Iarnród Éireann
Irish Rail

Rosslare ORE Hub

EIAR Environmental Topic Chapters

Chapter 13:

Marine Mammals

venterra
GDG
GAVIN & DOHERTY GEOSOLUTIONS
NICHOLAS O'DWYER
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LIST OF ABBREVIATIONS

AA	Appropriate Assessment
ASCOBAMS	Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas
BIA	Biologically Important Area
cSAC	Candidate Special Area of Conservation
cSPA	Candidate Special Protection Area
CT	Computed Tomography
DAFM	Department of Agriculture, Food and the Marine
DCENR	Department of Communications, Energy and Natural Resources
DT	Disturbance Threshold
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMODnet	European Marine Observation and Data Network
EPA	Environmental Protection Agency
EU	European Union
EUROBATS	Agreement on the Conservation of Populations of European Bats
GDG	Gavin & Doherty Geosolutions
GIS	Geological Survey Ireland
HRA	Habitats Regulations Assessment
IWDG	Irish Whale and Dolphin Group
JNCC	Joint Nature Conservation Committee
LoLo	Lift-On Lift Off
MARIE	Marine Atlantic Regions of Ireland and Europe
MMO	Marine Mammal Observer
MPA	Marine Protected Area
MSFD	Marine Strategy Framework Directive
NBDC	National Biodiversity Data Centre
NDP	National Development Plan
NHA	Natural Heritage Area
NPWS	National Parks and Wildlife Service
NSA	Nutrient Sensitive Area
NTS	Non-Technical Summary
OPW	Office of Public Works
ORE	Offshore Renewable Energy
pNHA	Proposed Natural Heritage Area
PTS	Permanent Threshold Shift
RMP	Record of Monuments and Places
RoRo	Roll-on Roll-off
SAC	Special Area of Conservation
SCI	Site of Community Importance
SPA	Special Protection Area
SPL	Sound Pressure Level

S-P-R	Source–Pathway–Receptor model
SSC	Suspended Sediment Concentration
TTS	Temporary Threshold Shift
UNCLOS	United Nations Convention on the Law of the Sea
WFD	Water Framework Directive
ZoI	Zone of Influence

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13 MARINE MAMMALS

13.1 INTRODUCTION

Iarnród Éireann – Irish Rail is applying for development permission for the Rosslare Offshore Renewable Energy Hub (hereafter the ‘Proposed Development’), located immediately adjacent and to the northwest of the existing Rosslare Europort at Rosslare Harbour in County Wexford, which is operated by Iarnród Éireann. The Proposed Development includes capital dredging to achieve navigable depths for vessels delivering ORE components; land reclamation to create a storage area for these components; and construction of two new berths to facilitate loading and unloading of ORE components. The land reclamation works include infilling the existing small boat harbour, after the construction of a new small boat harbour. The Proposed Development also includes the installation of a new slipway and facility for local clubs, such as the Sea Scouts.

The purpose of the Proposed Development is to provide a facility for the efficient handling and storage, marshalling, staging and integration of ORE components to facilitate installation of offshore wind energy projects by ORE developers and operators. The Proposed Development is designed to provide facilities that accommodate a wide range of infrastructure uses, both for current requirements and anticipated future needs. For instance, the Proposed Development could be used for traditional port activities if required, including during periods of reduced ORE-related activity. Refer to EIAR Chapter 6: Project Description for further detail.

This chapter of the Environmental Impact Assessment Report (EIAR) presents the assessment of the likely significant effects of the Proposed Development on marine mammal ecology receptors arising from the construction and operation of the Proposed Development, both alone and cumulatively with other projects. The scope of this chapter was determined following issue of a scoping report to the following topic-relevant stakeholder (see Chapter 4 Scoping and Consultation for full details of consultation):

- National Parks and Wildlife Service (NPWS)

The assessment presented in this chapter is informed by the following EIAR chapters/technical appendices:

- EIAR Technical Appendix 13: Marine Mammals
    - Desktop Study and Field Surveys
    - Underwater Noise Modelling

Indirect impacts that may result from the Proposed Development and may affect marine mammals include sediment plume formation, elevated turbidity, pollutant release and indirect impacts on prey species. These indirect impacts are assessed within the following chapters of this EIAR:

- Chapter 8: Coastal Processes
    - assessment of changes in sediment transport and deposition
- Chapter 9: Water Quality and Flood Risk
    - assessment of turbidity and potential pollutant pathways.

- Chapter 11: Benthic Ecology
    - assessment of impacts on benthic prey resources.
- Chapter 12: Fish, Shellfish and Turtle Ecology
    - assessment of impacts on pelagic and demersal fish species of ecological relevance (prey species) to marine mammals.
- Chapter 15: Commercial Fisheries and Aquaculture (GDG, 2025)
    - assessment of potential implications for commercially exploited prey species.

13.1.1 POLICY, LEGISLATION AND GUIDELINES

Regulations and guidance pertaining to environmental impact assessment, ecology and biodiversity are outlined in Chapter 2: Legislation and Policy Context of this EIAR. This section lists the regulations and guidance specific to marine mammals.

13.1.1.1 EUROPEAN AND INTERNATIONAL LEGISLATION

- European Union (EU) Directive 92/43/EEC (Habitats Directive)
- Marine Strategy Framework Directive (2008/56/EC)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
- Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention)
- Convention for the Protection of the Marine Environment of the Northeast Atlantic (OSPAR Convention)
- International Convention for the Regulation of Whaling (ICRW Convention)
- Convention for the Protection of the Marine Environment of the North-East Atlantic (1992)
- Agreement on the Conservation of Small Cetaceans of the Baltic, North-East Atlantic, Irish and North Seas 1994 (ASCOBANS)
- Maritime Spatial Planning (MSP) Directive (2014/89/EU)

13.1.1.2 NATIONAL LEGISLATION

- Wildlife Act 1976, as amended
- Wildlife Act 1976 (Protection of Wild Animals) Regulations 2022
- Whale Fisheries Act, 1937

13.1.1.3 RELEVANT POLICIES AND PLANS

National Biodiversity Action Plan

The National Biodiversity Action Plan (NBAP) establishes a "Whole-of-Government, Whole-of-Society" approach to biodiversity conservation, recognizing the need for urgent action to address biodiversity loss, which is "deeply intertwined with climate breakdown". It emphasizes that a significant upscaling of effort and resources is required to address urgent conservation and restoration challenges in land, water, and marine environments. The Plan also responds to the recommendations of the Citizens' Assembly on Biodiversity Loss, which calls for prompt and decisive action.

Marine Conservation and Restoration

The NBAP explicitly includes several key actions and targets for the marine environment:

- **Marine Protected Areas (MPAs):** The protected area network will be expanded to include new Marine Protected Areas. The Plan commits to enacting and implementing comprehensive legislation for the designation and management of MPAs, with a goal of reaching at least 10% MPA coverage as soon as practicable and 30% by 2030. The legislation will cover species and habitats beyond those listed in EU Directives, as well as features providing ecosystem services like climate change mitigation and adaptation.
- **Water Quality:** The Plan aims for Ireland to meet all requirements under the Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD) by 2026. This is to achieve and maintain "High or Good Ecological Status" and "Good Environmental Status" for transitional, coastal, and marine waters. Development of new environmental targets under MSFD Descriptors is also mentioned.
- **Ecosystem Management:** The NBAP supports the management of wild species, including fisheries, to ensure their use is sustainable. There is a specific target to conduct high-quality research and mapping of Ireland's coastal and marine environments to identify biologically diverse and eco-systemically important areas.

Core Objectives

A core objective of the NBAP is to "Enhance the Evidence Base for Action on Biodiversity". This includes:

- **Monitoring Programmes:** Strengthening long-term monitoring programmes to underpin future decision-making on biodiversity.
- **Research Needs:** Identifying research gaps to facilitate more focused research calls from funding bodies.
- **Climate Change Impacts:** The Plan aims to strengthen the evidence base on the current and future impacts of climate change on biodiversity by 2028. This is particularly relevant given that climate change is a growing driver of biodiversity loss.

The Plan highlights a **"Whole-of-Society"** approach, with multiple entities having a role in conservation. For the marine environment, key players include:

- **Department of Housing, Local Government and Heritage (DHLGH)**: Responsible for the Marine Environment, Water & Planning.
- **Department of Agriculture, Food and the Marine (DAFM):** Responsible for policies and funding in fisheries.
- **Environmental Protection Agency (EPA):** A state body with a role in biodiversity conservation.
- **Marine Institute:** Also a state body involved in conservation efforts.
- **Irish Whale and Dolphin Group:** Mentioned as a member of the Biodiversity Forum.

The NBAP notes the importance of a collaborative approach with these and other stakeholders, including "fishers," to protect and restore nature.

National Marine Planning Framework

Underwater Noise Policy 1

Proposals must take account of spatial distribution, temporal extent, and levels of impulsive and / or continuous sound (underwater noise) that may be generated and the potential for significant adverse impacts on marine fauna.

Where the potential for significant impact on marine fauna from underwater noise is identified, a Noise Assessment Statement must be prepared by the proposer of development. The findings of the Noise Assessment Statement should demonstrably inform determination(s) related to the activity proposed and the carrying out of the activity itself.

The content of the Noise Assessment Statement should be relevant to the particular circumstances and must include:

- Demonstration of compliance with applicable legal requirements, such as necessary assessment of proposals likely to have underwater noise implications, including but not limited to:
  - Appropriate Assessment (AA);
  - Environmental Impact Assessment (EIA);
  - Strategic Environmental Assessment (SEA);
  - Specific response to 'strict protection' requirements of Article 12 of the Habitats Directive in relation to certain species listed in Annex IV of the Directive; and
  - Species protected under the Wildlife Acts.
- An assessment of the potential impact of the development or use on the affected species in terms of environmental sustainability.
  - Demonstration that significant adverse impacts on marine fauna resulting from underwater noise will, in order of preference and in accordance with legal requirements be:

    a) avoided,

b) minimised, or

c) mitigated, or d) if it is not possible to mitigate significant adverse impacts on marine fauna, the reasons for proceeding must be set out.

This policy should be included as part of statutory environmental assessments where such assessments require consideration of underwater noise.

Wexford County Development Plan 2022-2028

The *Wexford County Development Plan (WCDP) 2022–2028* sets out a comprehensive framework for environmental management in County Wexford, with several policies and objectives directly relevant to the protection of marine mammals and their habitats. The Plan adopts an integrated, ecosystem-based and precautionary approach to coastal and marine planning, ensuring that development is managed to minimise environmental impact while supporting sustainable growth.

Environmental Protection and the Precautionary Principle

The Plan establishes a strong commitment to environmental protection, recognising the importance of safeguarding biodiversity for the benefit of communities, visitors, and ecosystems. A precautionary approach is embedded in the assessment of planning applications.

- **Environmental Impact Assessment (EIAR):** Objective EM01 requires EIARs to identify, describe and assess the direct, indirect and cumulative significant effects of a project on biodiversity, with specific reference to habitats and species protected under the Habitats and Birds Directives (Directives 92/43/EEC and 2009/147/EC).
- **Appropriate Assessment (AA):** Objective EM02 requires that planning permission be refused for developments that would have significant effects on European sites. Where such effects are likely, the competent authority must carry out an AA in accordance with Article 6(3) of the Habitats Directive.

These requirements are directly relevant to marine mammals, particularly given the proximity of the Proposed Development to designated European sites such as the Slaney River Valley SAC.

Water Quality and Marine Ecosystems

The WCDP recognises the critical role of water quality in maintaining healthy ecosystems, including estuarine and coastal waters that provide habitat and prey resources for marine mammals.

The Plan aligns with the EU Water Framework Directive (WFD) and Marine Strategy Framework Directive (MSFD), both of which require Member States to achieve good ecological and environmental status.

- **Objective WQ05** seeks to achieve and maintain at least “Good” status in all water bodies and to prevent deterioration.
- **Objective WQ15** explicitly requires that development must not negatively impact water quality or quantity in rivers, estuarine waters, coastal waters, transitional waters or associated wetlands.

Maintaining good water quality is fundamental to supporting marine mammal foraging grounds and conserving broader marine food webs.

Noise and Light Pollution

The Plan identifies noise and light as important environmental pressures that must be managed to protect both people and wildlife.

- **Noise:** The WCDP highlights the potential impacts of development-generated noise, referencing the EU Environmental Noise Directive and the County Wexford Noise Action Plan. Developments must demonstrate that noise-sensitive receptors, including wildlife, are safeguarded. For marine mammals, this includes consideration of underwater noise impacts, which are assessed under EIAs and licensing processes.
- **Lighting: Objective EL02** requires that all external lighting is designed to minimise spillage and avoid adverse impacts on wildlife, including protected species. This is relevant for coastal and marine mammals, which may be disturbed or disoriented by inappropriate lighting along the shoreline.

Coastal and Marine Biodiversity

The Coastal Zone Management and Marine Spatial Planning chapter of the WCDP contains objectives that directly address marine biodiversity and highly mobile species such as marine mammals.

- **Objective CZM41** requires that an ecosystem-based approach is adopted in all coastal and marine planning, ensuring that development proposals avoid, minimise or mitigate disturbance to species and adverse impacts on habitats. Disturbance factors specifically include vessels, underwater noise and artificial lighting.
- **Objective CZM44** commits to ensuring that development proposals do not negatively affect water quality, in line with EU directives.
- **Objective CZM45** requires the maintenance, conservation and restoration of marine ecosystems within existing and future MPAs, including Natura 2000 sites, to achieve and maintain "good environmental status." This is particularly important for marine mammals that depend on these areas for foraging, breeding and resting.
- **Objective CZM25** requires that all future planning applications consider the potential impacts of climate change (e.g. sea level rise, storm surges) on coastal and marine ecosystems, supporting the resilience of species such as marine mammals to future pressures.

13.1.1.4 GUIDANCE

- Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters (DAHG, 2014)
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022)
- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.2 (CIEEM, 2024)

- Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (England, Wales and Northern Ireland). JNCC Report No. 654 (JNCC, 2020)
- Department of Communications, Marine and Natural Resources released a Marine Notice (No 15 of 2005) for the correct procedures when encountering whales and dolphins in Irish coastal waters DCMNR, 2005)
- Irish Whale and Dolphin Group Code of Conduct for all watercraft encountering whales and dolphins (IWDG, 2005)
- Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (version 2.0) (National Oceanic and Atmospheric Administration (NOAA), 2016)
- Guidance on survey and Monitoring in Relation to Marine Renewables Deployments in Scotland. Volume 2. Cetaceans and Basking Sharks (SNH and Marine Scotland, 2011)
- Guidance on Marine Baseline Ecological Assessments and Monitoring Activities for Offshore Renewable Energy Projects Part 1 (DCCAE,2018)
- Guidance on Marine Baseline Ecological Assessments and Monitoring Activities for Offshore Renewable Energy Projects Part 2 (DCCAE,2018)

13.2 ASSESSMENT METHODOLOGY

13.2.1 STATEMENT OF COMPETENCE

The chapter has been prepared by Maggie Starr (BSc. (Hons) Marine Sciences), Andrew Millar (MEng, PhD Electronic and Electrical Engineering) and Yaiza Pilar Pozo Galvan (BSc. (Hons) Marine Sciences, International MSc. (Hons) Marine Biological Resources).

Maggie is lead author for the Marine Mammal chapter. Maggie is a Marine Ecologist and Ornithologist with experience in terrestrial, aquatic and marine/coastal ecology and is a trained Marine Mammal Observer (MMO; Joint Nature Conservation Committee (JNCC) accredited). Her expertise includes specialised mammal, bird (land based and aerial) and habitat surveys, as well as freshwater surveys such as assessments for white-clawed crayfish, pearl mussel, and Biotic Indices (Q-values) Surveys. Her current work includes ecological and environmental desktop studies for terrestrial, aquatic and marine environments, specialised mammal surveys, ornithological surveys, map preparation and reporting (AA/NIS, PEAR, EcIA, EIAR).

