalk Bay was within East, Area 1 (Carlingford Lough to River Boyne (Drogheda)) where 61 harbour seals were recorded in 2011/12 and 2017/2018 (see **Table 3.4**). Distribution mapping by Morris and Duck (2019) indicate that they were recorded in Dundalk Harbour. While harbour seals may occasionally haul-out on the intertidal sandbanks exposed at low water, the subtidal surveys require half-tide minimum for vessel access. The intertidal habitats within the bay, while extensive, are heavily influenced by tidal regimes and human activity, and are not considered to represent key resting or breeding areas for the species. Harbour seals using the wider area are therefore expected to occur at low densities and on a non-resident basis.

The survey activities may result in the temporary presence of vessels and personnel and survey equipment within the bay but will not involve any physical disturbance to haul-out sites or breeding habitat. No piling, drilling, dredging or high-intensity noise-generating activities will occur. Any interaction between harbour seals and the proposed site investigation surveys are expected to be limited to short-term behavioural

responses, such as brief avoidance of vessels or sampling locations. Harbour seals are known to exhibit a degree of tolerance to routine vessel traffic in coastal environments, and any disturbance would be localised, temporary and fully reversible. There is no pathway for injury, significant disturbance or displacement from important habitat.

Table 3.4: Count of harbour in the east region of Ireland, from surveys in 2003, 2011/2012 and 2017/2018, extracted from Table 1. in Morris and Duck (2019). Area 1 (Carlingford Lough to River Boyne (Drogheda)) which overlaps the proposed site is highlighted in bold.

Region	Area	Harbour seals		
		2003	2011/2012	2017/2018
East	1	89	61	61
	2	34	29	70
	3	0	0	0

3.9.2 Grey seal (*Halichoerus grypus*)

Grey seals are the other seal species to inhabit the coast of Ireland, with greatest numbers around the western coast. This species is included under Annex II of the Habitats Directive, thus requires Member States to designate SACs for their protection. There are 10 SACs designated for this species in Ireland; however, there are no SACs designated for this species within or in close proximity to the proposed site investigation surveys. The closest significant SAC supporting grey seals is Lambay Island SAC [000204] approximately 61 km away from the proposed Project.

Thermal imaging aerial surveys carried out by Duck and Morris (2012) in 2011 and by Morris and Duck (2019) in 2017–2018 indicate that while grey seals are regularly recorded along the broader Louth coastline, Dundalk Bay does not support any major haul-out or breeding sites. In 2011/12 and 2017/18, 48 and 83 grey seals were recorded, respectively, within East Area 1 (Carlingford Lough to River Boyne (Drogheda)). Records on the NBDC indicate that the species may occasionally rest on the sandbanks when they are exposed during low tide.

Grey seals are therefore likely to occur within the vicinity of the proposed Project area only on a transient basis, moving through the bay while foraging along coast. These counts of grey seals in the Irish east region are provided in **Table 3.5** where Area 1 includes the Project area.

Table 3.5: Count of grey seals in the east region of Ireland, from surveys in 2003, 2011/2012 and 2017/2018, extracted from Table 1 in Morris and Duck (2019). Area 1 (Carlingford Lough to River Boyne (Drogheda)) which overlaps the proposed site is highlighted in bold.

Region	Area	Grey seals		
		2003	2011/2012	2017/2018
East	1	39	48	83
	2	211	172	335
	3	12	3	0

3.9.3 Basking shark (*Cetorhinus maximus*)

Basking sharks are the second-largest fish species, most frequently sighted between April and September in shallow coastal areas in the northern Atlantic (Doherty *et al.*, 2017). Basking sharks are protected under Section 23(2)(a) of the Irish Wildlife Act 1976, entitled the “Wildlife Act 1976 (Protection of Wild Animals) Regulations 2022”, making it an offense to hunt, injure, or disrupt their breeding and resting sites. They are listed under international legislation, such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the United Nations Convention on the Law of the Sea and they are also listed in the International Union for Conservation of Nature (IUCN) Red List, classified as endangered in 2019.

