Proposed Installation of Meteorological Stations, Deployment of Tide and Flow Gauges, Bed-mounted Current Meters and Utilisation of Drones and a Remotely Controlled Boat (ARCBoat) in Newport Bay and Clew Bay, Co. Mayo.

Risk Assessment for Annex IV Species

Produced by

AQUAFACT

On behalf of

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AQUAFACT – APEM Group,

[redacted]

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1. Introduction

1.1. Background

This report has been prepared by AQUAFACT – APEM Group to provide the relevant information to the competent authority to inform the Risk Assessment for Annex IV Species for a Maritime Usage Licence. The MUL is being submitted for the proposed installation of meteorological stations and pontoons, deployment of tide and flow gauges, current meters, utilisation of drones and a remotely controlled boat (ARCBoat) at Newport Bay and Clew Bay, Co. Mayo (the 'Project'). The objective of the Project is to obtain environmental data within Newport Bay and Clew Bay areas to inform detailed modelling of the hydrographic conditions of the area, to ultimately inform the outfall discharge location for a proposed new Wastewater Treatment Plant (WwTP) to serve the Newport agglomeration in County Mayo. The locations of the meteorological (weather) station installation, current meter deployments and tide and flow gauge deployments are shown in **Figure 1-1**. The aerial and hydro drone survey extent for Light Detection and Ranging (LiDAR), Multi Beam Echo Sounder (MBES), microbial and dye tracing surveys will occur within the red line boundary shown in **Figure 1-2** with sampling points for water quality surveys in **Figure 1-3** and **Figure 1-4**.

MBES surveys will be carried out in areas where the seabed will not dry entirely, to complement the LiDAR dataset. The collection of samples for water quality analysis will include additional *E. coli* and intestinal coliforms sampling, upstream of the tidal limit of the Newport River. Depending on access availability, either an automatic sampler will be deployed to collect water samples or manual sampling may occur. In addition to deploying a drone for dye tracing, a hydro-drone will be deployed with a mounted GPS system to monitor the concentration of the dye plume *in situ*, its development and variation over time. Temperature and salinity sensors will be included in bed-mounted current meters.

The aims of the Project can be summarised as follows:

The proposed marine surveys are required as part of data collection to provide quantitative inputs for a hydrodynamic model which is required to profile Clew, Newport and Westport Bay to aid the selection of a new discharge outfall for a proposed wastewater treatment plant for the settlement of Newport. The principal objective of the marine surveys is to help ensure robust assessments can be completed for the design of a new wastewater treatment plant which provides treated discharges in compliance with the Urban Waste Water Treatment Directive and with the conditions set in the extant Waste Water Discharge Authorisation licence.

The benefits resulting from the completion of the Project would include:

- In-depth understanding of hydrographic conditions and water quality within Newport Bay and Clew Bay.
- Validate pre-existing datasets and provide the necessary dataset to conduct detailed modelling and highlight data gaps to be addressed to aid development of WwTP.

1.2. Proposed Works and Duration of the Project

The works proposed for this Project include:

- Installation of 2no. weather stations to aid validation of data
- Installation of 6no. tidal gauges
- Installation of 5no. acoustic doppler current profiler (ADCPs) with vertical profiles and conductivity, temperature, and depth (CTD) device
- Installation of 4no. river flow and stage gauges
- Deployment of a drone to conduct a Light Detection and Ranging (LiDAR) survey to establish bathymetry of site
- Deployment of Multi Beam Echo Sounder (MBES) to complement the LiDAR dataset
- Deployment of an ARCBoat or installation of 8no pontoons mounted to Buoys which will be temporarily anchored to aid water sample collection
- Deployment of drone and hydro-drone to conduct dye and microbial tracing survey to understand dispersion pattern of effluent and to aid conceptual model calibration and verification processes under different conditions
- Water quality sampling within the bay and rivers
- Maintenance of the tidal and flow gauges, weather stations at site
- Decommissioning/removal of all surveying equipment at the end of the survey period

The marine surveys are not seasonally constrained, as spring and neap tides occur bi-monthly. The current gauge, tide meter and CTDs (conductivity, temperature, depth profiler) will be deployed for a minimum period of 35 days (up to 12 weeks dependent upon weather conditions) to cover spring and neap tides. The marine survey equipment is either drone operated, or comprises floating instrumentation deployed from a boat.

The programme for collecting data on meteorological conditions, river and tidal levels and water quality will take place for a period of 12 months.

The licence is sought for a period of five years to enable works to be scheduled and completed in favourable weather conditions. The commencement of the surveying will be dependent upon the issuing of the maritime usage licence.