Andrew undertook the noise modelling for the Proposed Development, providing critical insight for this assessment on marine mammals. Andrew is a Principal Acoustic Modeller with over 10 years' experience in the offshore oil and gas and renewables industries. He routinely conducts underwater noise modelling, environmental impact assessments, and permit applications for a wide variety of UK and international projects for activities including seismic surveys, geophysical site surveys, piling, drilling, and explosives use. Andrew has developed GDG's acoustic propagation modelling software for estimating the potential impacts of underwater noise on marine receptors.

Yaiza prepared the desk study and analysed the seal vocalisations recorded during the field surveys that were conducted in preparation for the Proposed Development, and compiled EIAR Technical

Appendix 13: Marine Mammals. Yaiza is an Oceanographer and Marine Mammal Ecologist, specialised in Marine Conservation and Applied Megafauna Conservation. Her research is mainly focused on bioacoustics, animal behaviour, and telemetry, working with international teams and being involved in European projects (SeaMonitor, STRAITS). She is also a JNCC certified MMO and currently works for GDG preparing marine licences and environmental assessments. At the time of writing, she had started her PhD at the Atlantic Technological University (Galway) on seal bioacoustics.

This chapter has been checked by Catarina Aires (BSc (Hons) in Marine Biology, MSc in Ecology and Marine Conservation). Catarina is a Senior Marine Environmental Scientist with a background in marine regulation and extensive experience in environmental assessment and consenting. She has worked across the public and private sectors, delivering high-quality environmental reports, regulatory submissions and stakeholder engagement for a wide range of marine and coastal projects in Ireland, the UK, and internationally.

This chapter has been reviewed by Joey O'Connor (BSc. (Hons) Marine Science, MSc. Engineering in the Coastal Environment). Joey is an Environmental Impact Assessment practitioner and Marine Scientist with coastal engineering expertise. Joey has had an overview role in this project as EIAR coordinator.

Independent peer review of this chapter and EIAR Technical Appendix 13: Marine Mammals has been undertaken by HiDef Ltd. HiDef carry out and present data from aerial wildlife surveys to ensure sustainable developments, such as wind farms, consider the natural environment, both on land and at sea, providing full environmental consultancy to companies throughout their project. HiDef have experts skilled in the quality assurance, analysis and presentation of ecological data and provide expert advice and support to clients across all levels of environmental consulting, including EIA and HRA/AA.

13.2.2 CONSULTATION

The project team had a consultation call with the National Parks and Wildlife Service (NPWS), Department of Housing, Local Government and Heritage on 4th September 2023.

The project team presented the scope of marine mammal surveys proposed to collect data to inform the EIAR chapter. NPWS agreed the scope of surveys was appropriate and advised that 24 months of vantage point surveys should be undertaken to characterise the marine mammal communities present, in particular harbour seals (*Phoca vitulina*).

The project team engaged the Irish Whale and Dolphin Group (IWDG) to undertake the marine mammal surveys. IWDG experts supported the project team in scoping the program of Static Acoustic Monitoring (SAM) undertaken, which was performed in excess of NPWS recommendations.

In addition, NPWS provided the project team with recent seal monitoring reports, including the *Aerial thermal-imaging survey of seals in Ireland* (Morris and Duck, 2019) and *Grey seal pup production estimates 2024* (NPWS, 2024). Data from the 2018 aerial thermal-imaging survey had already been digitised and mapped by the project team to inform spatial analyses of seal haul-out sites, and both datasets were incorporated into the baseline desk study to contextualise survey findings and to characterise regional seal populations relevant to the Proposed Development.

13.2.3 STUDY AREA

The **Study Area** for marine mammals has been selected to encompass all areas where potential impacts to marine mammals from the Proposed Development could occur, thereby informing the definition of the Zone of Influence for each marine mammal receptor.

For the purpose of this chapter, two overarching Study Areas are applied, with interpretation varying according to the ecology and movements of the species concerned:

- **Regional Marine Mammal Study Area**: This covers the wider Celtic and Irish Sea, accounting for the highly mobile nature of marine mammals and their broader population structures. For cetacean species this is defined by Management Units (MUs) (IAMMWG, 2023), which represent biologically relevant geographic areas for assessment. For seals, maximum foraging ranges from Carter *et al* (2022) are used to define relevant spatial scales (448 km for grey seals (*Halichoerus grypus*) and 273 km for harbour seals (*Phoca vitulina*)).
- **Marine Mammal Survey Area**: This encompasses the Proposed Development Boundary and adjacent waters within the spatial coverage of project-specific marine mammal surveys. This area is most relevant for assessing site-level disturbance or displacement effects.

While these two spatial scales provide a consistent framework for assessment, the relevant scale of impact assessment varies by species according to their ecology, ranging behaviour, and sensitivity to pressures. For example, harbour porpoise (*Phocoena phocoena*) assessments focus primarily on the South Celtic Sea MU, while grey seal impacts are considered in relation to their larger foraging range and designated haul-out sites.

13.2.4 ESTABLISHING A ZONE OF INFLUENCE

The CIEEM *Guidelines for Ecological Impact Assessment in the UK and Ireland* (CIEEM, 2024) define the Zone of Influence (ZoI) as the area where ecological receptors, in this case marine mammal species, may be subject to significant effects from a development and associated activities.

The ZoI considers the scale, location, and nature of the Proposed Development, alongside the temporary construction-phase and permanent operational-phase impacts. For mobile species such as marine mammals, large foraging ranges and migratory patterns must be considered, alongside the specific ecological context of the Proposed Development Boundary and surrounding area.

Baseline data from desk studies and field surveys were used to define the ZoI, focusing on potential significant effects on marine mammal receptors. Site-specific factors, such as existing anthropogenic impacts and species habituation, were also considered to determine the likelihood and significance of effects within the ZoI.

The assessment has been undertaken through interpretation of the baseline data, review of relevant literature and websites, application of relevant legislation, consultation and use of professional judgement. The assessment has been informed by the information provided in EIAR Technical Appendix 13: Marine Mammal and in Chapter 6: Project Description.

The CIEEM (2024) guidelines have been used as the basis of the assessment. Standard impact assessment terms have been used, where appropriate, to provide consistency with the other assessments in this EIAR. Professional judgement has been used to determine potential environmental impacts which could arise during the construction and operational phases of the Proposed Development.

The ZoI has been defined per species per activity in Section 13.5. The ZoI includes both the immediate zone of impact, where direct and measurable changes are anticipated (e.g., impacts from underwater noise), and the broader zone which accounts for indirect and cumulative effects.

13.2.5 ECOLOGICAL VALUE EVALUATION AND ASSIGNMENT OF KEY ECOLOGICAL RECEPTORS

Marine mammal features within the Regional Marine Mammal Study Area that are deemed to be of sufficient ecological importance and are likely to be notably impacted were identified as Key Ecological Receptors (KERs, as detailed in Section 13.5.4). While all cetaceans and seal species are strictly protected under EU law (e.g., the Habitats Directive) and Irish law (e.g., the Wildlife Acts), the identification of KERs for this assessment also considered site-specific conditions, desk study findings, and survey results. These factors helped determine which marine mammal species and habitats were most relevant to the assessment.

Llikely significant effects (LSEs) on designated European sites are also addressed separately in the Appropriate Assessment Screening Report and Natura Impact Statement (NIS) accompanying the application, in accordance with the requirements of the Habitats Directive.

The assessment methodology focuses on evaluating the ecological significance of the Proposed Development Boundary to marine mammals. The Proposed Development Boundary's importance is assessed by examining:

- Level of Use: The number of individuals, their activity patterns, and the intensity of their use of the area (e.g., feeding, resting, migration corridors).
- Type of Activity: The specific behaviours exhibited by the species in the area (where possible during the surveys) and how these relate to their life cycle and ecological requirements.
- Site Value to Species: A holistic understanding of the Proposed Development Boundary's ecological importance based on the combination of baseline data, expert judgment, and contextual knowledge of the Proposed Development Boundary and surrounding marine environment.

13.2.6 IMPACT ASSESSMENT PROCESS

The following approach was taken:

- Describing the Baseline: establishes current conditions within the Regional Marine Mammal Study Area to serve as a comparison point for assessing potential changes
- Identifying Receptors: determines specific marine mammal species and important habitats that could be affected by the Proposed Development
- Assessing Conservation Importance: evaluates the ecological value of the receptors within the Regional Marine Mammal Study Area that may be impacted

- Characterising Impacts and their Effects: considers the effects of construction and operations along with the nature of these
- Determining Significance: utilises expert judgment to evaluate the significance of the identified impacts
- Mitigation Measures: identifies potential mitigation strategies to reduce significant adverse effects
- Residual Impact: assesses remaining impacts after applying mitigation measures; identifies appropriate compensation measures to offset significant residual effects; identifies opportunities for ecological enhancement.
- Cumulative and Transboundary Effects: examines the broader effects of the Proposed Development, including those in combination with other projects and across borders

Each assessment evaluated the spatial extent of impacts relative to the relevant Management Unit (MU) and species' ecological characteristics. Consideration was given to the duration of impacts in the context of the species' lifespan and reproductive cycle, the frequency and reversibility of impacts, and the potential for long-term population-level effects. These factors were used to determine the magnitude of impacts and the subsequent categorisation of outcomes as either ‘significant’ or ‘not significant’.

13.2.6.1 SENSITIVITY OF RECEPTOR

The sensitivity of marine mammal species has been determined by evaluating their capacity to adapt to a specific impact, their tolerance of that impact, and their ability to recover to pre-impact conditions. Tolerance refers to the degree to which a species is susceptible to disturbance, harm, or mortality from a particular external factor. Recoverability is the species’ ability to return to a state similar to its pre-impact condition, depending on the extent of disturbance or damage incurred and the species' capacity to recover.

This assessment of sensitivity for marine mammals to specific impacts has been informed by the best available scientific evidence, including research on marine mammals from both controlled studies and field observations. Evidence from field studies of marine mammals during the construction and operation of port developments and similar activities, such as offshore windfarms, has been particularly relevant in shaping this evaluation.

The evaluation of vulnerability (tolerance) and recoverability has been combined to provide a comprehensive assessment of the sensitivity of each receptor to the identified impacts.

13.2.6.2 CHARACTERISING AND DESCRIBING THE IMPACTS

The assessment has considered the following factors:

- Nature of the Effect: whether the impact is expected to be positive, neutral, or negative. This helps to identify whether the development may improve, have no impact on, or cause harm to ecological features.
- Significance of the Effect: the importance of the impact on the environment, based on the value of the affected ecological receptor and the scale of the change.

- Extent and Context: the geographical scope of the impact, considering how far-reaching it is (e.g., local, regional, national) and whether the receptor is rare, sensitive, or under threat within the specific context.
- Probability: the likelihood of the effect occurring, considering factors such as the type of development activity and its interaction with ecological receptors. This determines whether the impact is probable or uncertain.
- Duration and Frequency: how long the impact will last (e.g., short-term, medium-term, or long-term) and how often the impact is likely to occur (e.g., continuous or intermittent). For example, construction-related impacts may be temporary, while operational impacts could persist over the project's lifespan.
- Reversibility: an irreversible effect is one from which recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it. A reversible effect is one from which spontaneous recovery is possible or which may be counteracted by mitigation.
- Cumulative Effects: this considers the combined impact of the Proposed Development when assessed alongside other existing or planned projects. Individually insignificant impacts may become significant when combined over time or across a wider area. This is crucial for assessing long-term, widespread ecological changes.

These characteristics are used to make a professional judgement about whether the identified effect will have a "significant" or "not significant" impact on the receptor, taking into account the integrity of habitats and the conservation status of species.

Additionally, as outlined in Section 13.2.6.5, consideration is given to any primary mitigation measures that are integrated within the project design and are intended to prevent, reduce, or where possible, offset significant adverse effects on the receiving environment, and tertiary mitigation measures that are required regardless of the EIA assessment. These primary and tertiary mitigation measures are described below, and further details regarding primary mitigation measures can be found in Chapter 6: Project Description of this EIAR.

13.2.6.3 SENSITIVITY OF RECEPTORS

The sensitivity of marine mammal receptors has been assessed according to their capacity to tolerate anthropogenic pressures, their ability to recover to pre-impact conditions, and their recognised ecological and conservation importance. In this context, tolerance refers to the degree to which species or populations are susceptible to acoustic, physical, or behavioural disturbance, including underwater noise injury, displacement, and reduced foraging efficiency. Recoverability reflects the ability of individuals or populations to return to baseline conditions following disturbance, which is influenced by life history traits (e.g., reproductive rate, site fidelity, migratory behaviour), population size and conservation status, and the scale and duration of the impact.

This assessment is informed by the best available scientific evidence, including peer-reviewed literature, international guidelines on noise exposure (e.g., Southall *et al*., 2007; 2019), and empirical data from comparable marine infrastructure projects such as dredging, piling, and port expansions. Particular attention is given to species of known sensitivity or legal protection, such as harbour porpoise, bottlenose dolphin, grey seal, and harbour seal, all of which exhibit specific vulnerabilities to underwater noise, displacement, and disturbance of critical behaviours. In addition, the species prioritised in this assessment have been informed by the outcomes of site-specific surveys and the desk study review, which identified those species most frequently recorded or occurring in relatively high numbers within the Regional Marine Mammal Study Area. This evidence base has been used to determine which species warranted treatment as Key Ecological Receptors (KERs).

The sensitivity evaluation combines professional ecological judgement with receptor-specific evidence to assign relative sensitivity ratings. These ratings are then considered alongside the predicted magnitude of change arising from the Proposed Development to determine whether impacts are likely to be significant or not significant.

13.2.6.4 SIGNIFICANCE

A **significant** effect is one that is likely to affect:

- The structure and functioning (i.e. ecological integrity) of a population, habitat, or ecosystem, or
- The conservation status of a species or habitat, including its extent, abundance, and distribution.

Conversely, an effect is considered **not significant** if:

- It does not materially affect the conservation status or ecological integrity of a receptor, or
- The receptor is of low ecological value and/or the effect is of such low magnitude or duration that it would not result in a meaningful ecological consequence.

This ensures that conservation priorities and ecological integrity for marine mammals are central to the assessment, focusing on how the Proposed Development could alter key environmental features critical to these species.

The nature of these impacts can vary in terms of scale, extent, duration, timing, and frequency. These factors are combined to assess the overall magnitude of impact. Where possible, the magnitude of the impact is quantified. Professional judgment is then applied to categorise the effects on marine mammal receptors.

The significance of an effect refers to the extent to which an impact on marine mammals is considered meaningful in terms of their conservation status, ecological function, or value. Significance is evaluated based on the geographical scale at which the receptor's integrity or conservation status is affected, such as local, county, regional, national, or international levels. In some cases, an impact may not be significant at the scale at which the receptor is valued but could still be significant at a lower scale. For example, while an effect might not influence the global conservation status of a cetacean species of international importance, it could still have a localised impact on the species' behaviour or habitat use in the vicinity of the Proposed Development. In such cases, the impact would be deemed significant at the local scale, reflecting the species' importance within the specific context of the project area.

The assessment concludes on a binary classification - "significant" or "not significant" - to ensure clarity in decision-making. This approach is considered proportionate and aligned with best practice where potential impacts are either clearly negligible or where mitigation measures are integrated into the project design to effectively reduce impacts below the threshold of significance.

13.2.6.5 MITIGATION

As discussed in Chapter 1: Introduction and Methodology, three types of mitigation measures are considered in this chapter.

- Primary mitigation
- Secondary mitigation
- Tertiary mitigation

13.2.7 APPROACH TO ASSESSING UNDERWATER NOISE IMPACTS

Marine mammals rely on sound for various critical life functions, including locating prey, avoiding predators, communication, and navigation (Au *et al.,* 1974; Bailey *et al.,* 2010). An increase in human-generated noise could therefore potentially impact the marine environment (Parsons *et al.,* 2008; Bailey *et al.,* 2010).