Distribution patterns of basking sharks show inter-annual site-fidelity in areas around the Isle of Man (Dolton *et al.*, 2019), with the Irish Sea being identified as a migratory corridor for this species (Lieber *et al.*, 2020). Due to their primary prey (zooplankton), basking shark abundance peaks have been shown to be positively correlated with peaks in plankton density, which can explain this species abundance during summer months (Sims and Quayle, 1998). Previous literature suggests that basking sharks go through extensive migrations from September to May (Doherty *et al.*, 2017), as an alternative to hibernation periods (Parker and Boseman, 1954). Although their distribution patterns have been widely studied around Ireland and UK waters, their abundance and density estimations have not yet been assessed (Sims, 2008). The number of sightings and average group sizes have dramatically increased. In 2024, the Irish Whale and Dolphin Group recorded 262 sighting events, with a total of 1,972 sharks observed, an average of about 7.5 sharks per sighting. That’s nearly three times the average of around 2.6 sharks per sighting in 2009 (IWDG, 2024). However, it has been noted that active research and conservation interest in the species in recent years has led to an increase in the number of sightings reported around Ireland (Clarke *et al.*, 2016).

Based on the limited records of basking shark within Dundalk Bay, the restricted spatial and temporal scope of the proposed activities, and the fact that any potential interaction would be on an individual basis and unlikely to affect the population, the proposed Project is not expected to result in any significant interaction or adverse effect on this protected species.

4. Potential Environmental Impacts

A detailed description of the proposed survey activities is provided in **Section 1.2** above. Given the nature of the proposed site investigation surveys, the potential impact mechanisms identified to potentially have an impact on Annex IV species in the Project area are:

4.1 Potential Impact Mechanism 1: Visual disturbance (vessel presence/operations)

The operation of survey vessels during subtidal and intertidal survey activities, together with human presence during intertidal surveys and the deployment of DDV and/or non-contact ROV equipment, has the potential to generate visual disturbance within the immediate vicinity of the surveys. The presence and movement of vessels may affect sensitive marine fauna, including marine mammals, through temporary behavioural responses such as avoidance or short-term displacement.

Visual disturbance associated with the proposed survey activities will arise from vessel movements and human presence. These activities are limited to the proposed intertidal and subtidal survey stations and transects and are small in spatial extent. Noise sources associated with the proposed site investigation surveys will be limited to vessel engines, vessel manoeuvring, and brief deployment and recovery of sampling equipment. This noise will be low-frequency and low-intensity, comparable to the existing background noise associated with routine vessel traffic in Dundalk Bay. Any noise-related effects would therefore be localised, short-term, and restricted to the duration of survey operations. Disturbance will be localised and temporary, with no mechanism by which effects could extend beyond the immediate footprint of the surveys.

For Annex IV species, including harbour porpoise, short-beaked common dolphin and bottlenose dolphin, visual disturbance may result in brief, low-level behavioural responses to vessel presence, vessel movement or DDV/ROV deployment. Any such responses are expected to be non-injurious, short-lived, and similar in nature to those elicited by routine vessel activity within Dundalk Bay. There is no plausible mechanism by which short-duration avoidance behaviour within the limited survey footprint could reduce foraging efficiency, alter movement patterns, or result in significant disturbance as defined under Article 12 of the Habitats Directive. Furthermore, given the shallow, highly tidal nature of the Inner Bay and its limited suitability for cetaceans, interaction with these species is expected to be infrequent overall.

Otter may occasionally use intertidal areas in the vicinity of shore-based piers or docks; however, individuals using these locations are likely to be habituated to regular human presence, given the ongoing maritime and port-related activities in the area. In addition, the localised nature of the proposed vessel-related surveys and intertidal survey activities, together with the daytime timing of survey activities, which avoids sensitive periods for otter, mean that no disturbance of ecological function or protected features is expected to occur. The

proposed site investigation surveys are also proportionate, short in duration, and targeted, ensuring that any potential disturbance is entirely reversible.

Physical disturbance associated with site activities will be further limited through the application of standard best-practice operational procedures, including careful vessel manoeuvring and adherence to established marine environmental protection measures. Vessels will follow predictable routes at regulated speeds consistent with existing activity in Dundalk Bay. While these measures further reduce the already low magnitude of disturbance, they are not required to avoid significant effects.