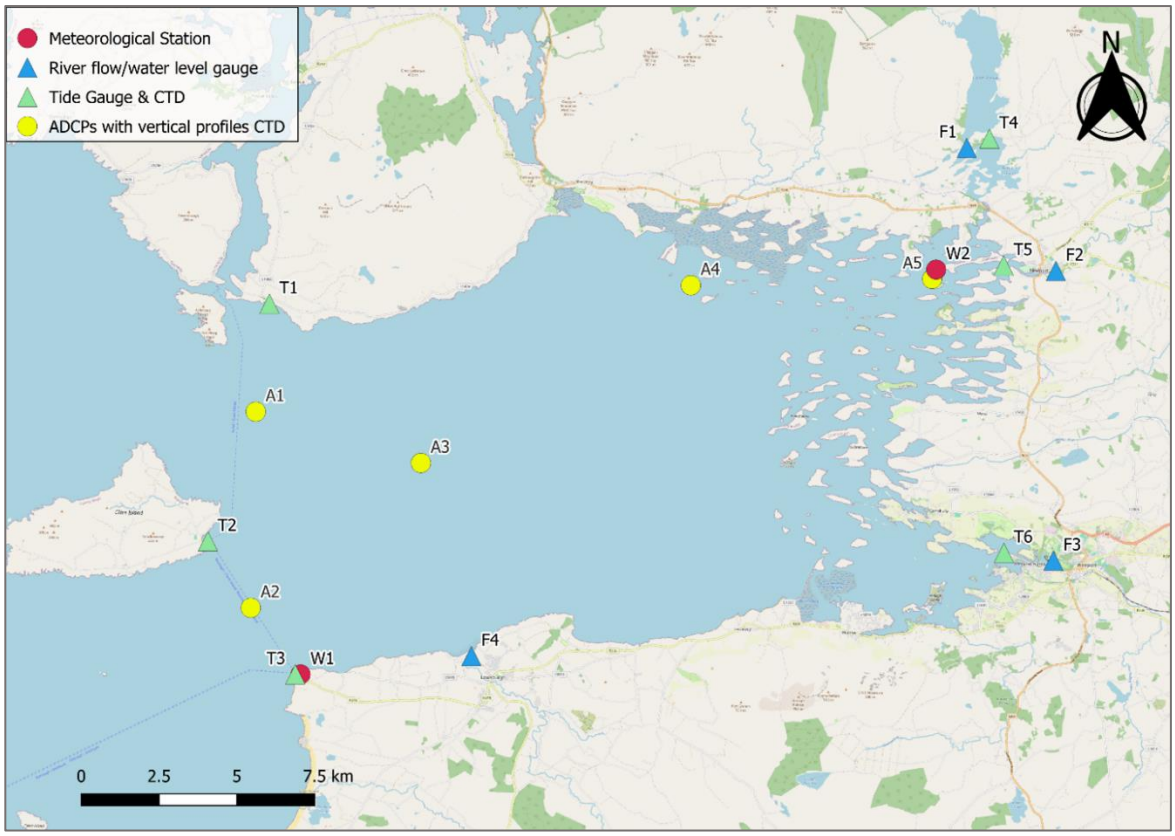

Figure 1-1: Proposed survey locations for hydrodynamic data in the Newport and Clew Bay area.

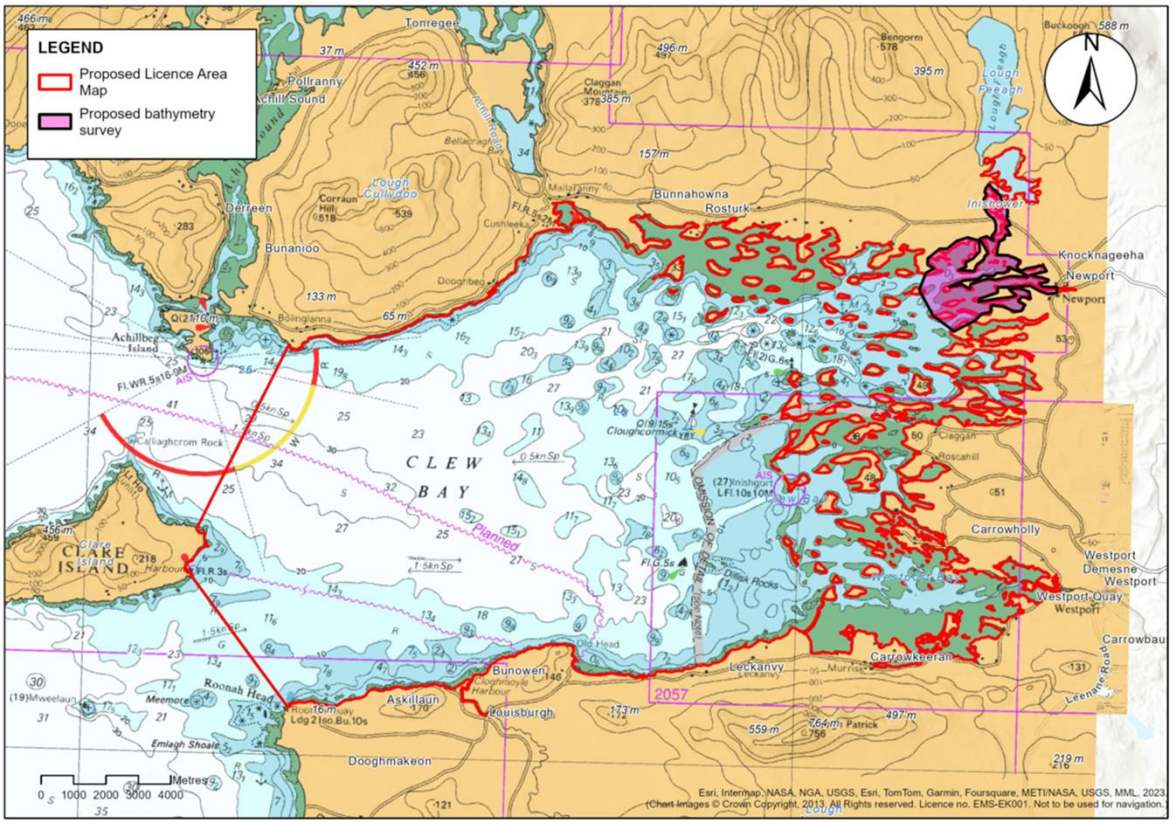

Figure 1-2: Proposed extent for bathymetric and for water quality surveys in Clew Bay.