A marine mammal's auditory system is its most sensitive organ to acoustic injury, meaning injury to the auditory system can occur at lower noise levels than injuries to other tissues (Tougaard, 2015; Southall *et al.,* 2008, 2019; NMFS, 2018, 2024). Underwater noise can potentially cause injurious, or disturbance impacts to marine mammals, including:

- Non-auditory physical impacts:
  - Tissue damage, such as rupture or internal bleeding
  - Risk of gas embolism or decompression sickness
- Auditory physical impacts:
  - Severe damage to the ear structure
  - Permanent threshold shift (PTS), resulting in lasting hearing loss
  - Temporary threshold shift (TTS), leading to short-term hearing impairment
- Chronic/stress-related impacts:
  - Lowered individual health and viability
  - Increased susceptibility to illness
  - Heightened potential for cumulative negative effects
  - Sensitisation to sound or stressors, which can intensify other impacts
  - Habituation to noise, leading animals to remain within harmful zones
- Behavioural impacts:
  - Displacement from an area, either temporarily or over the long term
  - Significant disruption of normal activities
  - Reduced effectiveness in behaviour due to modification
  - Disruption of social structures, such as mother-calf bonds

- Interference with echolocation and associated activity such as feeding
- Perceptual impacts:
  - Masking of communication signals with conspecifics
  - Obscuring of sounds essential for biological functions
  - Difficulty in interpreting the acoustic characteristics of the environment
  - Altering vocalisations adaptively, potentially affecting efficiency and energy use

In this assessment, the primary focus is on evaluating the impact of underwater noise from activities associated with the Proposed Development on marine mammals. The analysis emphasises **PTS**, as defined in Section 13.2.7.2 below, TTS, and displacement**,** since thresholds for these impacts are relatively well established.

13.2.7.1 THRESHOLDS FOR PTS, TTS & DISPLACEMENT

The thresholds that have been adopted in this assessment for assessing PTS, TTS and displacement impacts to marine mammals from underwater noise are based on an extensive review of current scientific literature and guidance and are discussed in the following sections.

PTS and TTS thresholds

Exposure to loud sounds can result in a reduction in hearing sensitivity, known as a hearing threshold shift, caused by physical injury to the auditory system. This threshold shift may be permanent (i.e., PTS) or temporary (i.e., TTS). Numerous studies have been conducted to estimate the noise levels required to cause PTS and TTS to marine mammals (e.g., Tougaard, 2016; Finneran *et al.,* 2010, 2015; Finneran and Schlundt, 2013; Kastelein *et al.,* 2012, 2013; Lucke *et al.,* 2009; Southall *et al.,* 2008, 2019; NMFS, 2018, 2024). The thresholds adopted in this assessment for PTS and TTS are those suggested by Southall *et al.* (2019).

Southall *et al. (*2019) established PTS and TTS thresholds for different marine mammal hearing groups for both impulsive and non-impulsive noise. Both sets of thresholds are relevant to this assessment since underwater noise generated from activities associated with the Proposed Development could be impulsive (e.g., noise from piling and rock blasting) or non-impulsive (e.g., noise from dredging, vessels, operational noise).

To establish thresholds for different marine mammal species, Southall *et al.* (2019) categorised marine mammals into the following generalised hearing groups that are relevant to this assessment:

- Low frequency (LF) cetaceans
- High frequency (HF) cetaceans
- Very high frequency (VHF) cetaceans
- Phocid carnivores (pinnipeds)

Southall *et al.* (2019) also established hearing groups for sirenians and other carnivores. No sirenians are known to inhabit European Atlantic waters and this hearing group has therefore not been considered in the assessment. The other carnivores hearing group includes otter species. Eurasian otters (*Lutra lutra*) are recognised as Key Ecological Receptors and are assessed in full within Chapter 10: Terrestrial Ecology of this EIAR

The PTS and TTS thresholds proposed by Southall *et al.* (2019) for impulsive and non-impulsive noise that have been adopted in this assessment are shown in Figure 13.1, which also shows species belonging to the relevant generalised hearing groups that could be in the region of the Proposed Development. The thresholds are established in terms of two different metrics: zero-to-peak sound pressure level (SPL) and weighted cumulative sound exposure level (cSEL). The zero-to-peak SPL is a measure of the maximum absolute instantaneous sound pressure, and exceedances of the zero-to-peak SPL thresholds indicate where instantaneous onsets of PTS or TTS may occur. The cSEL metric is a cumulative metric calculated over a given period of exposure (e.g., over the duration of an activity) and accounts for a marine mammal's hearing ability using generalised auditory weighting functions for different marine mammal hearing groups. The auditory weighting functions used in this assessment are those proposed by Southall *et al.* (2019) and are shown in Figure 13.1. Exceedances of the cSEL thresholds indicate where PTS or TTS may occur over prolonged periods of time rather than instantaneously.

Table 13.1: PTS and TTS onset thresholds for impulsive and non-impulsive noise (Southall et al., 2019)

Hearing group	Generalised hearing range	Species relevant to this assessment	Impulsive noise thresholds				Non-impulsive noise thresholds			
			Zero-to-peak SPL (dB re 1 µPa^2)		Weighted cSEL (dB re 1 µPa^{2}s)		Zero-to-peak SPL (dB re 1 µPa^2)		Weighted cSEL (dB re 1 µPa^{2}s)	
			PTS	TTS	PTS	TTS	PTS	TTS	PTS	TTS
LF cetaceans	7 Hz to 35 kHz	Minke Whale	219	213	183	168	219	213	199	179
HF cetaceans	150 Hz to 160 kHz	Bottlenose Dolphin, Common Dolphin and Risso's Dolphin	230	224	185	170	230	224	198	178
VHF cetaceans	275 Hz to 160 kHz	Harbour Porpoise	202	196	155	140	202	196	173	153
Phocid carnivores in water	50 Hz to 86 kHz	Grey Seal and Harbour Seal	218	212	185	170	218	212	201	181

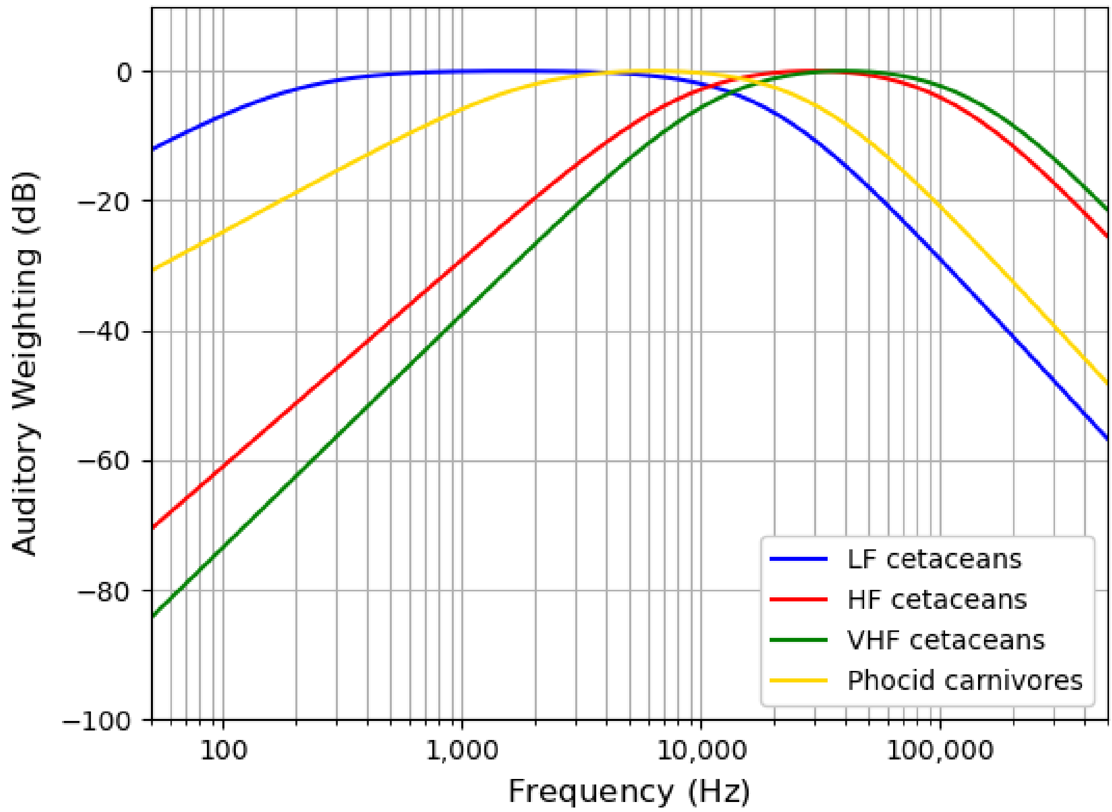

Figure 13.1: Auditory weighting functions for generalised marine mammal hearing groups that are relevant to this assessment (Southall et al., 2019)

Displacement

Brandt *et al.* (2016) analysed the effect of piling on harbour porpoise from the construction of eight offshore wind farms within the German North Sea between 2009 and 2013. The results showed that the majority of harbour porpoise were displaced at SELs above 145 dB re 1 µPa^{2}s. Thompson *et al.* (2013) also observed displacement of harbour porpoises at SELs exceeding 145 dB re 1 µPa^{2}s from a seismic survey in the Moray Firth. Lucke *et al.* (2009) reported that a captive harbour porpoise consistently showed aversive responses at SELs exceeding 145 dB re 1 µPa^{2}s after exposure to impulsive noise stimuli. An SEL threshold of 145 dB re 1 µPa^{2}s has therefore been used in this chapter for assessing potential displacement of marine mammals from piling within the Proposed Development Boundary.

Studies reviewed by Southall *et al.* (2008) suggest that there will be an increasingly likelihood of behavioural disturbance to marine mammals from non-impulsive noise at SPLs beyond 140 dB re 1 µPa^2. This threshold has been used in the noise assessment for this chapter to signify where displacement of marine mammals may occur from dredging activities.

The disturbance thresholds adopted in this assessment (Table 13.2) are predominantly based on observed displacements of harbour porpoises (VHF cetaceans). It is thought that harbour porpoises are more sensitive to underwater noise than other species (Southall *et al.,* 2019; NMFS, 2018, 2024; Tougaard, 2016, 2021). Applying these thresholds for predicting disturbance to other marine mammal hearing groups may therefore be conservative.

Table 13.2: Thresholds used to assess displacement of marine mammals from piling and dredging

Activity	Displacement threshold	Source
Piling	SEL: 145 dB re 1 µPa^{2}s	Brandt *et al.* (2016) Thompson *et al.* (2013) Lucke *et al.* (2009)
Dredging	SPL: 140 dB re 1 µPa^2	Southall *et al.* (2008)

13.2.7.2 APPROACH TO ASSESSING EFFECTS OF PTS, TTS & DISPLACEMENT

A structured approach was adopted to ensure a comprehensive evaluation of the potential impacts on marine mammals. To carefully and accurately assess the effects of underwater noise generated by the Proposed Development, the following framework has been applied:

- PTS as Injury:
  - PTS, which results in irreversible, auditory damage, is assessed as an indicator of physical injury. It is an **unrecoverable, permanent reduction in hearing sensitivity** resulting from physical damage to auditory structures. This provides a clear measure of potential harm to marine mammals and informs the design of exclusions zones.
- TTS as a standalone effect:
  - TTS represents recoverable auditory impacts that, although not causing direct injury, could still affect the behaviour and short-term functionality of marine mammals. It is characterised by a **temporary elevation of the auditory threshold**, which diminishes over time as the auditory system recovers. The implications for behaviour due to TTS is assessed.
- Displacement as a separate consideration:
  - Displacement, defined as the spatial or temporal movement of marine mammals away from an area due to disturbances, is assessed independently. This ensures that behavioural responses to underwater noise are analysed without conflating them with auditory impacts.

This methodology has been applied consistently for each marine mammal species and each activity associated with the Proposed Development.

Definition of 'Injury'

In the context of this assessment, **'injury'** refers specifically to **irreversible physical harm (e.g., PTS)** to the auditory system of marine mammals resulting from exposure to underwater noise. This is characterised by the onset of PTS, which occurs when the hearing sensitivity of an individual is permanently reduced due to damage to auditory structures, such as the hair cells within the cochlea.

PTS is assessed as an indicator of injury because it constitutes a physical alteration to the animal's hearing ability that cannot recover over time. Importantly, this definition of injury does not include TTS, as TTS represents a recoverable reduction in hearing sensitivity and does not result in lasting harm.

Definition of Behavioural Disturbance

Behavioural disturbance caused by underwater sound sources depends on numerous factors related to the context of the exposure (Southall *et al*., 2008; NMFS, 2018, 2024). An animal's response to anthropogenic noise is influenced by its ability to detect the sound, which in turn depends on its hearing sensitivity and the relative loudness of the noise compared to natural ambient and background anthropogenic sound. For a sound to be detectable, it must exceed the background noise level and surpass the animal's hearing threshold at the relevant frequency.

When disturbance occurs, behavioural responses can manifest in several ways. These may include alterations to or masking of communication signals, which can interfere with critical behaviours such as foraging, mating, or nurturing the young. In some cases, disturbance may lead to restricted access to essential habitats, such as foraging grounds, migratory routes, or breeding sites. Prolonged or repeated disturbances that affect these behaviours could lead to broader ecological impacts, such as reduced reproductive success or shifts in local population distributions and abundances.

One response to disturbance is avoidance, where an animal moves away from the source of noise. For instance, marine mammals may swim out of the zone of disturbance and remain at a distance until the activity ceases. While this displacement may reduce their immediate exposure to harmful noise levels, it can result in increased energy expenditure or displacement into less suitable habitats.

Behavioural disturbance is defined in this assessment as the disruption of natural behavioural patterns, including of migration, breeding, nursing, foraging, and resting.

13.3 DATA COLLECTION AND MODELLING METHODOLOGY

13.3.1 DESK STUDY

The data sources used to inform the desk study are summarised in Table 13.3.

Table 13.3: Summary of key desktop reports

Data Source	Type of Data	Temporal and Spatial Coverage
Site-specific survey data		
Ornithological Surveys – Incidental Marine Mammal Observations (July-August 2024)	Monthly vantage point data	Incidental marine mammal observations recorded by Nick Veale (APEM) from September 2023 to August 2024.
Published survey data covering the wider region		
ObSERVE Phase I Aerial surveys (Rogan *et al.*, 2018)	Published Report	Aerial surveys from 2015 to 2017, providing year-round temporal coverage of marine mammal populations off Ireland's coast. Spatially, the surveys encompassed key offshore regions, including the Celtic Sea, Irish Sea, and deep waters of the Porcupine Basin and Rockall Trough, focusing on

Data Source	Type of Data	Temporal and Spatial Coverage
		monitoring cetaceans and other marine megafauna to support conservation efforts. This report was used to provide recent context for the wider Irish Sea, including abundance estimates where possible.
SCANS III surveys (Hammond *et al.*, 2021)	Published Report	Ship-based and aerial surveys conducted in the summer of 2016, providing extensive spatial coverage of small cetacean populations across the European Atlantic continental shelf, including waters around Ireland and the UK. The surveys aimed to estimate the abundance and distribution of key species, such as harbour porpoise (*Phocoena phocoena*), common dolphin (*Delphinus delphis*), and minke whale (*Balaenoptera acutorostrata*), with a focus on supporting conservation and management under the EU Habitats Directive. This report offered context for understanding small cetacean populations, including trends and density estimates, within the Irish Sea and adjacent regions.
SCANS IV surveys (Guilles *et al.*, 2023)	Published Report	Ship-based and aerial surveys conducted in the summer of 2022, offering updated spatial and temporal coverage of small cetacean populations across the European Atlantic continental shelf, including Irish and UK waters. These surveys focused on estimating the abundance and distribution of key species, such as harbour porpoise, common dolphin, and minke whale, to inform conservation and management under the EU Habitats Directive. This report offered context for understanding small cetacean populations, including trends and density estimates, within the Irish Sea and adjacent regions.
ObSERVE Phase II Aerial surveys (Giralt Paradell *et al.*, 2024)	Published Report	Aerial surveys from 2021 to 2023, providing updated seasonal and spatial coverage of marine mammal populations within Ireland's Exclusive Economic Zone. Spatially, the surveys encompassed coastal and offshore regions, including the Irish Sea, Celtic Sea, and Atlantic Margin. These surveys focused on refining abundance and distribution estimates for cetaceans, seabirds, and other marine megafauna,

Data Source	Type of Data	Temporal and Spatial Coverage
		while addressing previously under-surveyed areas. This report provided population data and trends, providing contemporary context for the Irish Sea and adjacent regions, including density and abundance estimates where possible.
National Biodiversity Records Centre	Online marine mammal datasets for Ireland https://maps.biodiversityireland.ie/	Online database of historic and recent marine mammal records from national atlases and other datasets. Information was used to provide details of marine mammal species recorded in the vicinity of the site.