Based on the small and temporary footprint of the proposed Project, the localised nature of all potential interactions, and the existing baseline of fishing and commercial activity within Dundalk Bay, the proposed site investigation surveys will not result in injury, significant disturbance, or the deterioration or destruction of breeding or resting sites for any Annex IV species.

5. Risk Assessment

A number of Annex IV species and other protected marine fauna may occur in or near the Project site, either on a resident, transient, or occasional basis. These include the species listed in **Section 3**.

The potential for significant effects on these species from the proposed subtidal and intertidal site investigation surveys has been considered in relation to the potential impact mechanisms identified in Section 4, namely visual disturbance associated with survey vessels, human presence and DDV/ROV deployment, and low-level underwater noise associated with vessel operations, DDV/ROV deployment and brief sampling activities. Given the nature of Dundalk bay, is it largely unsuitable for regular use by cetacean species and the likelihood of a realise impact is low.

Given the temporary and brief nature of the surveys, the small and localised survey footprint, and the low-intensity nature of the activities, any effects would be limited to short-term, highly localised, and fully reversible behavioural responses (avoidance). Mobile species, such as harbour porpoise, short-beaked common dolphin, and bottlenose dolphin, are considered unlikely to enter the harbour area, and in the unlikely event that individuals were present in the wider bay during survey operations, they would be capable of readily avoiding the immediate survey area. There is no plausible mechanism by which the proposed activities could result in sustained disturbance, displacement from important habitat, or effects on key life-history functions for cetaceans.

More site-associated species, such as otter using the intertidal zone, may experience short-term disturbance or foraging disruption if the brief surveys overlap with feeding or commuting areas. However, based on the level of activity in Dundalk Bay, otters in the area are generally tolerant of localised human and vessel activity, and impacts are expected to be of low magnitude. Any interaction would be limited to brief, low-level disturbance, with no expected long-term effect on ecological function, breeding, or resting behaviour.

Taking into account the limited suitability of Dundalk Harbour for cetaceans, the small scale and short duration of the proposed surveys, and the existing baseline of maritime activity within the bay, the overall risk to Annex IV species is considered to be very low. The proposed site investigation surveys are not expected to result in injury, significant disturbance, or the deterioration or destruction of breeding or resting sites, and therefore will not contravene the strict protection provisions of Article 12 of the Habitats Directive. A summary of the Annex IV risk assessment is provided in **Table 5.1**.

Table 5.1: Annex IV Risk Assessment.

Species/Group	Visual Disturbance	Impact Assessment
Common dolphin	Low	Wide-ranging, highly mobile species. Dundalk Bay generally unsuitable to regular use by cetaceans. Individuals
Harbour porpoise	Low	Wide-ranging, highly mobile species. Dundalk Bay is generally unsuitable for regular use by cetaceans. Individuals may exhibit brief, localised avoidance of vessels if interaction occurs, but the effect would be temporary, fully reversible and not significant.
Bottlenose dolphin	Low	Wide-ranging, highly mobile species. Dundalk Bay is generally unsuitable to regular use by cetaceans, so any occurrence is expected to be occasional and transient. Individuals may exhibit brief, localised avoidance of vessels when interacting. If interaction occurs, it will readily return once activity ceases (<i>i.e.</i> , effects are fully reversible and not significant).
Killer whale	Negligible-Low	Wide-ranging, highly mobile species. Dundalk Bay generally unsuitable to regular use by cetaceans. May exhibit brief, localised avoidance of vessels if interaction occurs but will readily return once activity ceases.
Grey & harbour seals	Negligible -Low	No haul-outs or breeding sites within the survey area. Transient individuals may briefly avoid vessels or sampling points, but no population-level effects anticipated.
Larger whales (e.g. minke, fin, humpback)	Negligible –Low	Occasionally recorded further offshore. Dundalk Bay generally unsuitable to regular use by cetaceans; unlikely to overlap closely with survey area. No risk of sustained displacement or disturbance.
Basking shark	Low	Occasionally recorded in wider Irish coastal waters, but unlikely to overlap closely with survey area. May temporarily avoid areas of vessel activity, but effects are very localised and not significant.
Marine turtles	Negligible	Very rare inshore occurrence. No realistic pathway for exposure to survey impacts.
Otter	Low	May use intertidal and nearshore areas for foraging. Surveys have a very small, short-term footprint and utilise pre-existing piers and maritime infrastructure. Any disturbance would be minimal and would not affect commuting or breeding behaviour.
Bats	Negligible	The proposed surveys are confined to marine and intertidal environments; therefore, there is no pathway for effects on bats and no potential for disturbance or deterioration of breeding/resting sites.