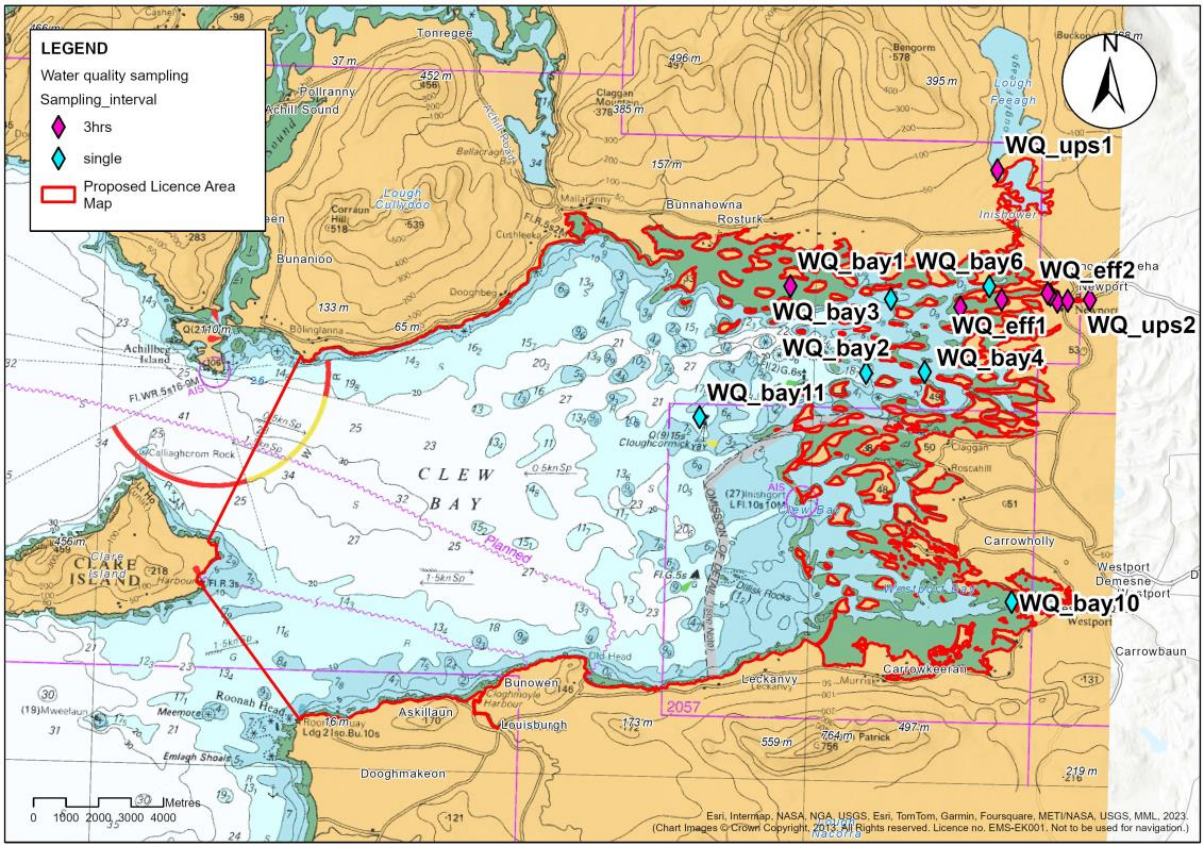

Figure 1-3: Proposed sampling points for water quality in Clew Bay.

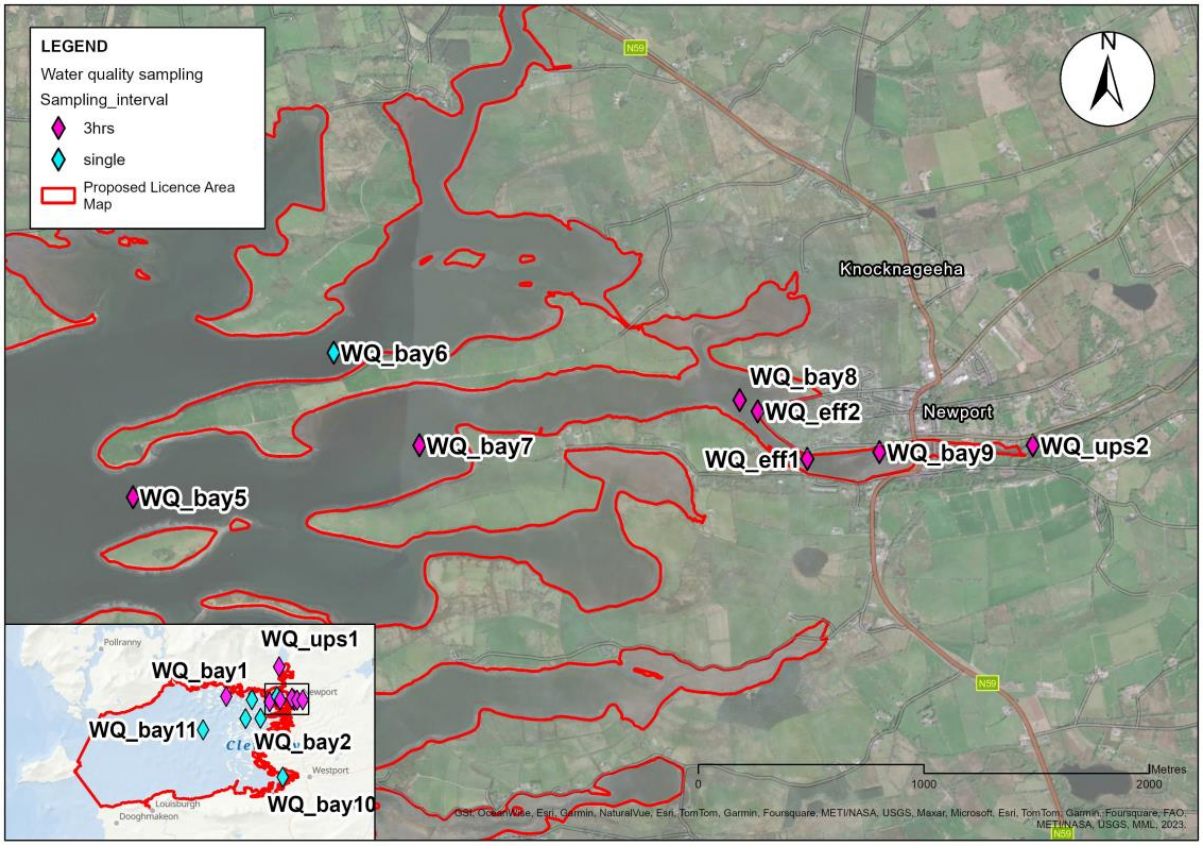

Figure 1-4: Close up of proposed sampling points for water quality in inner Clew Bay.

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 area of 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).

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 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 Law[1]. 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. Article 12 of the Habitats Directive, under Regulation 51 of the 2011 Birds and Natural Habitats Regulations states:

[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.

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:

- DAHG (2014) Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters.
- EC (2021) Guidance document on the strict protection of animal species of Community interest under the Habitats Directive. Commission Notice (2021) and
- 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 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,
- Site Synopsis, Conservation Objective Reports and Natura 2000 Forms available from NPWS,
- Published and unpublished NPWS reports on protected habitats and species including Irish Wildlife Manual reports, Species Action Plans, and Conservation Management Plans and
- 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

All cetacean species are listed under Annex IV of the Habitats Directive, which makes them strictly protected in Ireland. To this day, 25 species of cetaceans have been recorded in Irish waters, ranging from resident species such as bottlenose dolphins located in the Shannon Estuary Co. Clare, to migratory species such as humpbacks and fin whales recorded in the south and southwest coast of Ireland. Data available[2] have shown high density hotspots for delphinid species such as bottlenose dolphins, common dolphins and white-beaked dolphins during the Spring and Summer seasons, in the vicinity of the Project area. Other cetaceans recorded around the Project area include Risso's dolphins and harbour porpoises. Due to the location of the Project area, it is very unlikely to have deep diving species (*e.g.* sperm whales) within the Project area.