13.3.2 FIELD SURVEYS

The characterisation of the receiving environment has been informed by data collected during site-specific marine mammal surveys. IWDG was commissioned by Iarnród Éireann to undertake a desk-based study, a 24-month land-based visual marine mammal Vantage Point (VP) survey, and SAM to assess the presence and activity of marine mammals in and around Rosslare Europort.

Dedicated VP watches were carried out twice per month between July 2022 and June 2023 (Year 1) and between September 2023 and August 2024 (Year 2) from a watch site to the west of Rosslare Europort. SAM was coordinated by IWDG and used F-PODs and a SoundTrap to monitor marine mammal activity and ambient noise levels.

The SAM programme was undertaken at two locations (Site 1 and Site 2) using FPODs to assess the presence of harbour porpoise and dolphins between December 2023 to December 2024 in the Marine Mammal Survey Area (Figure 13.2). F-POD data were collected for a total of 377 days at Site 1 and 286 days at Site 2 and analysed to extract dolphin and porpoise detections. The shorter deployment period at Site 2 was due to the F-POD not being retrieved during the final site visit in September 2024, as it was no longer attached to the buoy.

The SoundTrap data were collected at Site 2 between April and July 2023 to record broadband acoustic data to characterise ambient noise and detect seal vocalisations.

Figure 13.2 illustrates the coverage of the vantage point (VP) visual survey and the locations of the SAM deployments at Site 1 and Site 2. Comprehensive details of these surveys are provided in EIAR Technical Appendix 13: Marine Mammals.

Incidental marine mammal sightings were also recorded during monthly ornithological VP surveys which were carried out for the Proposed Development. Each survey lasted 6 hours, with surveys performed every month between April 2022 and September 2024 (see EIAR Technical Appendix 14: Ornithology for full details of the ornithology survey methodology). Although dedicated visual surveys for marine mammals were not carried out in July 2023 and August 2023, incidental sightings were recorded during ornithology surveys and are summarised below for additional context.

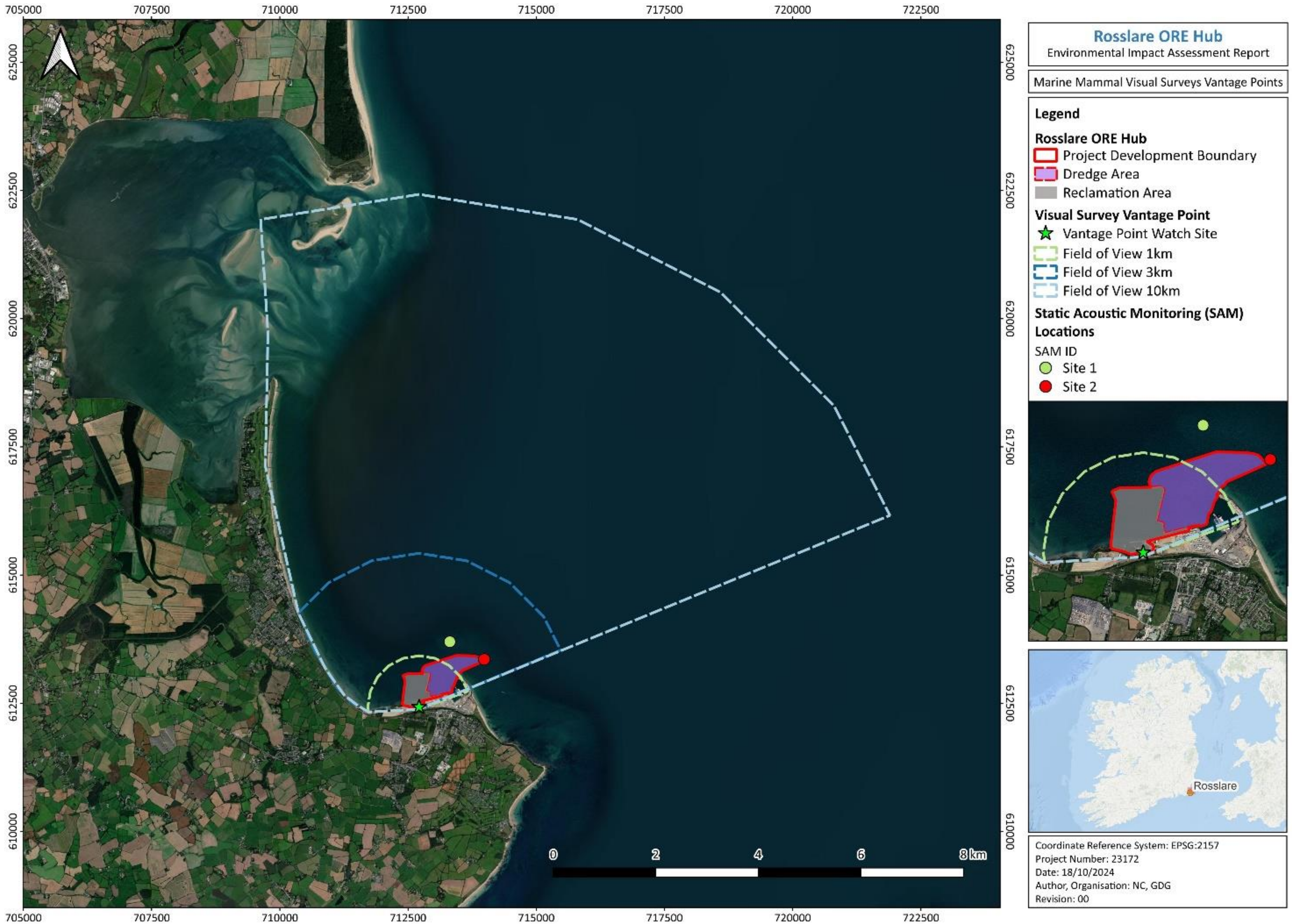

Figure 13.2: Vantage Point survey location and visual monitoring coverage and SAM deployment locations (Site 1 and Site 2) at Rosslare Europort

13.3.3 NOISE MODELLING

A quantitative assessment of potential impacts to marine mammals from underwater noise generated during piling, dredging, and potential rock blasting activities associated with the Proposed Development has been conducted. The quantitative assessment has been conducted by estimating underwater noise levels using modelling and comparing the estimated noise levels with established impact thresholds. The modelling and quantitative underwater noise impact assessment focuses on piling, dredging, and potential rock blasting activities since these activities will generate the highest levels of noise and/or may be conducted over prolonged periods of time. A description of the noise modelling methodology is provided below. Full details of the noise modelling methodology and results are provided in EIAR Technical Appendix 13: Marine Mammals.

Noise modelling was conducted for impact piling that may be required at the Proposed Development. The noise levels generated during other piling activities (e.g., rotary bored piling) will be lower than those generated during impact piling and impacts will therefore be smaller compared to those estimated for the impact piling. Source levels for the piling modelling were derived from measurements made during impact piling (Ainslie *et al.,* 2012) and scaled to a maximum impact energy of 240 kJ, which is higher than the maximum energy that is expected to be used for impact piling at the Proposed Development. The scaling laws used to scale piling source levels with hammer energy have been derived from finite element modelling (von Pein *et al.,* 2022). Other key parameters considered in the piling modelling were the soft-start and ramp-up of hammer energy, strike rate, and duration of piling. Source levels used for the dredging modelling were derived from measurements of numerous dredging activities using Trailing Suction Hopper Dredger (TSHDs) (Robinson *et al.*, 2011).

Noise modelling for the rock blasting that may be required at the Proposed Development has been conducted using a semi-empirical model. Whilst the characteristics of underwater noise generated from open water explosives are well studied, there are limited measurements of noise levels from confined explosives (e.g., during rock blasting). Available results thus show that the zero-to-peak sound pressure from rock blasting could be between 6 – 41% of equivalent open-water detonations (Nedwell and Thandavamoorthy, 1992; Hempen *et al.*, 2007). The semi-empirical model used for estimating noise levels from rock blasting has taken this uncertainty into account and provides a range of estimated potential impacts.

Noise levels for the piling, dredging, and rock blasting activities associated with the Proposed Development were predicted in terms of zero-to-peak SPLs and cSELs and compared to thresholds for PTS, TTS and displacement based on current scientific guidance to assess zones of impact for marine mammals. The outputs of the modelling provided the basis for evaluating the significance of noise-related effects and identifying appropriate mitigation measures.

The cSEL is calculated over a prolonged period of time (e.g., over a full day of piling or dredging). In the modelling, a “fleeing receptor” model has been used where it is assumed that marine mammals will swim away from the noise source under consideration. Marine mammals are known to move away from loud sound sources in practice (Kastelein *et al.,* 2018). In the modelling, the speed at which marine mammals swim away from the noise source is important, since the faster they swim away, the lower the cSEL they will receive and therefore the smaller the predicted distances to PTS or TTS will be. The cSELs received by marine mammals have been calculated from the noise modelling using a range of swimming speeds (from 1.5 – 3.0 m/s). This range of swim speeds covers the speeds at which different species that may be present in the area could swim away, as discussed in the following sections.

13.3.4 DIFFICULTIES AND UNCERTAINTIES

13.3.4.1 DESKTOP STUDY

The data sources used in the desktop assessment to characterise marine mammal baseline conditions in the region of the Proposed Development are detailed in Table 13.3. These published data sources are the most up to date publicly available information on marine mammal presence and abundance. However, these datasets represent a snapshot in time. The absence of desk study data does not necessarily indicate that the site is devoid of a given marine mammal species, either from a historical or current perspective. Ecological conditions may have changed, and certain species might have been under-recorded or overlooked in previous surveys. Similarly, there will be uncertainty associated with marine mammal densities reported or derived from results of historical surveys.

Marine mammal population density and abundance data at Management Unit scale provide a snapshot in time, based on survey data and extrapolation. It does not account for the dynamic nature of marine mammal populations or their movements over the duration of the Proposed Development. Population density and abundance data used do not consider spatial distribution of species within the Management Unit. Instead, they assume an even distribution of individuals across the entire coverage area.

13.3.4.2 BASELINE SURVEYS

The monitoring duration may not fully capture inter-annual variability influenced by factors such as environmental changes, prey availability, and migratory patterns.

The full range of marine mammal use of the area relevant to the Proposed Development, including foraging and breeding, may not be adequately represented by survey coverage.

SAM does not provide information on population density, exact locations, or behavioural contexts. The deployment of the SoundTrap was from April to July 2024, therefore long-term temporal patterns, such as seasonal or annual variations in seal activity or ambient noise levels, cannot be evaluated.

13.3.4.3 NOISE ASSESSMENT

There is limited publicly available information on source levels for piling and dredging. The source level used in the modelling for piling has been derived from measurements made at an offshore wind farm with a hammer energy of 800 kJ (Ainslie *et al.,* 2012) and scaled to different hammer energies suitable for piling at the Proposed Development using scaling laws derived from finite element modelling (von Pein *et al.,* 2022). The source levels used in the modelling for dredging are based on measurements made of several TSHDs (Robinson *et al.,* 2011).

The PTS and TTS thresholds adopted in the noise assessment are based on the most up-to-date and scientifically established thresholds (Southall *et al.,* 2019). The PTS and TTS thresholds for different marine mammal groups have generally been derived from observations/measurements of TTS from limited exposure times. The assumption that lower levels of noise over much longer time frames (resulting in the same level of sound exposure) will result in the same impact (e.g., PTS or TTS) has not been demonstrated in practice and it is uncertain if such an assumption is true (NMFS, 2018).

Not all marine mammals will be displaced from an area at the same noise levels, and even individuals of the same species can exhibit different responses at the same noise level (e.g., some individuals may be displaced whilst others are not). Thus, the predicted distances to the displacement thresholds adopted in this assessment do not necessarily mean that all marine mammals of a given species will be displaced up to these distances.

13.4 BASELINE ENVIRONMENT FOR MARINE MAMMALS

Irish waters are home to and refuge for at least twenty-six (26) species of cetaceans (IWDG, accessed July 2024 online). In addition, two pinniped species, the harbour seal (*Phoca vitulina*) and the grey seal (*Halichoerus grypus*), can be easily found in Irish coastal and offshore waters.

13.4.1 INTERNATIONAL CONTEXT

13.4.1.1 CETACEANS

Since 1994, extensive efforts have been made to map the distribution and relative abundance of all cetacean species within the Irish Exclusive Economic Zone (EEZ), primarily using platforms of opportunity. Key initiatives in these surveys include the European Seabirds at Sea (ESAS) research, the Irish Scheme for Cetacean Observation and Public Education (ISCOPE), and the Policy and Recommendations from Cetacean Acoustics, Surveying and Tracking (PReCAST). These projects have aimed to provide seasonal coverage, with a particular focus on offshore waters (Berrow *et al*., 2006, 2010, 2013; Ó Cadhla *et al*., 2004; Pollock *et al*., 1997; Wall *et al*., 2006, 2011).

The first dedicated double-platform cetacean survey (i.e., using aerial and boat-based methods) in Ireland was SCANS-I (Small Cetacean Abundance in the North Sea) conducted in the summer of 1994. This survey focused exclusively on the Celtic Shelf region of the Irish EEZ (Hammond *et al*., 2002). In 2000, the Survey in western Irish waters and the Rockall Trough (SIAR) survey extended its coverage to both inshore and offshore waters of the western seaboard, using a double-platform visual survey technique to estimate the abundance of common and white-sided dolphin (Ó Cadhla *et al*., 2004). Summer 2005 saw the implementation of SCANS-II, a follow-up to the earlier survey, which expanded its scope to include all Irish continental shelf waters and the Irish Sea. This survey provided abundance estimates for several species, including harbour porpoise, common dolphin, bottlenose dolphin (*Tursiops truncatus*), white-beaked dolphin (*Lagenorhynchus albirostris*), and minke whale (SCANS-II, 2008; Hammond *et al.*, 2013). In 2007, the Cetacean Offshore Distribution and Abundance in the European Atlantic (CODA) survey assessed cetacean populations in the European Atlantic waters beyond the continental shelf. Such a survey produced abundance estimates for a range of species, including common, striped (*Stenella coeruleoalba*) and bottlenose dolphin, as well as long-finned pilot (*Globicephala melas*), sperm (*Physeter macrocephalus*), minke, fin whale (*Balaenoptera physalus*) and beaked whale (*Ziphiidae*) (Hammond *et al.*, 2009).

Recently, survey efforts have intensified through various national and international initiatives, including the ObSERVE Acoustic and Aerial Programme, which focused on Irish waters (Berrow *et al*., 2018; Rogan *et al*., 2018). Additionally, the SCANS-III (Hammond *et al*., 2021) and SCANS-IV (Gilles *et al*., 2023) surveys have substantially expanded their geographic scope compared to earlier iterations. These later surveys encompassed the North Sea, Irish Sea, English Channel, Celtic Sea, and extended into the deeper waters of the North-East Atlantic.