6. Conclusion

This Annex IV Risk Assessment has considered the potential disturbance arising from the proposed subtidal and intertidal site investigation surveys. The assessment has been undertaken with reference to the sensitivities and ecological requirements of Annex IV species known or likely to use the area.

The survey activities are temporary, small in spatial extent and predominantly confined to the harbour area unsuitable for regular cetacean use. Furthermore, the Project area does not contain resting or breeding sites for any Annex IV species. Intertidal surveys at the harbour occupy a very limited footprint and do not overlap with suitable otter holt or couch habitat. Behavioural responses by cetaceans, if they occur, would be brief, localised and fully reversible. There is no mechanism for sustained displacement, reduced foraging success or any population-relevant effect.

Physical disturbance from sampling equipment will be limited to very small, discrete grab sampling locations. DDV and/or ROV surveys will be undertaken in a non-contact manner, and no construction, dredging, piling, drilling, geophysical survey or high-energy acoustic source will be used. The proposed activities will not result in habitat loss, deterioration of ecological functionality, or disruption of breeding or resting sites.

The proposed Project will not cause injury or significant disturbance to Annex IV species.

Based on the nature and scale of the proposed site investigation surveys, the mobility of the species concerned, and the limited spatial and temporal extent of potential disturbances, no deliberate capture, killing, significant disturbance or deterioration of breeding/resting sites of Annex IV species is predicted. The proposed Project therefore complies with the strict protection requirements of Article 12 of the Habitats Directive, and a derogation licence under Regulation 54 is not required.

7. References

- Anderwald, P., Haberlin, M.D., Coleman, M., Ó Cadhla, O., Englund, A., Visser, F., Cronin, M. (2012). Seasonal trends and spatial differences in marine mammal occurrence in Broadhaven Bay, north-west Ireland. *Journal of the Marine Biological Association of the United Kingdom*, 92(8), 1757–1766.
- Bailey, M. & Rochford, J. (2006). Otter Survey of Ireland 2004/2005. Irish Wildlife Manuals No. 23. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Berrow, S.D., Whooley, P., O’Connell, M. and Wall, D. (2010). Irish Cetacean Review (2000–2009). Irish Whale and Dolphin Group, 60pp.
- Berrow, S., O'Brien, J., Groth, L., Foley, A. and Voigt, K., 2012. Abundance estimate of bottlenose dolphins (*Tursiops truncatus*) in the Lower River Shannon candidate Special Area of Conservation, Ireland. *Aquatic Mammals*, 38(1), p.136.
- Berrow, S., Hickey, R., O'Connor, I. and McGrath, D., 2014. Density estimates of harbour porpoises *phocoena phocoena* at eight coastal sites in Ireland. In *Biology and Environment: Proceedings of the Royal Irish Academy* (Vol. 114, No. 1, pp. 19-34). Royal Irish Academy. Blázquez, M., Baker, I., O'Brien, J.M. and Berrow, S.D., 2020. Population viability analysis and comparison of two monitoring strategies for bottlenose dolphins (*Tursiops truncatus*) in the Shannon Estuary, Ireland, to inform management. *Aquatic Mammals*, 46(3).
- Buckstaff, K.C. (2004). Effects of watercraft noise on the acoustic behaviour of bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida. *Marine Mammal Science*, 20, 709-725.
- Buckstaff, K.C. (2004). Effects of watercraft noise on the acoustic behaviour of bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida. *Marine Mammal Science*, 20, 709-725.
- Cañadas, A., Donovan, G.P., Desportes, G. & Borchers, D.L. (2009). A short review of the distribution of short beaked common dolphins (*Delphinus delphis*) in the central and eastern North Atlantic with an abundance estimate for part of this area. North Atlantic Sightings Surveys. *NAMMCO Scientific Publications*, 7, 201–220.
- Clarke, M., Farrell, E.D., Roche, W., Murray, T.E., Marnell, F. (2016). Red List No. 11 Cartilaginous fish (sharks, skates, rays and chimaeras). NPWS.
- Chapman, P.J. & Chapman, L.L. (1982). Otter survey of Ireland 1980-81. The Vincent Wildlife Trust, London.