Following the Newport Clew Marine Survey Scope Supporting Information for Screening for Appropriate Assessment (herein referred to as Newport Clew MSS SISAA), the zone of impact (Zol) is 15km of the proposed project. A key factor to establish the Zol is the assessment of connectivity between the project impact mechanisms (source) and the conservation features. Within the Zol of the proposed project, there are four SACs with Annex IV animal species as conservation features:

- West Connacht Coast SAC (Site code: 002998) (<0.1km from the Project area) - Common Bottlenose Dolphin (*Tursiops truncatus*) [1349] and Harbour porpoise (*Phocoena phocena*) [1351].
- Clew Bay Complex SAC (Site code: 001482) (within the Project area) – Otter (*Lutra lutra*) [1355].
- Mweelrea/Sheeffry/Erriff Complex SAC (Site code: 001932) (7.2km south of Project area)– Otter (*Lutra lutra*) [1355].
- Owenduff/Nephin Complex SAC (Site code: 00534) (4.5km north of Project area)– Otter (*Lutra lutra*) [1355].

[2] Identifying Potential MCZ's in Ireland's EEZ (arcgis.com) (Accessed:02/05/2024)

Overview of the Annex IV species distribution and abundance estimations are summarised in **Section 3.1** through **Section 3.4**, while **Section 3.5** provides a brief summary of other (non-Annex IV) species**.**

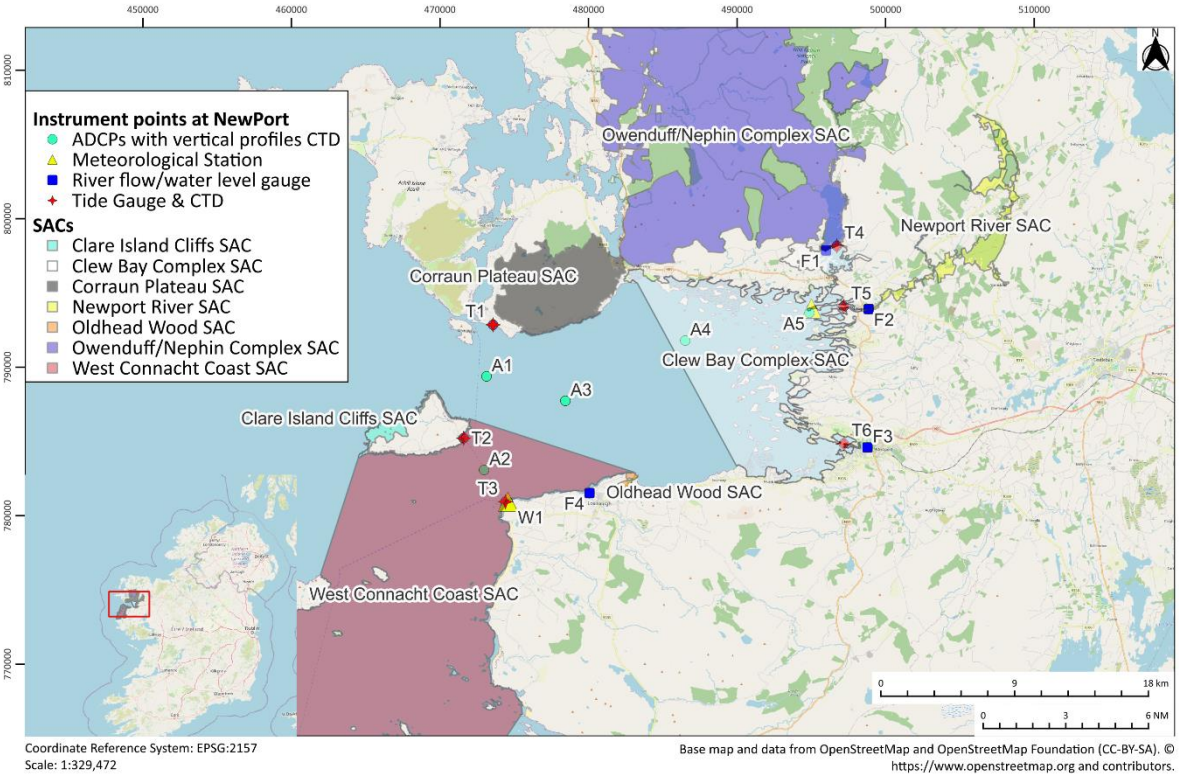

Figure 3-1: Distribution of the SACs within the Zone of Impact (ZoI).

3.1. Common bottlenose dolphin (Tursiops truncatus)

Bottlenose dolphins are one of the most studied delphinid species and are widely distributed in both temperate and tropical marine waters worldwide (Wells and Scott, 2009). This species is strictly protected under Annex II and IV of the Habitats Directive, thus requiring Member States to designate SACs for their protection, with twelve SACs designated for this QI in Ireland.

One of the SACs is located within the Project area: West Connacht Coast SAC. This European site is comprised of a range of shallow marine habitats, including shallow coastal bays, areas of steep seafloor topography and complex areas of strong current flow, which are important hydrographic features for bottlenose dolphins (NPWS, 2014). The bottlenose dolphin population in the West Connacht Coast SAC is designated as resident within the SAC, with sightings of known individuals through the years showing site fidelity. Multiple groups of dolphins were also recorded in the Mullet Peninsula and outlying islands, outer Clew Bay, Clare Island, Roonagh, outer Killary Harbour, Ballynakill Harbour and west Connemara (NPWS, 2014). Previous studies by Mirimin *et al.* (2011) and Nykänen *et al*. (2015) have shown a genetically distinct aggregation in the Connemara-Mayo region, which has also been shown for the Shannon Estuary region in Co. Clare.