Of the 26 cetacean species documented in Irish waters, up to nine have been observed in the Irish Sea, reflecting its ecological significance (O'Brien *et al*., 2009; Whooley & Berrow, 2019). Among the most frequently encountered species are common dolphin, harbour porpoise, and bottlenose dolphin, which are seen throughout the year (Wall *et al*., 2013). Risso's dolphin (*Grampus griseus*) are occasionally sighted, particularly in the summer, while Killer whale (*Orcinus orca*) have been recorded less frequently near the coast. Records prior to 2010 suggest the presence of white-beaked dolphin in the area, though recent sightings have not been documented (Lysaght & Marnell, 2016).

The Irish Sea also serves as a critical foraging ground for several baleen whale species. Fin whale and minke whale are commonly observed, with minke whale being the most frequently sighted baleen whale during the summer months. Fin whale are notably present from late summer through autumn (Volkenandt *et al.*, 2015). Humpback whale (*Megaptera novaeangliae*), known for acrobatic displays, are seen more sporadically, with sightings peaking from late summer through to January (Molloy, 2006; Rogan *et al*., 2018; Ryan *et al.,* 2016).

The seasonal variation in cetacean presence is closely linked to the abundance of prey species, such as small pelagic fish, which concentrate in schools before migrating to their spawning grounds (Evans & Waggitt, 2023; Molloy, 2006; Waggitt *et al*., 2020). The waters surrounding Rosslare Harbour, including areas near Carnsore Point and Hook Head (see Figure 13.3 below), are known to support dense populations of small pelagic fish (e.g., herring (*Clupea harengus*), mackerel (*Scomber scombrus*), sprat (*Sprattus sprattus*)) due to favourable oceanographic conditions, including tidal currents and nutrient upwelling. In this way, these prey species form the foundation of a rich food web that attracts harbour porpoise, common dolphin, and grey seal, making these parts of the Irish and Celtic Seas an important zone for foraging and seasonal migration. Similar patterns of prey-driven distribution are observed in other coastal regions of the Irish Sea, where productive zones consistently attract marine mammal populations due to the availability of prey (Ellis, 2018; Healy & McGrath, 1998; Orphanides, 2019; Wall, 2013).

Although some species may occur within the Regional Marine Mammal Study Area occasionally, e.g., killer whale and fin whale, these are unlikely to travel through or use the Proposed Development Regional Marine Mammal Study Area as important foraging grounds.

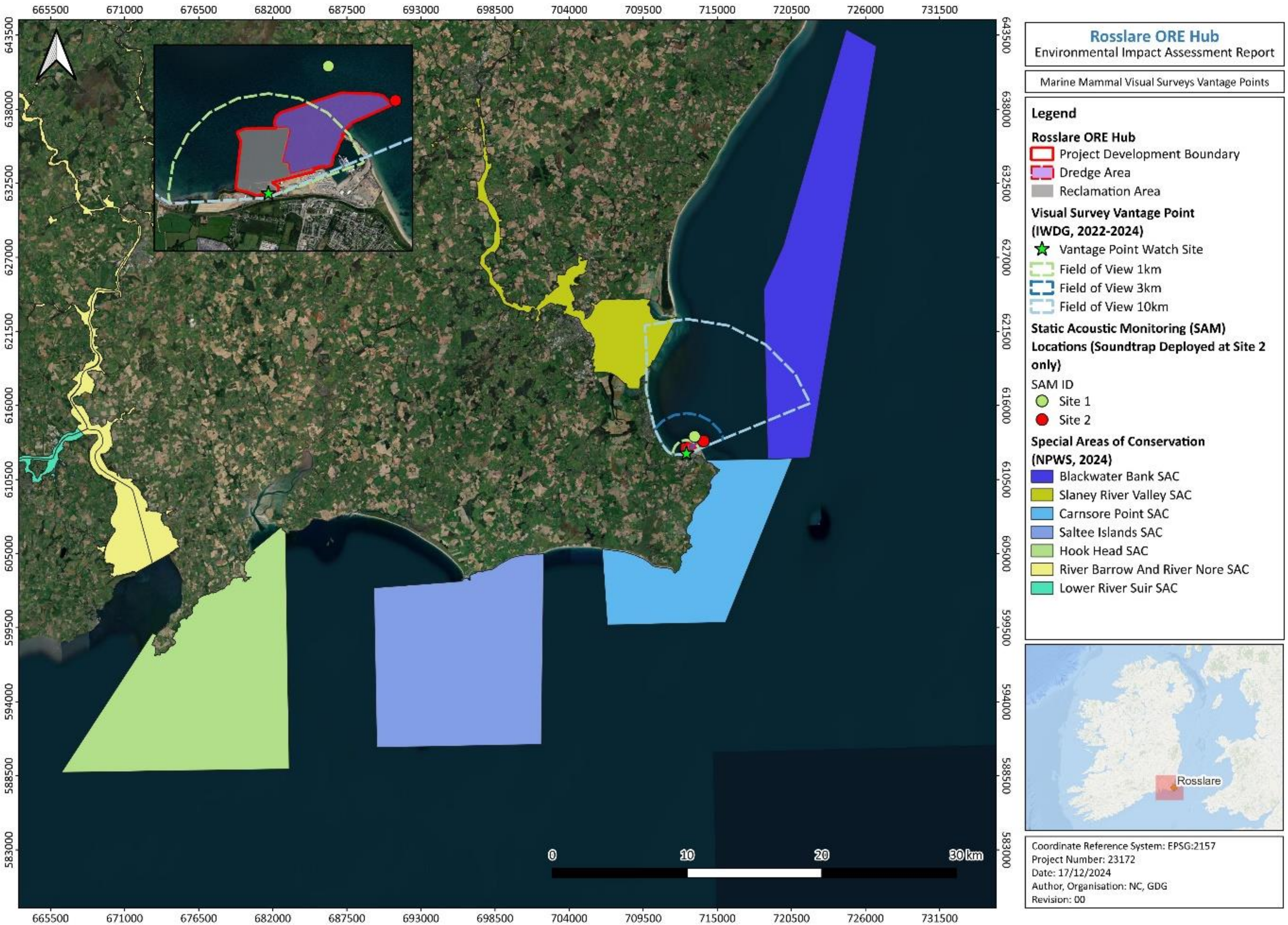

Figure 13.3: Special Areas of Conservation important for marine mammals near the study area. VP and SAM survey locations are also shown

13.4.1.2 PINNIPEDS

Similarly to cetaceans, efforts have been made to map the distribution, abundance, and ecology of the two common pinniped species - grey seal and harbour seal - within the Irish EEZ. The Irish Seal Sanctuary, along with various governmental and academic institutions, conducted the first comprehensive studies in the 1990s. These efforts included population censuses carried out during pupping and moulting seasons, when seals are most visible at haul-out sites.

In the 2000s, targeted programs such as the National Seal Database initiative and habitat-specific studies were developed to assess the abundance and distribution of seals. These studies employed ground counts, aerial photography, and infrared imaging, particularly during pupping seasons, when seals are concentrated onshore (e.g., Cronin *et al*., 2003; Lyons, 2004; Ó Cadhla *et al*., 2007). From 2007 onwards, the movements of grey seal in offshore regions were explored, employing satellite telemetry to track seasonal migration patterns and foraging behaviour. Extensive foraging trips into the Celtic Sea and beyond were revealed, emphasising the Irish EEZ as a critical habitat for grey seal, particularly during post-breeding periods (e.g., Cronin *et al.,* 2016). In contrast, harbour seal exhibited more localised distributions, favouring nearshore and estuarine habitats year-round (Cronin *et al*., 2008).

In 2010, advanced techniques such as GPS tracking and dive data loggers were used to provide detailed insights into the spatial ecology of seals (e.g., Cronin *et al.,* 2011; Jessopp *et al.,* 2013). Recent initiatives, including the ObSERVE programme, have intensified efforts to monitor pinniped populations using both aerial and acoustic methods (Rogan *et al*., 2018; Giralt Paradell *et al.*, 2024).

The Irish Sea represents a particularly important habitat for pinnipeds. Grey seal is frequently observed around sites like Lambay Island, the Saltee Islands, and Carnsore Point, especially during the pupping season (October–November) (Ó Cadhla *et al*., 2007). Harbour seal is most numerous in sheltered bays such as Strangford Lough and Cork Harbour, where haul-out sites support critical life-history activities like moulting and nursing (Duck & Morris, 2013a, 2013b; Lysaght & Marnell, 2016).

Both species of seal exhibit marked seasonal variations in abundance, largely driven by prey availability. Grey seal forage extensively on sandeels, gadoids, and pelagic fish, while harbour seal favour benthic prey such as flatfish and crustaceans (Gosch *et al.,* 2019; Kavanagh *et al*., 2010a). The ecological significance of these seals is underscored by their protection under the EU Habitats Directive, with key haul-out and breeding sites designated as SACs (Section 1.4.2.3).

13.4.1.3 DESIGNATED SITES

This section outlines the European sites with marine mammal Qualifying Interests (QIs) (harbour seal, grey seal, bottlenose dolphin and harbour porpoise) located within a 100-km radius of the Proposed Development. Please note a detailed assessment of the potential for the Proposed Development to adversely impact on the integrity of European sites is described in Volume 4: Appropriate Assessment of this EIAR.

Figure 13.4 and Table 13.4 show the Natura 2000 sites designated to protect marine mammal QIs that have been identified as being within a 100-km radius of the Proposed Development.

Where locally designated sites or national designations (excluding European sites) overlap with the boundaries of a European site, and where the qualifying interest features are identical, only the

European site is included in the assessment. Any potential impacts on the integrity and conservation status of the locally or nationally designated site are considered to be inherently addressed within the assessment of the European site, and therefore, a separate assessment for the local or national site is not carried out.

Table 13.4: Designated sites and relevant qualifying interest features for marine mammals

Designated Site	Closest Distance to Proposed Development (km)	Relevant Qualifying Interest Receptor
Carnsore Point SAC	1.4	Harbour Porpoise
Blackwater Bank SAC	4.9	Harbour Porpoise
Slaney River Valley SAC	6.6	Harbour Seal
Saltee Islands SAC	21.0	Grey Seal
Hook Head SAC	40.2	Harbour Porpoise Bottlenose Dolphin
River Barrow and River Nore SAC	57.1	Otter
Lower River Suir SAC	69.2	Otter
Pembrokeshire Marine/Sir Benfro Forol	64.9	Grey Seal Otter
West Wales Marine/Gorllewin Cymru Forol	72.1	Harbour Porpoise Bottlenose Dolphin
Cardigan Bay/Bae Ceredigion	91.0	Grey Seal

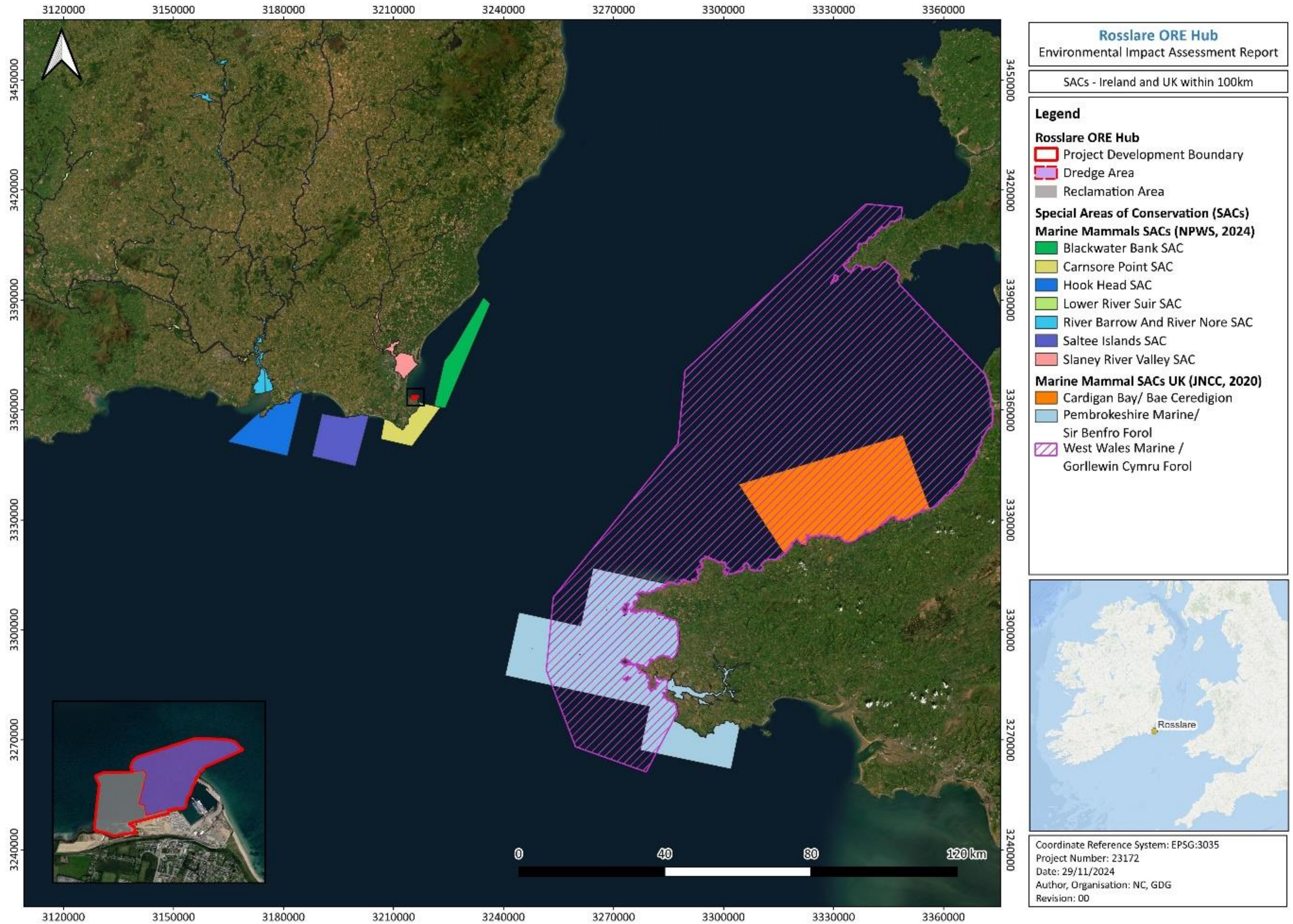

Figure 13.4: Designated Ireland and UK Special Areas of Conservation with marine mammals as Qualifying Interest Features

13.4.2 MARINE MAMMAL REGIONAL STUDY AREA

13.4.2.1 CETACEANS

Available density estimates and reference populations for cetaceans in the Proposed Development Regional Marine Mammal Study Area are presented in Figure 13.5 to Figure 13.8. The relevant MUs are presented in Figure 13.9 to Figure 13.11 below.