- Cronin, M., Duck, C., Ó Cadhla, O., Nairn, R., Strong, D., O’Keeffe, C. (2007). An assessment of population size and distribution of harbour seals in the Republic of Ireland during the moult season in August 2003. *Journal of Zoology*, 273, 131–139.
- Cooke, J.G. (2018). *Balaenoptera acutorostrata*. The IUCN Red List of Threatened Species 2018: e.T2474A50348265. <https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T2474A50348265.en>. Accessed: 19/08/2025.
- DAHG. (2014). Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters.
- Doherty, P.D., Baxter, J.M, Gell, F.R, Godley, B.J, Graham, R.T., Hall, G., Hall, J., Hawkes, L.A., Henderson, S.M., Johnson, L., Speedie, C. and Witt, M.J. (2017). Long-term satellite tracking reveals variable seasonal migration strategies of basking sharks in the north-east Atlantic. *Scientific Reports*, 7, 42837.
- Dolton, H., Gell, F., Hall, J., Hall, G., Hawkes, L. and Witt, M.J. (2019). Assessing the importance of Isle of Man waters for the basking shark *Cetorhinus maximus*. *Endangered Species Research*, 41, 209-223.
- EC (2021) Guidance document on the strict protection of animal species of Community interest under the Habitats Directive. Commission Notice.
- eOceanic. (2025). Louth Havens. See ‘Dundalk’ and ‘Giles Quay’ accessed 16/01/2026 from <https://eoceanic.com/sailing/harbours/europe/ireland/louth/>
- Field, M. S. (2005). Assessing aquatic ecotoxicological risks associated with fluorescent dyes used for water-tracing studies. *Environmental & Engineering Geoscience*, 11(4), 295-308.
- Ghoul, A., & Reichmuth, C. (2014). Hearing in the sea otter (*Enhydra lutris*): auditory profiles for an amphibious marine carnivore. *Journal of Comparative Physiology A*, 200, 967-981.
- Gilles, A, Authier, M, Ramirez-Martinez, NC, Araújo, H, Blanchard, A, Carlström, J, Eira, C, Dorémus, G, FernándezMaldonado, C, Geelhoed, SCV, Kyhn, L, Laran, S, Nachtsheim, D, Panigada, S, Pigeault, R, Sequeira, M, Sveegaard, S, Taylor, NL, Owen, K, Saavedra, C, Vázquez-Bonales, JA, Unger, B, Hammond, PS (2023). Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys. Final report published 29 September 2023. 64 pp
- Gutleb, A.C. & Kranz, A. (1998). Estimation of polychlorinated biphenyl (PCB) levels in livers of the otter (*Lutra lutra*) from concentrations in scats and fish. *Water, Air, and Soil Pollution*, 106, 481-491.