In a study in 2005, Small Cetaceans in the European Atlantic and North Sea project (SCANS-II) carried out shipboard and aerial surveys to estimate cetacean abundance in the continental shelf waters in the Northeast Atlantic. A total abundance of 313 individuals (CV = 0.81) was calculated around the coast of Ireland (Hammond *et al.,* 2013). The first attempt to assess the abundance estimates of bottlenose dolphins in the north-west coast of Ireland was by Ingram *et al.* (2009) which estimated a total of 171 ± 48 (CV = 0.28, 95% CI = 100 - 294), however surveys were restricted to north of Slyne Head, Connemara. Ingram *et al.* (2009) also stated that animals recorded in this study were present beyond the survey area, with sightings around Youghal, Co. Cork and in Co. Donegal. Local abundance estimates were calculated for bottlenose dolphins in north-west Connemara by Nykänen *et al.* (2015), during the summer months of 2013 and 2014, and can be seen in the following table:

Table 3.1: Model averaged Bayesian multi-site estimates and maximum likelihood-based local M_{th} estimates of bottlenose dolphin abundance, extracted from Table 6. in Nykänen *et al.* (2015).
(a) One encounter in Killala Bay has been included with the encounters in Donegal.
***Median given in the Bayesian multi-site estimates, local M_{th} estimates are averages.**

Method	Area	Year	Total Abundance	(Confidence Intervals) CI 95%	CV (Coefficient Variation)	Θ
Multi-site	Connemara-Mullet Peninsula-Donegal	2013	145*	111-239	0.30	0.55
Multi-site	Connemara-Mullet Peninsula-Donegal(a)	2014	189*	162-232	0.11	0.57
Local (M_{th})	Connemara	2013	56	34-90	0.25	0.63
Local (M_{th})	Connemara	2014	83	49-140	0.27	0.56
Local (M_{th})	Donegal	2014	143	113-181	0.12	0.63

3.2. 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 of the Habitats Directive, thus requiring Member States to designate SACs for their protection. There are sixteen SACs designated for harbour porpoises: Blasket Islands SAC (Site code: 002172), Roaringwater Bay and Islands SAC (Site code: 000101) and Rockabill to Dalkey Island SAC (Site code: 003000). Additionally, Broadhaven Bay located in the northwest of Ireland, was also identified has a site of high diversity for cetacean species, including harbour porpoises, with the longest marine mammal monitoring programme in Ireland (Anderwald *et al.*, 2012; Todd *et al.,* 2020).

Previous studies have assessed the density and abundance of harbour porpoises in Irish waters. Berrow *et al.* (2014) surveyed eight sites around the east, south and west coast of Ireland, and calculated density, abundance, and group size for this species, which can be seen in **Table 3.2**.

Table 3.2: Overall mean density and abundance estimates of harbour porpoises, extracted from Table 3. in Berrow *et al.* (2014).
N – Abundance; CI – Confidence Intervals; SE – Standard Error; CV – Coefficient Variation.

Site	N (95 % CI)	SE	CV	Density (km^{-2})	Mean group size (95 % CI)
North County Dublin	211 (137 - 327)	47.1	0.22	2.03	1.41 (1.26 - 1.56)
Dublin Bay	138 (86 - 221)	33.2	0.24	1.19	1.22 (1.11 - 1.34)
Carnsore Point	87 (39 - 196)	36.3	0.42	0.58	1.91 (1.25 - 2.92)
Cork Coast	173 (92 - 326)	56.6	0.33	0.53	2.67 (1.96 - 3.64)
Roaringwater Bay	159 (95 - 689)	42.4	0.27	1.24	2.21 (1.85 - 2.64)
Blasket Islands	372 (216 - 647)	105.3	0.28	1.65	1.76 (1.50 - 2.07)
Galway Bay	402 (267 - 605)	84.1	0.21	0.73	2.15 (1.84 - 2.51)
Donegal Bay	249 (106 - 586)	111.5	0.45	0.88	2.40 (1.63 - 3.53)

3.3. 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 requiring Member States to designate SACs for their protection. Otters have also been designated as species of conservation concern and high priority, due to a major decline in numbers as a result of alterations in water quality chemistry (eutrophication) in river and estuaries habitats, habitat destruction, and introduction of alien invasive species (Reid *et al*., 2013a; Gutleb & Kranz, 1998; Leppakoski *et al.,* 2002). Consequently, otters have been designated as 'sentinel species' for the dynamics and diversity of pesticides in aquatic food webs (Reid *et al*., 2013a; Lemarchand *et al.,* 2011).

In Ireland, there are 44 SACs 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, three SACs include otters as a QI: Clew Bay SAC, Mweelrea/Sheeffry/Erriff SAC and Owenduff/Nephin SAC. All these European sites consist of river and lake habitats which are suited for breeding. Ó Néill (2008) calculated estimates of otters during 1981 to 1982 based on species incidence from Chapman & Chapman (1982). Reid *et al.* (2013a) compared these estimates with estimates based on Reid *et al.* (2013b), which can be seen in the following **Table 3.3**:

Table 3.3: Otter estimates for the coastline of Ireland, based on Table 17. of Reid *et al*. (2013a).
***Population extimates were cumulative population within 44 SACs where otters were a designated feature and not from all SACs.**

Country	River Basin District	Population estimates		
		1981-1982	2010-2011	
		Total	Otter SACs*	Total
Republic of Ireland	Eastern	552 [497 - 684]	30 [29 - 40]	585 [556 - 742]
	Neagh Bann	121 [107 - 153]		223 [206 - 274]
	North Western	927 [850 - 1106]	153 [146 - 189]	1069 [1015 - 1316]
	Shannon	1515 [1401 - 1779]	199 [186 - 267]	1644 [1531 - 2200]
	South Eastern	1024 [918 - 1295]	106 [99 - 146]	1153 [1081 - 1593]
	South Western	1204 [1121 - 1384]	210 [199 - 266]	1311 [1158 - 1660]
	Western	1784 [1664 - 2073]	411 [379 - 545]	1809 [1671 - 2401]

3.4. Other Annex IV Species

Other marine mammal species under Annex IV of the Habitats Directive include:

- Short-beaked common dolphin (*Delphinus delphis*)
- Leatherback turtle (*Dermochelys coriacea*)
- Loggerhead turtle (*Caretta caretta*)

These species are not listed as QIs for any of the SACs located in the Zol, however, they are known for their foraging range which makes them a potential species to occur in the Project area.