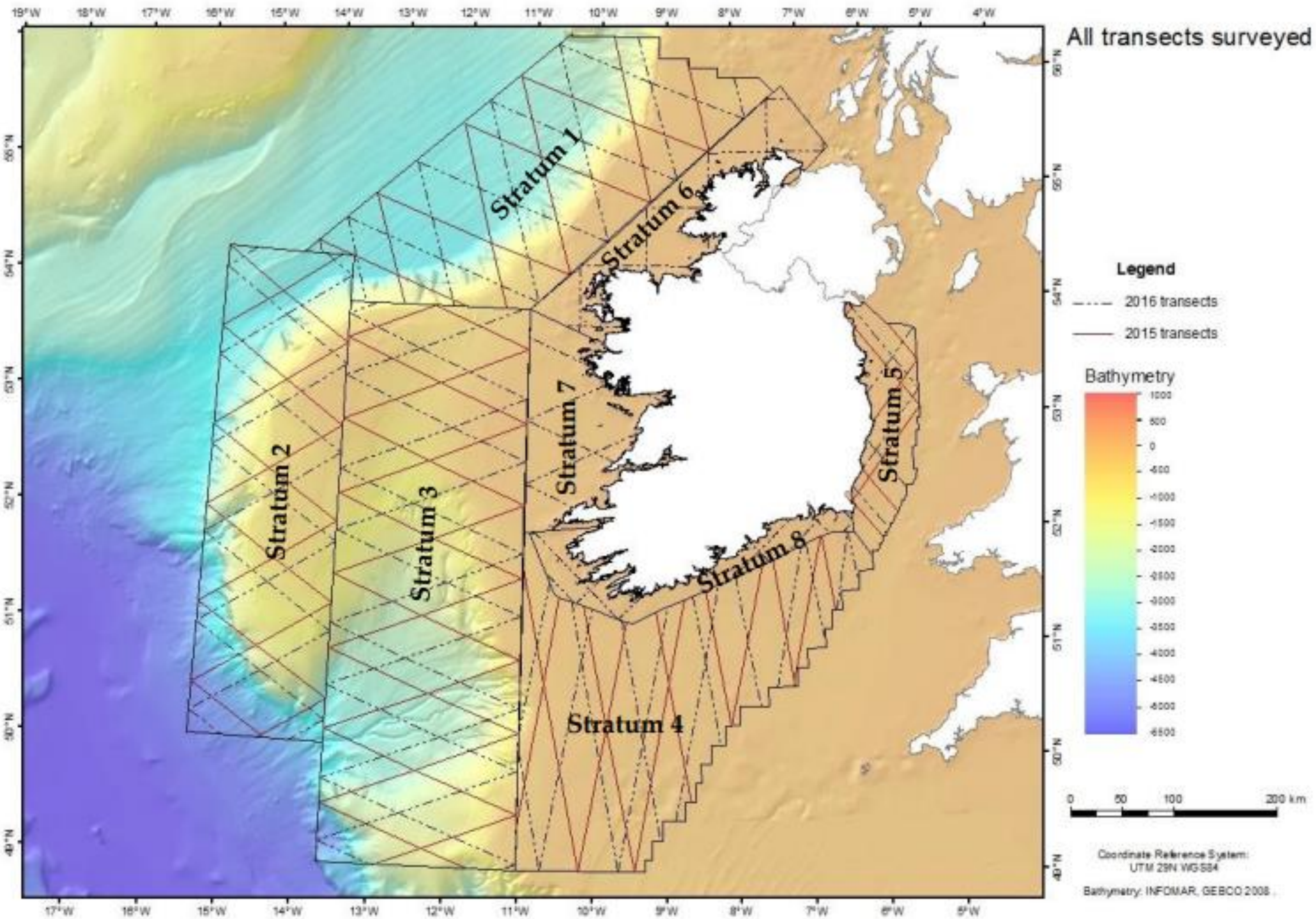

Figure 13.5: ObSERVE Aerial Phase I transect lines flown in summer and winter 2015 and 2016 in relation to bathymetry (from Rogan *et al*., 2018)

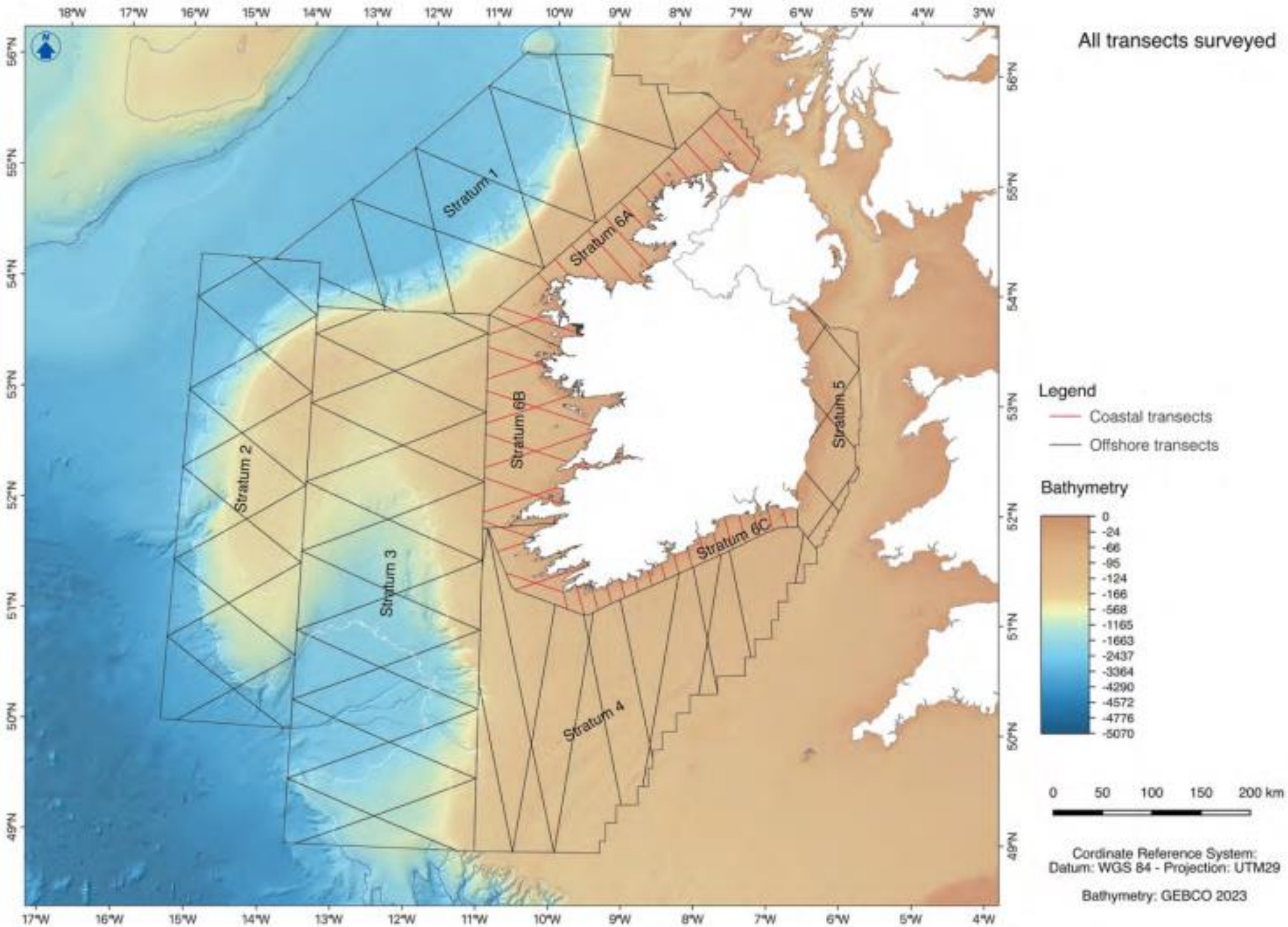

Figure 13.6: ObSERVE Aerial Phase II transect lines flown in summer 2021 and 2022 and winter 2022-2023 in relation to bathymetry. Black lines show the transect lines in offshore strata and red lines the transect lines in coastal strata (from Giralt Paradell *et al.,* 2024)

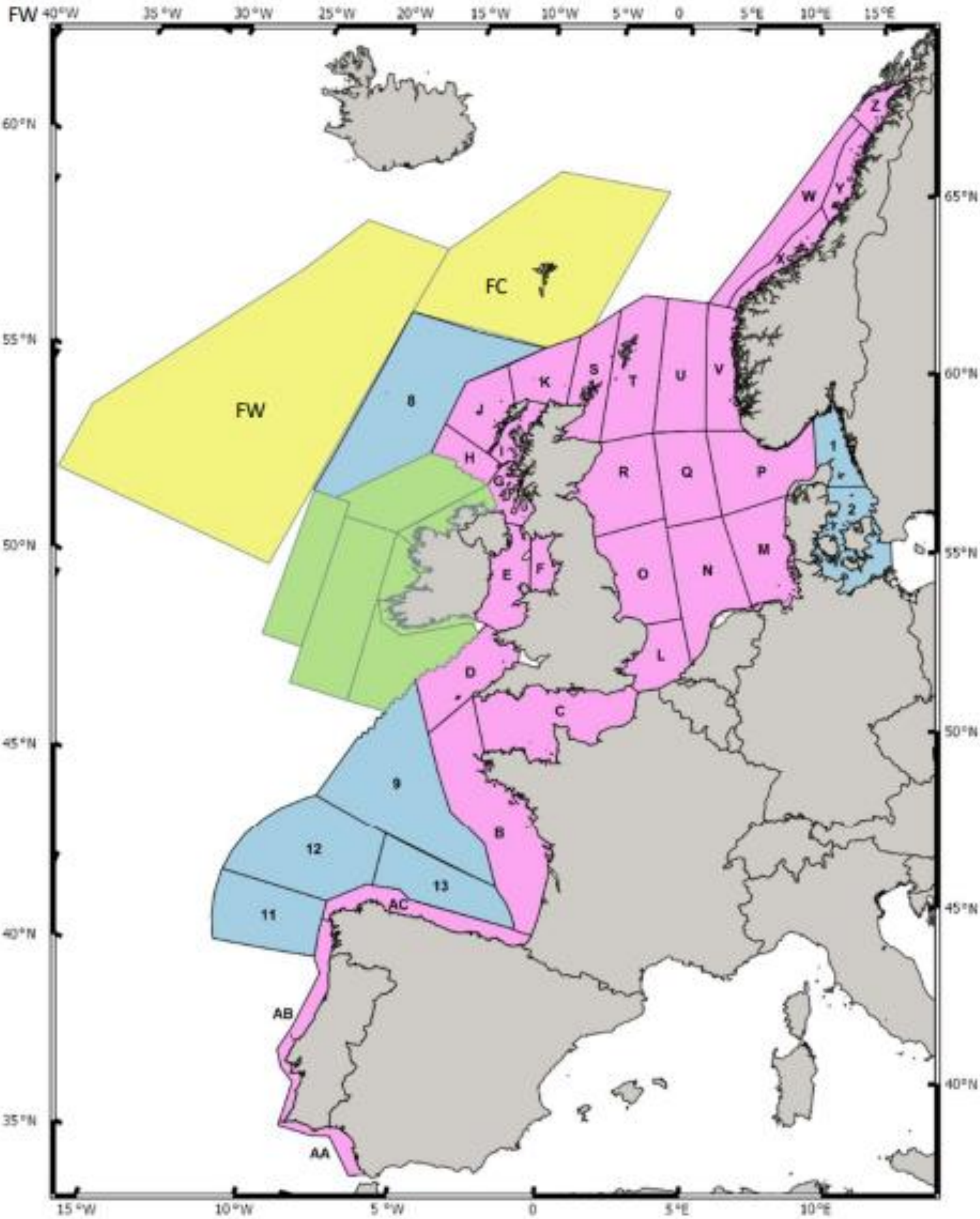

Figure 13.7: Area covered by SCANS-III and adjacent surveys. SCANS-III: pink lettered blocks were surveyed by air; blue numbered blocks were surveyed by ship. Blocks coloured green to the south, west and north of Ireland were surveyed by the Irish ObSERVE project. Blocks FC and FW coloured yellow were surveyed by the Faroe Islands as part of the North Atlantic Sightings Survey in 2015 (see Pike *et al*., 2019) (from Hammond *et al.,* 2021)

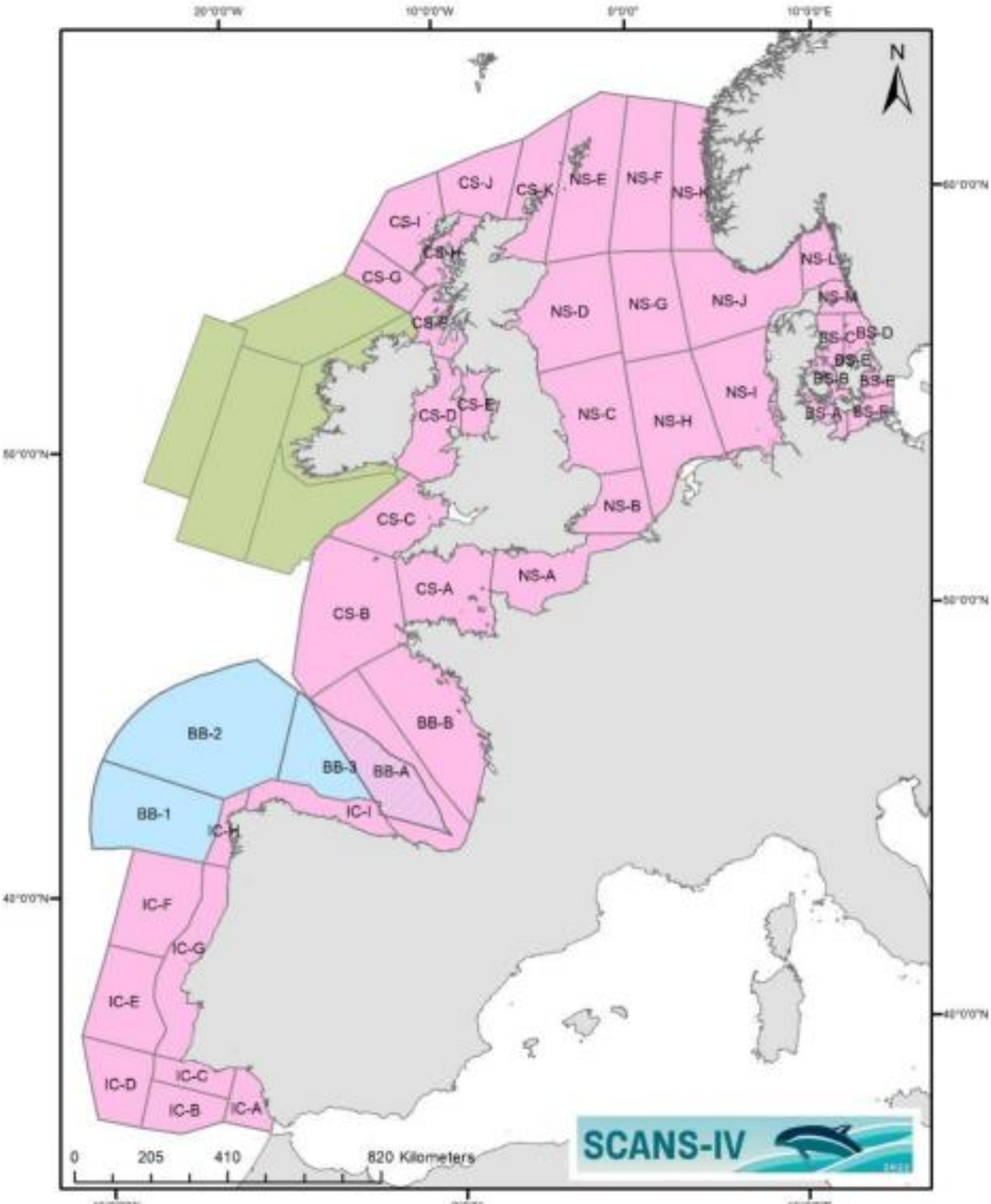

Figure 13.8: Area covered by SCANS-IV: pink blocks were surveyed by air and blue blocks were surveyed by ship. The cross-hatched area is where the ship survey BB-3 and aerial survey block BB-A overlapped in an area of 39,018 km^2. Blocks coloured green to the south and west of Ireland were surveyed by the Irish ObSERVE2 project (from Gilles *et al*., 2023)

Table 13.5: Densities and reference populations for cetacean species in the Regional Marine Mammal Study Area