- Hammond, P.S., Berggren, P., Benke, H., Borchers, D.L., Collet, A., Heide-Jørgensen, M. P., Heimlich, S., Hiby, A.R., Leopold, M.F., Øien, N., (2002). Abundance of harbour porpoise and other cetaceans in the North Sea and adjacent waters. *Journal of Applied Ecology*, 39, 361–376.
- Hammond, P.S. Macleod, K., Berggren, P., Borchers, D.L., Burt, L., Cañadas, A., Desportes, G., Donovan, G.P., Gilles, A., Gillespie, D., Gordon, J., Hiby, L., Kuklik, I., Leaper, R., Lehnert, K., Leopold, M., Lovell, P., Øien, N., Paxton, C.G.M., Ridoux, V., Rogan, E., Samarra, F., Scheidat, M., Sequeira, M., Siebert, U., Skov, H., Swift, R., Tasker, M.L., Teilmann, J., Van Canneyt, O., Vázquez, J.A. (2013). Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management. *Biological Conservation*, 164, 107 – 122.
- Houghton, J. D. R., T. K. Doyle, M. W. Wilson, J. Davenport, and G. C. Hays. (2006). Jellyfish aggregations and leatherback turtle foraging patterns in a temperate coastal environment. *Ecology*, 87(8), 1967–1972.
- Ingram, S., Kavanagh, A., Englund, A. and Rogan, E. (2009). Site assessment of the waters of northwest Connemara. A survey of bottlenose dolphins (*Tursiops truncatus*). Report for the National Parks and Wildlife Service of Ireland. University College Cork.
- Irish Basking Shark Group. (2024, May 31). *On the record 2024 shark season* [Blog post]. Irish Basking Shark Group. Retrieved August 6, 2025, from <https://www.baskingshark.ie/post/on-the-record-2024-shark-season>
- IWDG (Irish Whale and Dolphin Group). (2015). Minke Whale. Available from: IWDG - Irish Whale and Dolphin Group Accessed 18 August 2025.
- IWDG. (2024). Whale (& basking shark) Watch Ireland 2024, Sat. 18th May. Accessed 06/01/2025 from [Whale \(& basking shark\) Watch Ireland 2024, Sat. 18th May | Irish Whale and Dolphin Group](#)
- IWDG. (2026). Accessed 19/01/2026 retrieved from <https://iwdg.ie/killer-whale/>
- JNCC, NE and CCW. (2010). The protection of marine EPS from injury and disturbance. Guidance for the marine area in England and Wales and the UK offshore marine area.
- King, G. & Berrow, S. (2009). Marine turtles in Irish waters Special Supplement 2009. *Irish Naturalists' Journal*, 1-30.
- Laist, D.W., Knowlton, A.R., Mead, J.G., Collet, A.S. and Podesta, M. (2001). Collisions between ships and whales. *Marine Mammal Science*, 17, 35-75.
- Lélias, M.L., Lemasson, A. and Lodé, T., 2021. Social organization of otters in relation to their ecology. *Biological Journal of the Linnean Society*, 133(1), pp.1-27.

- Lemarchand, C., Rosoux, R. & Berny, P. (2011). Ecotoxicology of the Eurasian Otter (*Lutra lutra*) along Loire River (France) and Predictable Trends due to Global Change. *Proceedings of XIth International Otter Colloquium, IUCN Otter Specialist Group Bulletin, 28B*, 5 – 14.
- Leppakoski, E., Gollasch, S., & Olenin, S. (2002). Invasive aquatic species of Europe - Distribution, impacts and management. Kluwer Academic Publishers.
- Leung Ng, S. & Leung, S. (2003). Behavioural response of Indo-Pacific humpback dolphin (*Sousa chinensis*) to vessel traffic. *Marine Environmental Research, 56*, 555-567.
- Lieber, L., Hall, G., Hall, J., Berrow, S., Johnston, E. Gubili, C., Sarginson, J., Francis, M., Duffy, C., Wintner, S., Doherty, P., Godley, B., Hawkes, L., Witt, M., Henderson, S., de Sabata, E., Shivji, M., Dawson, D., Sims, D. and Noble, L. (2020). Spatio-temporal genetic tagging of a cosmopolitan planktivorous shark provides insight to gene flow, temporal variation and site-specific re-encounters. *Scientific Reports, 10*, 1661.
- Loy, A., Kranz, A., Oleynikov, A., Roos, A., Savage, M. & Duplaix, N. 2022. *Lutra lutra* (amended version of 2021 assessment). *The IUCN Red List of Threatened Species 2022*: e.T12419A218069689. <https://dx.doi.org/10.2305/IUCN.UK.2022-2.RLTS.T12419A218069689.en>. Accessed on 21 August 2025.
- Lundy, M.G., Aughney, T., Montgomery, W.I., & Roche, N., (2011) Landscape conservation for Irish bats & species specific roosting characteristics. Bat Conservation Ireland.
- Morris, C.D. & Duck, C.D. (2019). Aerial thermal-imaging survey of seals in Ireland, 2017 to 2018. Irish Wildlife Manuals, No. 111 National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.
- Murphy, S., Pinn, E. H., & Jepson, P. D. (2013). The short-beaked common dolphin (*Delphinus delphis*) in the North-East Atlantic: distribution, ecology, management and conservation status. *Oceanography and Marine Biology: An Annual Review, 51*, 123–280.
- NBDC. (2025). All abovementioned species have been accessed through biodiversity maps. Retrieved 30/12/2025 from <https://maps.biodiversityireland.ie/Map>
- National Marine Fisheries Service (NMFS). (2024). *2024 update to: Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (Version 3.0): Underwater and in-air criteria for onset of auditory injury and temporary threshold shifts* (NOAA Technical Memorandum NMFS-OPR-71). U.S. Department of Commerce, National Oceanic and Atmospheric Administration.
- NPWS. (2009). Threat Response Plan - Otter (*Lutra lutra*) 2009-2011.