3.4.1. 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 continental shelf and offshore waters (Murphy *et al.,* 2013). 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 (m) (Cañadas *et al.* 2009). Cañadas *et al.,* (2009) also calculated an average group size of 15 ± 2.2 individuals (± standard error, SE; 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 the 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. Estimates of group abundance, mean group size, animal abundance and animal density (individuals km^{-2})

for common dolphins calculated from SCANS-II for July 2005, around the south and west coast of Ireland (referred to as block R in Hammond *et al.* 2013) can be seen in **Table 3.4**.

Table 3.4: Estimates of common dolphin abundance, extracted from Table 7. in Hammond *et al.* (2013). Note: Aerial survey estimates are corrected for availability bias but not for perception bias.

Block	Group abundance		Mean group size		Animal abundance		Animal density	
	Estimate	CV	Estimate	CV	Estimate	CV	Estimate	CV
B	378	0.73	13.00	0.36	4919	0.82	0.040	0.82
N	1256	0.58	1.75	0.14	2199	0.60	0.072	0.60
O	375	0.69	2.20	0.36	826	0.78	0.018	0.78
P	1058	0.33	11.60	0.30	15957	0.31	0.081	0.31
Q	558	0.98	3.08	0.32	2230	0.87	0.015	0.87
R	1266	0.70	9.21	0.19	11661	0.73	0.302	0.73
W	1470	0.29	12.30	0.27	18039	0.23	0.130	0.23
Z	314	0.84	1.25	0.20	392	0.86	0.012	0.86

3.4.2. Leatherback turtle (*Dermochelys coriacea*)

Leatherback turtle is the most frequently sighted marine turtle species in Irish waters (King & Berrow, 2009), with a wide distribution throughout temperate waters during summer and autumn (Houghton *et al.*, 2006). This species is strictly protected under Annex II and IV of the Habitats Directive, thus requires Member States to designate SACs for their protection, however there are no SACs designated for leatherback turtles in Ireland. King & Berrow (2009) have collected a total of 1069 records of marine turtles in Irish waters, which calculated a total of 863 records for this species. Leatherback turtles were found to mostly occur in summer months between June and September, representing 90.8% of all records.

3.4.3. Loggerhead turtle (*Caretta caretta*)

Loggerhead turtle is the second most frequently recorded marine turtle species around the coast of Ireland (King & Berrow, 2009), occurring throughout temperate and tropical regions of the Atlantic, Pacific and Indian oceans. This species is strictly protected under Annex II and IV of the Habitats Directive, thus requires Member States to designate SACs for their protection, however there are no SACs designated for loggerhead turtles in Ireland. King & Berrow (2009) have collected a total of 1069 records of marine turtles in Irish waters, which calculated a total of 56 records for Loggerhead turtles. This species has recorded every month, showing a peak in March representing 23.6% of all records and, 60% occurring between January to April.

Marine turtles were found to occur more frequently along the south coast and off the headlands in west Cork representing 41.5% of all records, north Dingle Peninsula in Co. Kerry (13.2%), Killala Bay in north Co.

Mayo, and off Arranmore and Malin Head in the northwest off Donegal (11.9%) (King & Berrow, 2009). Distribution of these marine turtle species by county in Ireland can be seen in **Table 3.5**.

Table 3.5: Distribution of turtle species recorded around Ireland, adapted from Table 2. in King & Berrow (2009).

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**

3.5. 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 3.5.1** through **Section** 3.5.3.

3.5.1. Harbour seal (*Phoca vitulina*)

Common seals (also referred to as Harbour seals) are a 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 inhabit Irish waters, predominantly on the west side 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, with one of the SACs, Clew Bay Complex SAC, within the Project area.

Cronin *et al.* (2007) performed a combination of aerial and ground surveys, aiming to gather information on the abundance and distribution of harbour seals along the Irish coast during February – July 2003. Two of the ground-truthing sites were relatively close to the Project area: Bellacragher Bay and Roonagh Quay, which recorded a total of 34 and 24 individuals (for aerial count) and 33 and 21 (for ground count), respectively. Morris and Duck (2019) carried out thermal-imaging surveys along the coastline of Ireland in August 2017 and August 2018, which compiled the counts of harbour seals from surveys in 2003, in 2011/2012 and in 2017/2018. The counts of harbour seals in the western coast of Ireland are provided in **Table 3.6**, where area 6 includes the Project area.

3.5.2. Grey seal (*Halichoerus grypus*)

Grey seals are another seal species that inhabit the coast of Ireland, with the greatest numbers found around the western coast. This species is included under Annex II of the Habitats Directive, thus requiring Member States to designate SACs for their protection. There are 10 SACs designated for this species.

In combination with the harbour seal, Cronin *et al.* (2007) performed a combination of aerial and ground surveys, aiming to gather information on the abundance and distribution of grey seals along the Irish coast during February – July 2003. Two of the ground-truthing sites were relatively close to the Project area: Bellacragher Bay and Roonagh Quay. The ground survey summarised a total of three and six individuals respectively, while the aerial survey only counted one individual in Roonagh Quay. Morris and Duck (2019) carried out thermal-imaging surveys along the coastline of Ireland in August 2017 and August 2018, which compiled the counts of grey seals from surveys in 2003, in 2011/2012 and in 2017/2018.

The counts of grey seals in the western coast of Ireland are provided in the **Table 3.6**, where area 6 includes the Project area.

Table 3.6: Count of harbour and grey seals in the north region of Ireland, from surveys in 2003, 2011/2012 and 2017/2018, extracted from Table 1. in Morris and Duck (2019).

Region	Area	Harbour seals			Grey seals		
		2003	2011/2012	2017/2018	2003	2011/2012	2017/2018
West	1	17	27	48	11	64	55
	2	39	53	41	11	73	53
	3	396	501	570	7	11	32
	4	152	358	349	58	238	192
	5	36	106	134	61	100	107
	6	124	282	311	4	17	21
	7	144	134	90*	21	49	38
	8	0	0	0	176	304	531
	9	47	34	87	22	343	154

3.5.3. Basking shark (*Cetorhinus maximus*)

Basking sharks are the second-largest fish species, most frequently sighted between April to 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". They are listed under international legislation, such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the United Nations Convention on the Law of the Sea (UNCLOS) 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).