Species	Management Unit (MU)	Population in MU	Density (animals/km²)					
			SCANS-III Block E	SCANS IV Block CS-D	ObSERVE Phase I (Stratum 5)	ObSERVE Phase I (Stratum 8)	ObSERVE Phase II (Stratum 5)	ObSERVE Phase II (Stratum 6C)
Harbour Porpoise	Celtic and Irish Sea (CIS)	62,517 (48,324 – 80,877)	0.239	0.2803	0.675 (summer 2015) 0.942 (summer 2016)	0.288	0.4158 (summer 2021) 0.262 (summer 2022) 0.379 (winter 2022)	0.1084 (summer 2021) 0.053 (summer 2022) 0.058 (winter 2022)
Bottlenose Dolphin	Irish Sea (IS)	293 (108 – 793)	0.0082	0.2352	0.0106 (summer 2016) 0.0468 (winter 2016)	1.1544 (summer 2016) 0.3538 (winter 2016)	0.059	N/A
Common Dolphin	Celtic and Greater North Sea (CGNS)	102,656 (58,932 – 178,822)	N/A	0.0272	N/A	0.086	0.411 (summer 2022) 0.792 (winter 2022)	2.402 (summer 2021) 1.534 (summer 2022) 0.921 (winter 2022)
Risso's Dolphin	Celtic and Greater North Sea (CGNS)	12,262 (5,227 – 28,764)	0.0313	0.0022	0.0032	0.0565	N/A	N/A
Minke Whale	Celtic and Greater North Sea (CGNS)	20,118 (14,061 – 28,786)	0.0173	0.0137	0.045 (summer 2015) 0.016 (summer 2016)	0.236	0.014 (summer 2021) 0.009 (summer 2022)	0.039

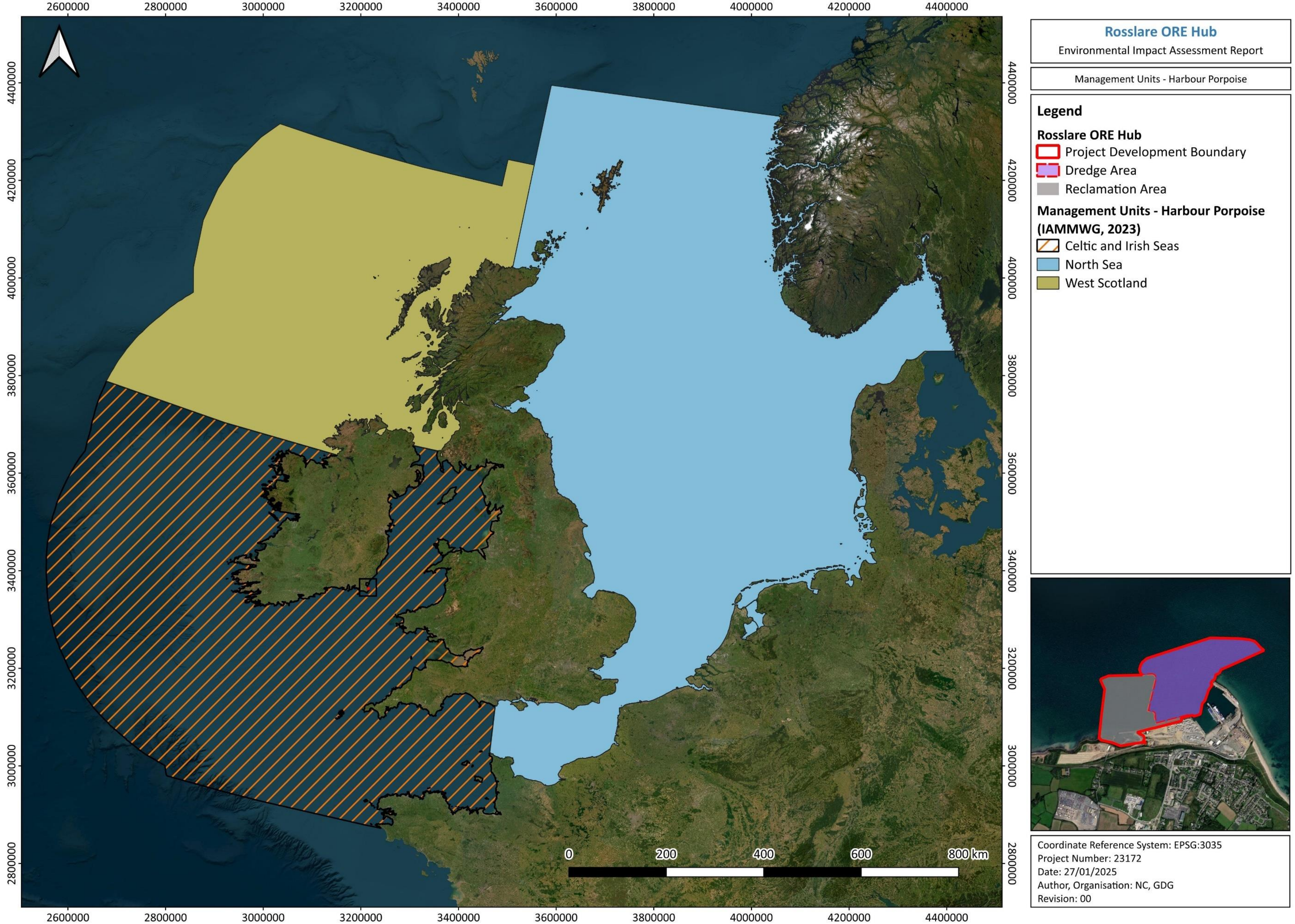

Figure 13.9: Management units for harbour porpoise (IAMMWG, 2023)

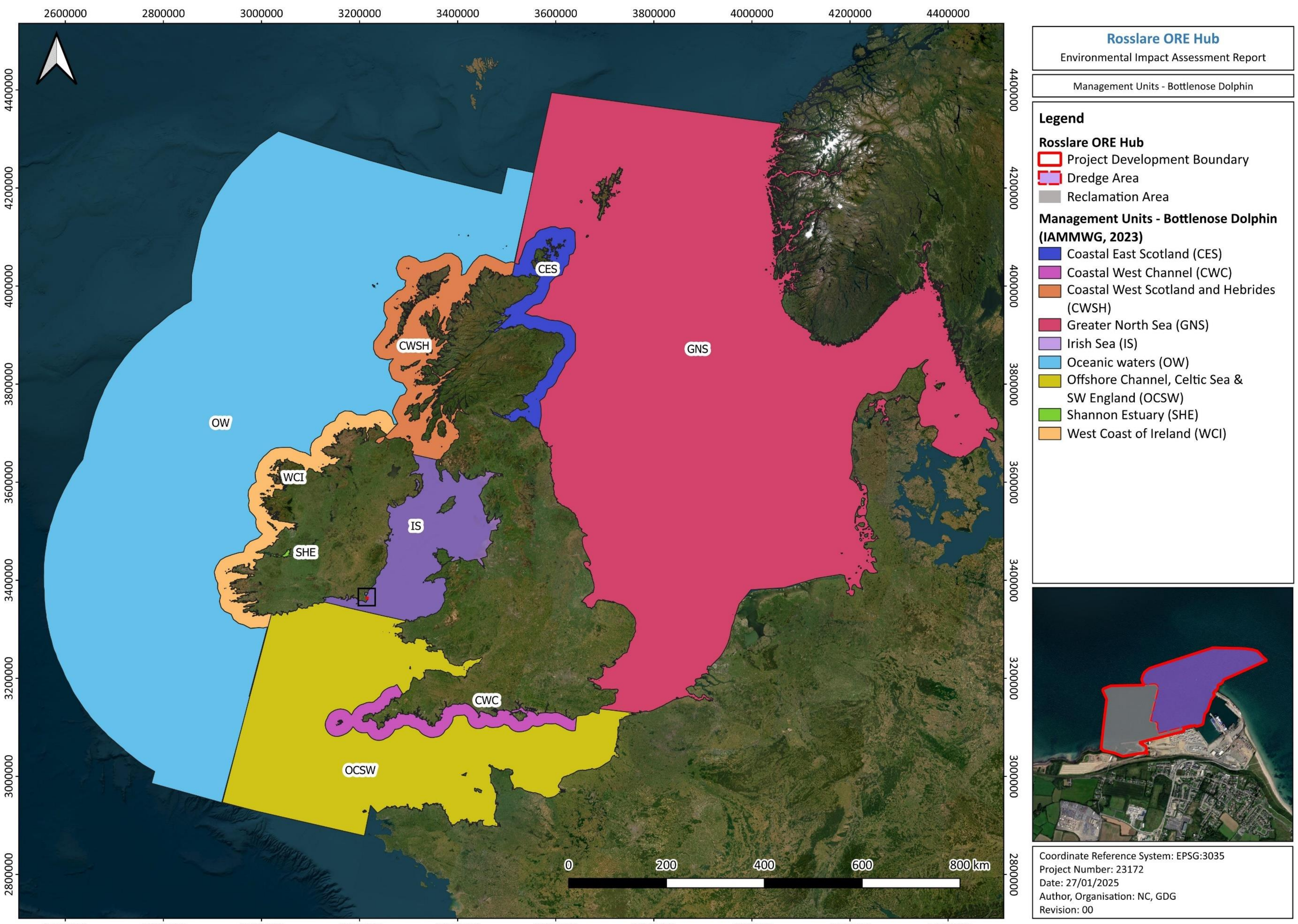

Figure 13.10: Management units for bottlenose dolphin (IAMMWG, 2023)

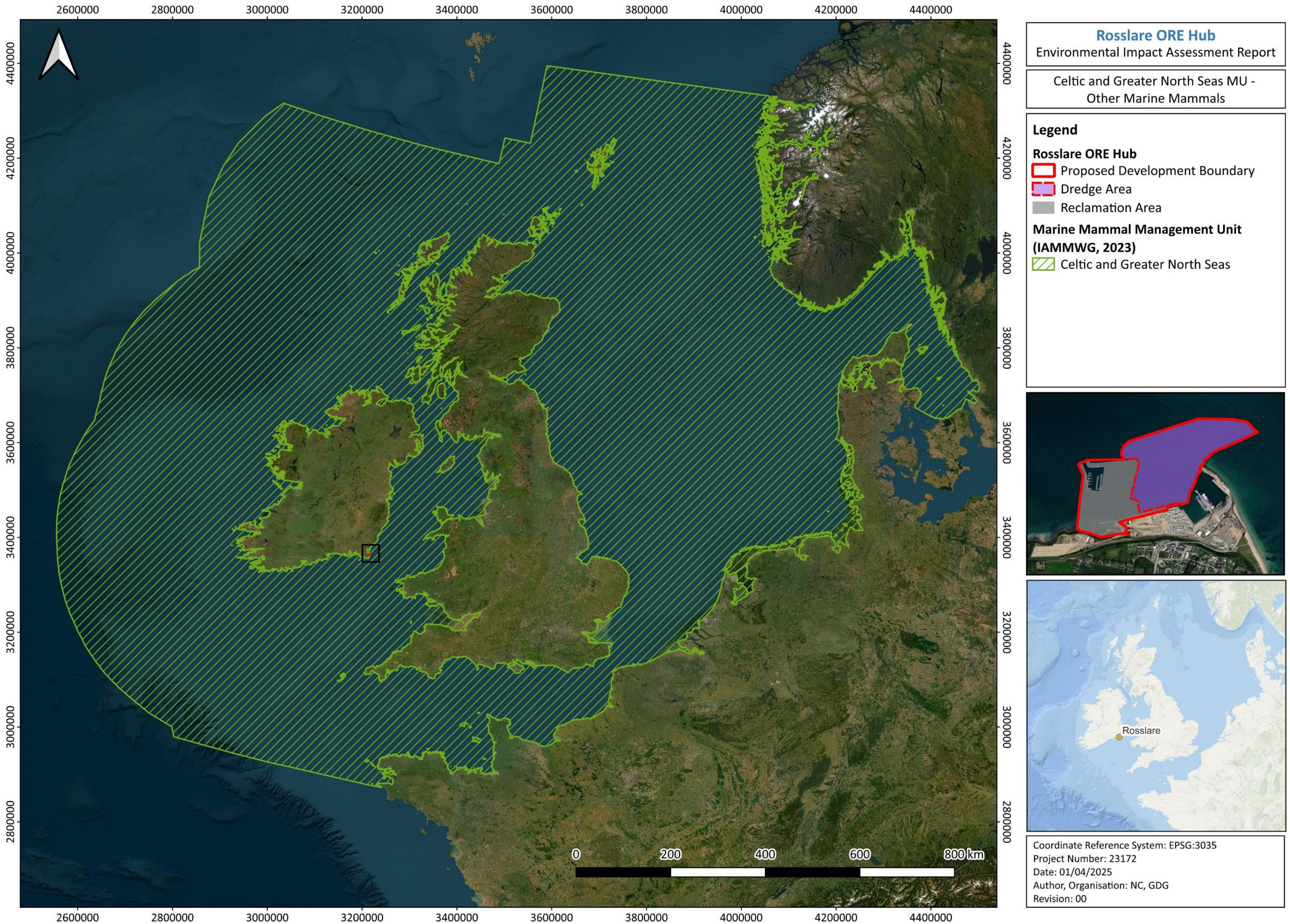

Figure 13.11: Celtic and Greater North Sea management unit for other cetacean species (IAMMWG, 2023)

Harbour Porpoise

Harbour porpoises are the most widely distributed cetacean species in Irish waters, commonly found along the entire coastline, particularly within 10 km of the coast (Berrow *et al.,* 2010). They are mostly observed in shallow coastal waters during the summer, with the highest densities along the south coast in autumn (Marine Institute, 2013). In spring, they are recorded moving further offshore, possibly related to calving activities. Late spring to summer marks the primary calving season, when females seek warmer, calmer, and shallower waters to give birth, offering safety for newborn calves and abundant food resources to support lactating mothers (DCENR, 2015). Mother-calf pairs are frequently observed in these habitats, as calves remain dependent on their mothers for several months (DAHG, 2009).

Harbour porpoises are opportunistic feeders, targeting small schooling fish such as herring, mackerel, and sprat, as well as cephalopods and crustaceans (Rogan *et al*., 2018). Foraging activity is most intensive during late summer and autumn, aligning with prey availability. Coastal waters and offshore banks (< 200 m depth) serve as key foraging grounds, where their echolocation clicks are frequently detected (DAHG, 2009).

This species is classified within the VHF hearing group, with peak auditory sensitivity at frequencies between 100 and 140 kHz, particularly around 130 kHz. This range aligns closely with the frequency of their echolocation clicks, which typically peak at 120 – 130 kHz, allowing them to effectively detect and locate prey in their environment (Au *et al*., 1999; Kastelein *et al*., 2002). Their reliance on echolocation for foraging, navigation, and communication makes them highly sensitive to underwater noise, especially impulsive sounds such as piling (Southall, *et al*., 2019).

Harbour porpoises exhibit high site fidelity, particularly in coastal regions, frequently returning to the same areas over time (IWDG, 2024d; Rogan *et al.,* 2018). However, they are known to avoid areas of high anthropogenic activity, where noise-related impacts may lead to both short-term behavioural changes and longer-term habitat shifts, especially in areas of high porpoise activity (Tougaard *et al.,* 2022).

They are more frequently encountered in the Irish Sea than in the Celtic Sea, likely due to survey effort and sea conditions (Rogan *et al*., 2018). A comparison of the SCANS and SCANS-II surveys (SCANS-II, 2008) indicates a general shift to the southwest and an increase in the harbour porpoise population over time.

In ObSERVE Phase I, harbour porpoises were the most abundant cetacean in Stratum 5 (Irish Sea), with peak densities of 1.046 individuals per km² in summer and 0.867 individuals per km² in winter, compared to lower densities in Stratum 8 (south and west) (Figure 13.12:; Rogan *et al*., 2018). A similar pattern was recorded during ObSERVE Phase II with the highest density recorded in Stratum 5 at 0.4158 individuals per km² during summer 2021, while densities in the coastal strata (6A - 6C), were comparatively lower (Figure 13.13:; Giralt Paradell *et al.*, 2024).

SCANS surveys corroborate these findings. In SCANS III Block E, the estimated density was 0.239 individuals per km² with an abundance of 8,320 individuals (range: 4,643 – 14,354) (Figure 13.14:; Hammond *et al*., 2021). The SCANS IV Block CS-D survey reported a density of 0.2803 individuals per km², with an estimated abundance of 9,773 individuals (range: 4,764 – 18,125) (Figure 13.14; Gilles *et al*., 2023).