- Nykänen, M., Ingram, S. & Rogan, E. (2015). Abundance, distribution and habitat use of Bottlenose dolphins in the west and north-west of Ireland. Final Report to the National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht. University College Cork. 31pp.
- O'Brien, J., Berrow, S., McGrath, D. and Evans, P., 2009. Cetaceans in Irish waters: A review of recent research. In *Biology and Environment: Proceedings of the Royal Irish Academy* (Vol. 109, No. 2, pp. 63-88). Royal Irish Academy.
- Ó Néill L. (2008) Population dynamics of the Eurasian otter in Ireland. Integrating density and demography into conservation planning. Ph.D. thesis. Trinity College, Dublin.
- OPR. (2021) Appropriate Assessment Screening for Development Management. Practice Note PN01. Office of the Planning Regulator.
- Parker, G. G. (1973). Tests of Rhodamine WT dye for toxicity to oysters and fish. *Journal of Research US Geological Survey*, 1(4), 499.
- Parker, H. W. & Boseman, M. (1954). The Basking Shark, *Cetorhinus maximus*, in winter. *Proceedings of Zoological Society of London*, 124, 185–194.
- Reid, J.B., Evans, P.G.H. & Northridge, S.P. (2003). Atlas of Cetacean Distribution in North-West European Waters. Peterborough, UK: Joint Nature Conservation Committee.
- Reid, N., Hayden, B., Lundy, M.G., Pietravallo, S., McDonald, R.A. & Montgomery, W.I. (2013a). National Otter Survey of Ireland 2010/12. Irish Wildlife Manuals No. 76. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- Reid, N., Lundy, M.G., Hayden, B., Lynn, D., Marnell, F., McDonald, R.A. & Montgomery, W.I. (2013b). Detecting detectability: identifying and correcting bias in binary wildlife surveys demonstrates their potential impact on conservation assessments. *European Journal of Wildlife Research*, 59(6).
- Reid, N., Dingerkus, K., Stone, R., Colhoun, K., Maddox, L. & Marnell, F. (2025). Otter Survey of Ireland 2023-24. Irish Wildlife Manuals, No. 161. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.
- Rogan, E., Garagouni, M., Nykänen, M., Whitaker, A. and Ingram, S., 2018. Bottlenose dolphin survey in the Lower River Shannon SAC, 2018. *Report to the National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht. University College Cork. 19pp. Cover image: A group of bottlenose dolphins in the outer Shannon Estuary© DCHG, p.2.*