4. Potential significant effects

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

- **Physical disturbance** associated with pontoon and weather station installation in the nearshore area of Clew Bay Complex SAC
- **Physical disturbance** associated with tidal gauge deployment along the coastline overlaps with Clew Bay Complex SAC and West Connacht Coast SAC
- **Collision risk** associated with deployment and operation of hydro-drone, ARCBoat and MBES and dye dispersion.
- **Collision risk** associated with an increased number of vessels during employment and collection of the equipment/devices and
- **Noise disturbance** associated with the meters when in operation and the MBES operation.

JNCC(2010) also stated that the two main potential causes of death and injury of marine European Protected Species (EPS) are physical contact (with a vessel) and anthropogenic noise.

The overview of the potential impact mechanisms described above are summarised in **Section 4.1** through **Section 4.3**.

4.1. Physical disturbance

4.1.1. Pontoons and weather stations

Pontoons will be placed throughout the Newport Bay as well as, at the tidal limits of the two main contributing rivers flowing into the Bay. This area includes the Clew Bay Complex SAC, designated for otters and harbour seals. Marine mammals are known to be highly mobile and have the ability to both avoid and evade these devices if they detect the object, perceive it as a threat and take appropriate action at long or short range. There are a number of factors that can interfere with this including detection failure, diving constraints, group effects, attraction, confusion, distraction, illogical behaviour, disease and life stage, size and season. Additionally, seals have the potential to use horizontal surface structures as haul out sites. Although this may be beneficial by increasing the area upon which seals can haul out on, it also may put seals at risk of injury when getting on and off the structures. The weather station will be on land and taking up a relatively small footprint.

4.1.2. Tide gauges

A total of six tide gauges will be installed for this Project: T2 and T3 tide gauges will be located within West Connacht Coast SAC, which is designated for bottlenose dolphins and the T4, T5 and T6 tide gauges will be located within Clew Bay Complex SAC (**Figure 1-1**). Tide gauges present a risk of disturbance to Annex IV marine mammal species, as their location may overlap with foraging areas, posing a risk of disturbance, leading to avoidance of the area by these species.

Assessment of the impacts of physical disturbance are summarised in **Section 5.1**.

4.1.3. Microbial dye tracing

Dye will be released from the baseline discharge locations and will be undertaken during the ebb of spring tides and neap tides on at least three occasions. Rhodamine B and Rhodamine WT are fluorescent dyes commonly used as tracers in hydrological investigations. Rhodamine B and Rhodamine WT are considered toxic at certain levels and therefore have to be investigated further in this report. Dyes have the potential to negatively impact aquatic life.

4.2. Collision risk

Collision risks can result in lethal and non-lethal impacts on marine mammals. Non-lethal collisions can be divided in two main categories: blunt trauma from impact, and lacerations from propellers. Consequently, these types of injuries can trigger a second type of impacts as they can potentially put species in a vulnerable state for infections and predation.

4.2.1. Hydro-drone, ARCBoat and MBES

Hydro-drone, ARCBoat and MBES will be used to survey the nearshore area, showed as the yellow area in **Figure 1-1**, during low tide. These devices will be remotely operated within the Clew Bay Complex SAC which can potentially pose a collision risk for marine mammals as the equipment traverses the bay area.

4.2.2. Vessel traffic

Collision risks due to increased vessel traffic include a range of injuries for marine mammals and basking sharks, which in extreme cases can cause mortality (Laist *et al.,* 2001; Van Waerebeek *et al.,* 2007).

Previous literature has assessed that cetaceans adopt avoidance behaviours determined on the type of vessel/boat characteristics. Boats with fast and unpredictable movements (speedboats and jet skis) are more likely to initiate avoidance behaviours in marine mammals (Leung and Leung, 2003; Buckstaff, 2004),

than vessels that are larger in size with slower speed which makes their trajectory predictable (cargo ships) (Leung and Leung, 2003; Sini *et al.,* 2005).

Assessment of the impacts of collision risk are summarised in **Section 5.2**.

4.3. Noise disturbance

Current meters will be deployed in the area specified in **Figure 1-1**. MBES surveys may be carried out in the Bathymetric survey area in **Figure 1-2**. Marine mammals use echolocation as their primary means of communication, foraging, navigation and predator avoidance. Previous studies have assessed the potential impacts of noise on marine mammals (Weilgart, 2007; Southall *et al.,* 2007; Wright *et al.,* 2007). Acoustic masking is the term used when a frequency of anthropogenic noise overlaps with the frequencies used by marine mammals, which reduces their ability to detect important sounds for communication, navigation and prey detection (Weilgart, 2007). Acoustic Masking can occur anywhere within an organism's auditory range (Wright *et al.,* 2007), and can result in increased information ambiguity and, in extreme circumstances, the inability for cetaceans to orientate themselves, hunt or evade predation in the marine environment (Wright *et al.,* 2007). Potential effects of noise disturbance on marine mammals can result in lethal effects, physical injury, auditory injury and behavioural response. Otters (*Lutra lutra*) spend 75% of their lives on land. They can be relatively tolerant of disturbance and adjust to circumstances. They are often present in urban areas with considerable human activity nearby. There are no criteria to assess the significance of underwater noise on the Eurasian otter however it is thought they are similar to those of pinnipeds (Ghoul & Reichmuth, 2014).

Southall *et al*. (2019) have categorised pinnipeds (listed as phocid carnivores) and cetaceans into different functional groups based on several laboratory studies, audiometric data, and comparisons of anatomy. The functional groups for cetaceans were created in relation to their known auditory ability and functional frequencies, whilst all pinniped species were assessed based on their auditory ability in air, as well as their auditory ability in water. The estimated auditory bandwidths for cetaceans and pinnipeds functional groups are listed in **Table 4.1**.

Table 4.1: Auditory bandwidths modelled (kHz) for the functional hearing groups (cetaceans and pinnipeds), extracted from Southall *et al.* (2019).
*** Estimated auditory bandwidth extracted from Southall *et al.* (2007).**

Marine mammal hearing group	Auditory weighting function	Groups	Species	Auditory modelling
Cetaceans	**Low frequency (LF)** (0.007 – 22 kHz)*	Baleen whales	-	-
	High frequency (HF) (0.15 – 160 kHz)*	Most toothed whales, dolphins	Bottlenose dolphin	0.15 – 163 kHz
			Common dolphin	-
	Very high-frequency (VHF) (0.2 – 180 kHz)*	Certain toothed whales, porpoises	Harbour porpoise	0.25 – 220 kHz
Phocid carnivores	**In water (PCW)** (0.075 – 75 kHz)*	All true seals	Harbour seals	-
	In air (PCA) (0.075 – 30 kHz)*		Grey seal	-

Otters are considered in the same section as pinnipeds given the study referenced in **Section 4.3**.

Assessment of the impacts of noise emission from the MBES and current meters are summarised in **Section 5.3**.

5. Assessment of Potential Significant Effects

5.1. Physical disturbance

5.1.1. Pontoons and weather station

The pontoons will be installed at fixed stations for the duration of the survey period within the boundary shown in (**Figure 1-2**). The likelihood of the pontoons acting as haul-out sites is unlikely as the surface area of the pontoons are expected to be relatively small and seals would require the devices to be no higher than 0.5m above the sea surface in order to be able to mount them. Similarly, the collision risks the pontoons pose is not significant due to their relatively small size. The effects of physical disturbance by the pontoons were assessed to not have any significant impact on Annex IV (and non-Annex IV) species included in this report. The weather station will be on land and taking up a relatively small footprint and was assessed to not have any significant impact on Annex IV (and non-Annex IV) species included in this report.

5.1.2. Tide gauges

The tidal gauges are to be deployed at fixed stations for the duration of the survey period (**Figure 1-2**), occupying a minimal area of the coastline. Considering the small spatial extent occupied by the proposed tidal gauges they pose no significant effect to the Annex IV (and non-Annex IV) species included in this report.

5.1.3. Microbial dye tracing

Dye will be released from the baseline discharge locations and will be undertaken during the ebb of spring tides and neap tides on at least three occasions. Rhodamine B and Rhodamine WT are fluorescent dyes commonly used as tracers in hydrological investigations. These dyes are frequently used due to their strong fluorescence even at low concentrations.

Rhodamine WT will be used in this study because of its low environmental impact. Field, 2005 studied the ecotoxicity of fluorescent dyes, including Rhodamine WT, and found low levels of concern for concentrations under 22mg/L, and Skjolding *et al*., 2021 found no statistically significant effects were observed (p<0.05) at tested concentrations (up to 91, 100 and 200 mg/L for algae, crustaceans and fish embryos, respectively). Earlier work by Parker, 1973 tested the toxicity of Rhodamine WT dye on the larval development of oysters and on juvenile salmon and trout; with concentrations up to 10mg/L over 48 hours for oysters and 375mg/L over 17.5 for fish, no mortalities or abnormalities were observed. The fish remained healthy in dye-free water when last checked a month after the test.

Dye tracing will be carried out with Rhodamine WT below the maximum allowable concentration quality standard set out in Skjolding *et al*., 2021 of >910 µg/L. The effects of the microbial dye tracing are considered to **not be significant** and are therefore **screened out** for further assessment.

5.2. Collision risk

5.2.1. Hydro-drone, ARCBoat and MBES

The hydro-drone and the ARCBoat will be deployed on three separate occasions, each lasting *c*. one day during the survey period. The MBES will be deployed during the survey period, covering a relatively small nearshore area (Figure 1-2) and during low tide. Considering the highly mobile nature of marine mammals, and the large spatial extent of suitable habitat available, excluding the bathymetric survey extent, an overlap is unlikely. All three pieces of equipment will subsequently be recovered after each sample collection/survey is completed. The effects of collision risk with the hydro-drone, ARCBoat and MBES individually, are considered to not have any significant impact on Annex IV (and non-Annex IV) species included in this report, due to their relatively small size and infrequent deployment throughout the survey period.

5.2.2. Vessel traffic

The proposed deployment will temporarily increase the number of vessels in the area during deployment and collection of the devices/equipment. The vessels to be used for the Project are yet to be selected, as well as the number of maintenance trips. Vessels will be traveling at a slow speed in the Project area. Thus, the effects on vessel collision on marine mammals, as well as other Annex IV species (and non-Annex IV species) are considered extremely unlikely. Therefore, they are assessed to not have any significant impact on the species included in this report.

5.3. Noise disturbance

The type of MBES used is dependent on the depth of the site of interest. Data available[3] shows that the Clew Bay Complex SAC has a depth range of 5-30 meters. The MBES manufacturer[4] states that a MBES used for a depth range of 0.2-50m would typically emit sound at a frequency of 500 kHz. Frequencies emitted within this range are outside the hearing threshold ranges of those described in **Section 5.3** and therefore, the sound emitted by the MBES will not be heard if the frequency emitted by the MBES falls into this category, which is extremely likely. Thus, the effects of underwater noise emitted by the MBES are considered to not have any significant impact on marine mammal species, as well as other Annex IV species (and non-Annex IV species) included in this report.

Most common current meters available on the market emit sound at frequencies typically between 300kHz – 1200kHz[5][6], with some below 5 Hz[7]. Frequencies emitted within this range are outside the hearing threshold ranges of those described in **Table 4.1.**

where the highest functional frequency is 180 kHz in high frequency cetaceans. Therefore, the sound emitted by the MBES will not be heard, if the frequency emitted by the MBES falls into the 500 kHz selection, which is highly likely. Thus, the effects of underwater noise emitted by the current meters are considered to not have any significant impact on marine mammal species, as well as other Annex IV species (and non-Annex IV species) included in this report.

[3] https://www.infomar.ie/index.php/maps/interactive-maps/seabed-and-sediment (Accessed 07/05/2024)

[4] kongsberg_application_note_discovering-the-redefined-em-series.pdf (accessed: 07/05/2024)

[5] https://www.nortekgroup.com/products (accessed: 07/05/2024)

[6] https://www.rowetechinc.com/adcp/ (accessed: 07/05/2024)

[7] InterOcean Spherical Solid State Sensor Current Meter S4 series — BODC Document 40555 (accessed: 07/05/2024)

6. Conclusion

Following a comprehensive evaluation of the potential impacts on the Annex IV species of the Habitats Directive, it has been determined that the proposed development will not have any significant effect on Annex IV species (and non-Annex IV species) included in this report, therefore no mitigation measures are required.

It has been objectively concluded by AQUAFACT, following an examination, analysis and evaluation of the relevant information, including the nature of the proposed Project, that the proposed Project does not pose a significant risk of affecting (either directly or indirectly) any Annex IV species, and there is no reasonable scientific doubt in relation to this conclusion.

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