- Sims, D.W. (2008). Sieving a living: a review of the biology, ecology and conservation status of the plankton-feeding basking shark *Cetorhinus maximus*. *Advances in Marine Biology* 54, 171-220.
- Sims, D.W. and Quayle, V.A. (1998). Selective foraging behaviour of basking sharks on zooplankton in a small-scale front. *Nature*, 393, 460-464.
- Sini, M.I., Canning, S.J., Stockin, K.A. & Pierce, G.J. (2005). Bottlenose dolphins around Aberdeen harbour, northeast Scotland: a short study of habitat utilization and the potential effects of boat traffic. *Journal of the Marine Biological Association of the UK*, 85, 1547-1544.
- Southall, B. L., Bowles, A. E., Ellison, W. T., Finneran, J. J., Gentry, R. L., Greene., C. R. Jr., Kastak, D., Ketten, D. R., Miller, J. H., Nachtigall, P. E., Richardson, W. J., Thomas, J. A., and Tyack, P. L. (2007). Marine mammal noise exposure criteria: Initial scientific recommendations. *Aquatic Mammals*, 33(4), 411-521.
- Skjolding, L. M., Dyhr, K. S., Köppl, C. J., McKnight, U. S., Bauer-Gottwein, P., Mayer, P., Bjerg, L. & Baun, A. (2021). Assessing the aquatic toxicity and environmental safety of tracer compounds Rhodamine B and Rhodamine WT. *Water Research*, 197, 117109.
- Southall, B.L., Finneran, J.J., Reichmuth, C., Nachtigall, P.E., Ketten, D.R., Bowles, A.E., Ellison, W.T., Nowacek, D.P. and Tyack, P.L. (2019). Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. *Aquatic Mammals*, 45(2), 125-232.
- Todd, N.R.E., Cronin, M., Luck, C., Bennison, A., Jessopp, M. and Kavanagh, A.S. (2020). Using passive acoustic monitoring to investigate the occurrence of cetaceans in a protected marine area in northwest Ireland. *Estuarine Coastal and Shelf Science*, 232, 106-509.
- Tolrà, A., Ruiz-Olmo, J. and Riera, J.L., 2024. Human disturbance and habitat structure drive eurasian otter habitat selection in heavily anthropized river basins. *Biodiversity and Conservation*, 33(5), pp.1683-1710.
- Van Waerebeek, K., Baker, A.N., Félix, F., Gedamke, J., Iñiguez, M., Sanino, G.P., Secchi, E., Sutaria, D., van Helden, A. and Wang, Y. (2007). Vessel collisions with small cetaceans worldwide and with large whales in the Southern Hemisphere, an initial assessment. *Latin American Journal of Aquatic Mammals*, 6(1), 43-69.
- Wall, D., Murray, C., O'Brien, J., Kavanagh, L., Wilson, C., Ryan, C., Glanville, B., Williams, D., Enlander, I., O'Connor, I., McGrath, D., Whooley, P. and Berrow, S. (2013). Atlas of the distribution and relative abundance of marine mammals in Irish offshore waters 2005 - 2011. Irish Whale and Dolphin Group, Kilrush, Co. Clare. 63pp.

- Weilgart, L.S. (2007). The impacts of anthropogenic ocean noise on cetaceans and implications for management. *Canadian Journal of Zoology*, 85, 1091 – 1116.
- Wells, R.S., Scott, M.D. (2009). Encyclopaedia of Marine Mammals: Common Bottlenose Dolphin *Tursiops truncatus*. In Encyclopaedia of Marine Mammals Second Edition. (Perrin, W.F., Würsig, B., Thewissen, J.G.M, eds) Academic press. ISBN: 978-0-12-373553-9, 249-250.
- Wells, R.S., Natoli, A. and Braulik, G. (2019). *Tursiops truncatus* (errata version published in 2019). The IUCN Red List of Threatened Species. 2019: e.T22563A156932432.
- Wright, A.J., Aguilar Soto, N., Baldwin, A.L., Bateson, M., Beale, C., Clark, C., Deak, T., Edwards, E.F., Fernández Rodríguez, A., Godinho, A., Hatch, L., Kakuschke, A., Lusseau, D., Martineau, D., Romero, L.M., Weilgart, L., Wintle, B., Notarbartolo di Sciara, G. Martin, V. (2007). Do marine mammals experience stress related to anthropogenic noise? *International Journal of Comparative Psychology*, 20, 274-316.