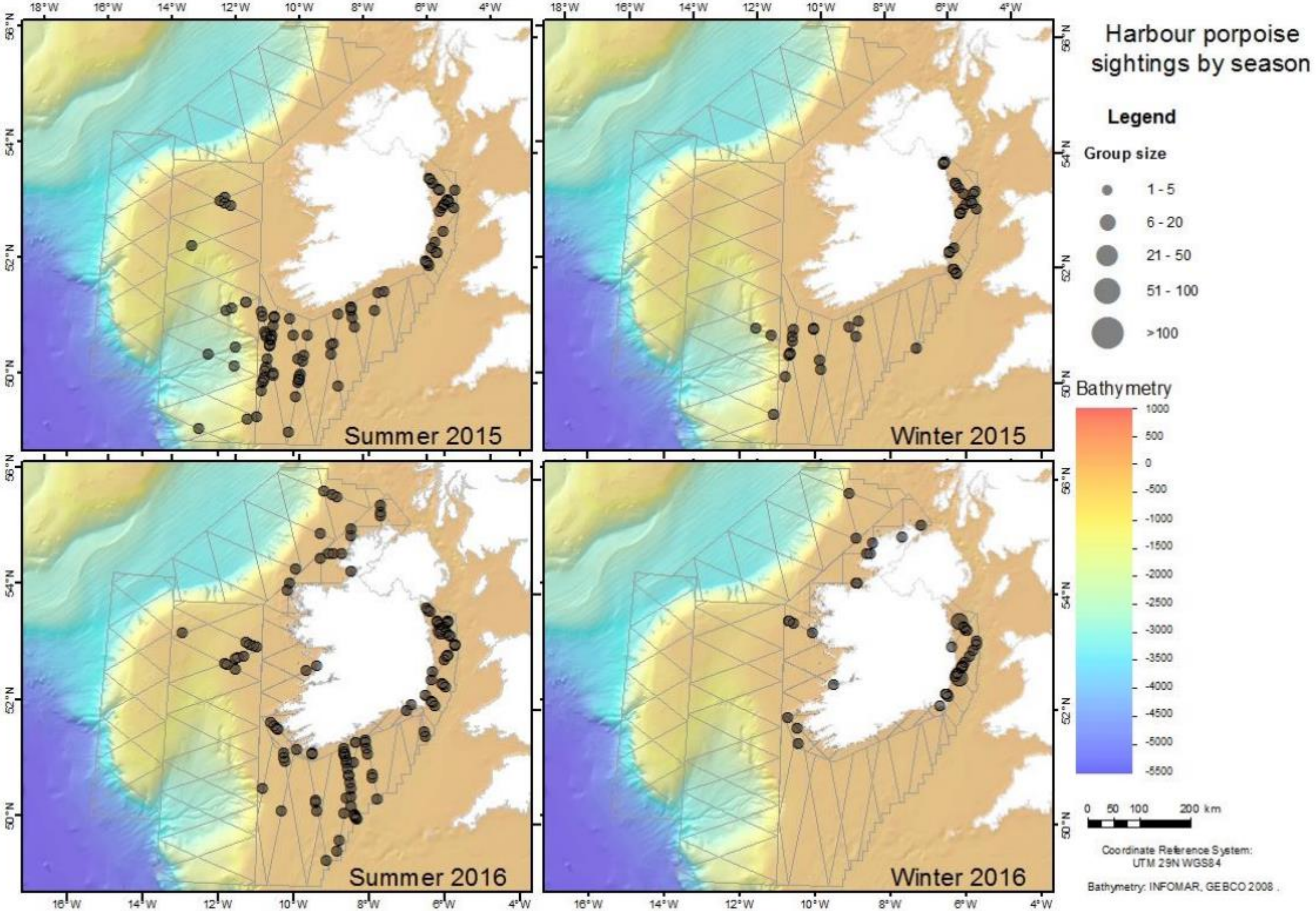

Figure 13.12: Sightings of harbour porpoise in each survey period during ObSERVE Phase I. Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the estimated number of porpoises seen in each sighting (from Rogan *et al.*, 2018).

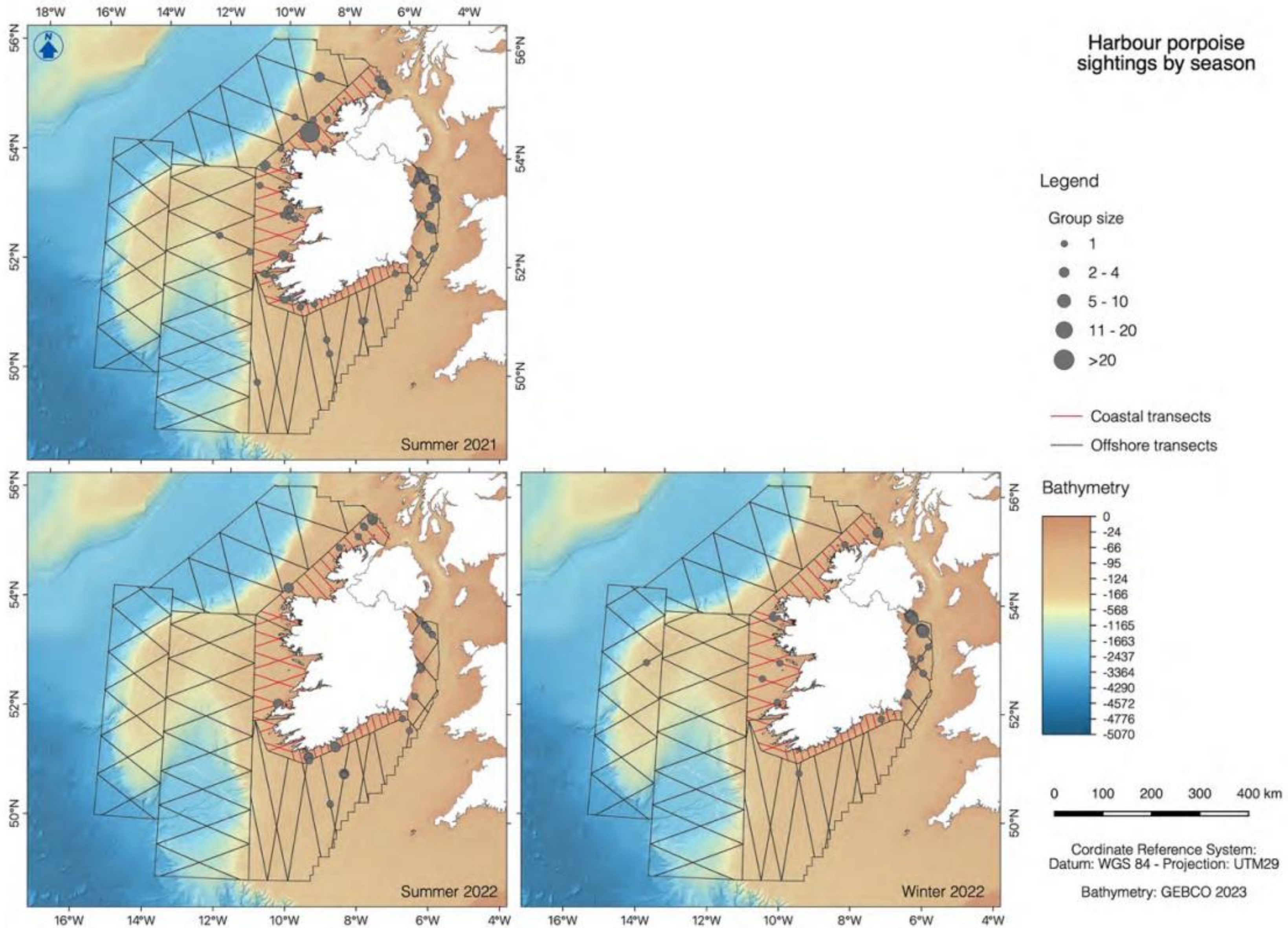

Figure 13.13: Sightings of harbour porpoise in each survey period during ObSERVE Phase II. Note that no surveys were carried out in winter 2021. Grey lines indicate the survey tracklines in the offshore strata and red lines indicate the tracklines in the coastal strata. Circles are proportional to the number of porpoises in each sighting (from Giralt Paradell *et al*., 2024).

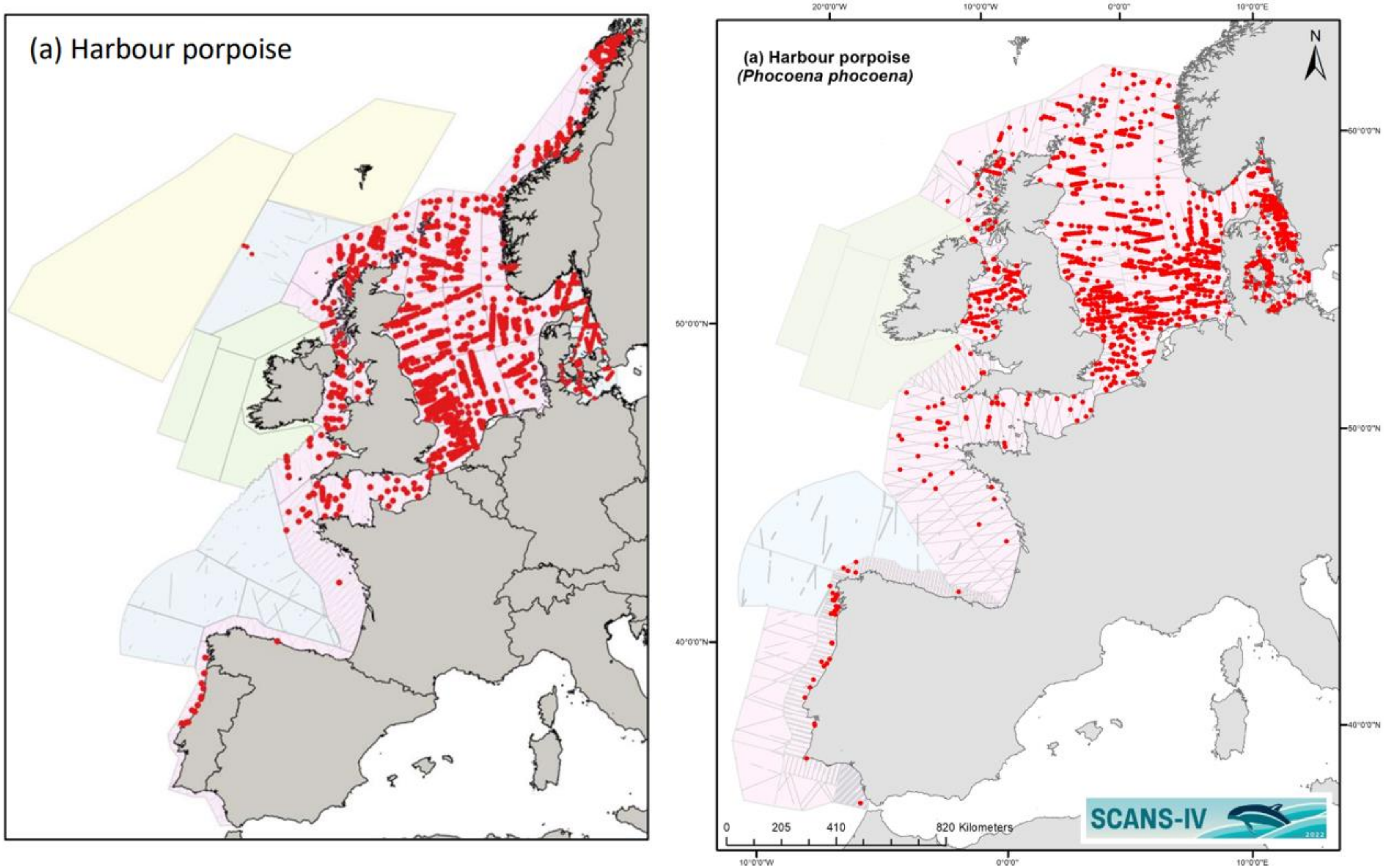

Figure 13.14: Distribution of sightings used in the analyses of SCANS III (left) and IV (right) surveys. Underlying effort is that used in the analysis: aerial survey - good and moderate sighting conditions; ship survey - Beaufort 0-2 for harbour porpoise (adapted from Hammond *et al*., 2021 and Gilles *et al*., 2023).

Bottlenose Dolphin

Bottlenose dolphins are a large, robust, and gregarious species with an average body length of 1.9 m – 3.8 m, found in tropical and temperate waters worldwide (Wall *et al*., 2013). In Ireland, this species exhibits both coastal and offshore distributions, with most sightings recorded off the western seaboard and in the Celtic Sea, although they are also found in the Irish Sea and in waters along the continental shelf edge (DAHG, 2009; Rogan *et al*., 2018; Waggitt *et al*., 2020). Seasonal variations in distribution are observed, with dolphins frequenting coastal areas during summer and shifting to deeper offshore waters during winter (Rogan *et al*., 2018). Along the south coast, bottlenose dolphins are generally uncommon, except for a small semi-resident population in Cork Harbour, where larger numbers are observed during summer. These semi-resident dolphins demonstrate more regular site fidelity in Cork Harbour compared to other coastal areas (Ryan *et al*., 2010). Bottlenose dolphins exhibit a combination of residency and long-distance movement patterns. Photo-identification (Photo-ID) studies have revealed their mobility, with individuals travelling between sites 130 – 650 km apart over periods ranging from 26 to 760 days (O'Brien *et al*., 2009). While some populations, such as those in Cork Harbour, show semi-residency, offshore populations are highly mobile, regularly traversing wide areas in search of prey or favourable conditions.

Foraging behaviour in bottlenose dolphins reflects their adaptability to various habitats. They primarily prey on fish such as mackerel, herring, and cod, as well as squid and other cephalopods. Coastal populations often hunt in shallow waters, using cooperative hunting strategies such as corralling fish against sandbanks, while offshore populations tend to rely on deeper prey species and adjust techniques based on prey availability (Wall et al., 2013; Rogan et al., 2018).

Calving in bottlenose dolphins occurs mainly in spring and summer, though births may occur year-round. Females give birth in sheltered, productive coastal areas, providing protection and abundant prey to support lactation. Calves are nursed for up to two years and remain close to their mothers, learning essential foraging and social behaviours within the pod (DAHG, 2009). Notable calving activity has been observed in semi-resident populations such as those in Cork Harbour (Ryan *et al*., 2010).

They are classified within the HF hearing group, with peak sensitivity between 40 and 100 kHz, aligning with the frequency of their echolocation clicks, which typically range from 40 to 120 kHz (Au, 1993; Richardson *et al*., 1995). This enables efficient echolocation and acoustic communication for foraging, navigation, and complex social interactions; however, this makes them vulnerable to underwater noise, including impulsive sounds such as piling (Southall *et al*., 2019).

Surveys indicate variation in bottlenose dolphin densities across regions. During ObSERVE Phase I, no bottlenose dolphins were recorded in the Irish Sea (Stratum 5); they were most abundant in the south and west (Stratum 8), with an estimated density of 1.161 individuals per km² in summer and 0.342 individuals per km² in winter, and an estimated abundance of 11,266 individuals in summer (range: 3,579 – 35,464) and 3,322 individuals in winter (range: 1,303 –8,471) (Figure 13.15; Rogan *et al.,* 2018). In ObSERVE Phase II, bottlenose dolphins were only observed sporadically in the coastal strata and the Irish Sea (Stratum 5), with a model-based density estimate of 0.059 dolphins per km² in summer 2022, and no sightings recorded off the south coast (Stratum 6C Figure 13.16:; Giralt Paradell *et al*., 2024).

During SCANS III, relatively low densities of bottlenose dolphins were recorded in Block E (overlapping Stratum 5) with an estimated density of 0.0082 individuals per km^2 and an abundance of 288 individuals (range: 0 – 664) (Figure 13.17:; Hammond *et al*., 2021). In SCANS IV, Block CS-D recorded a higher density of 0.24 individuals per km^2 and an abundance of 8,199 individuals (range: 3,595 – 15,158) (Figure 13.17:; Gilles *et al.*, 2023).

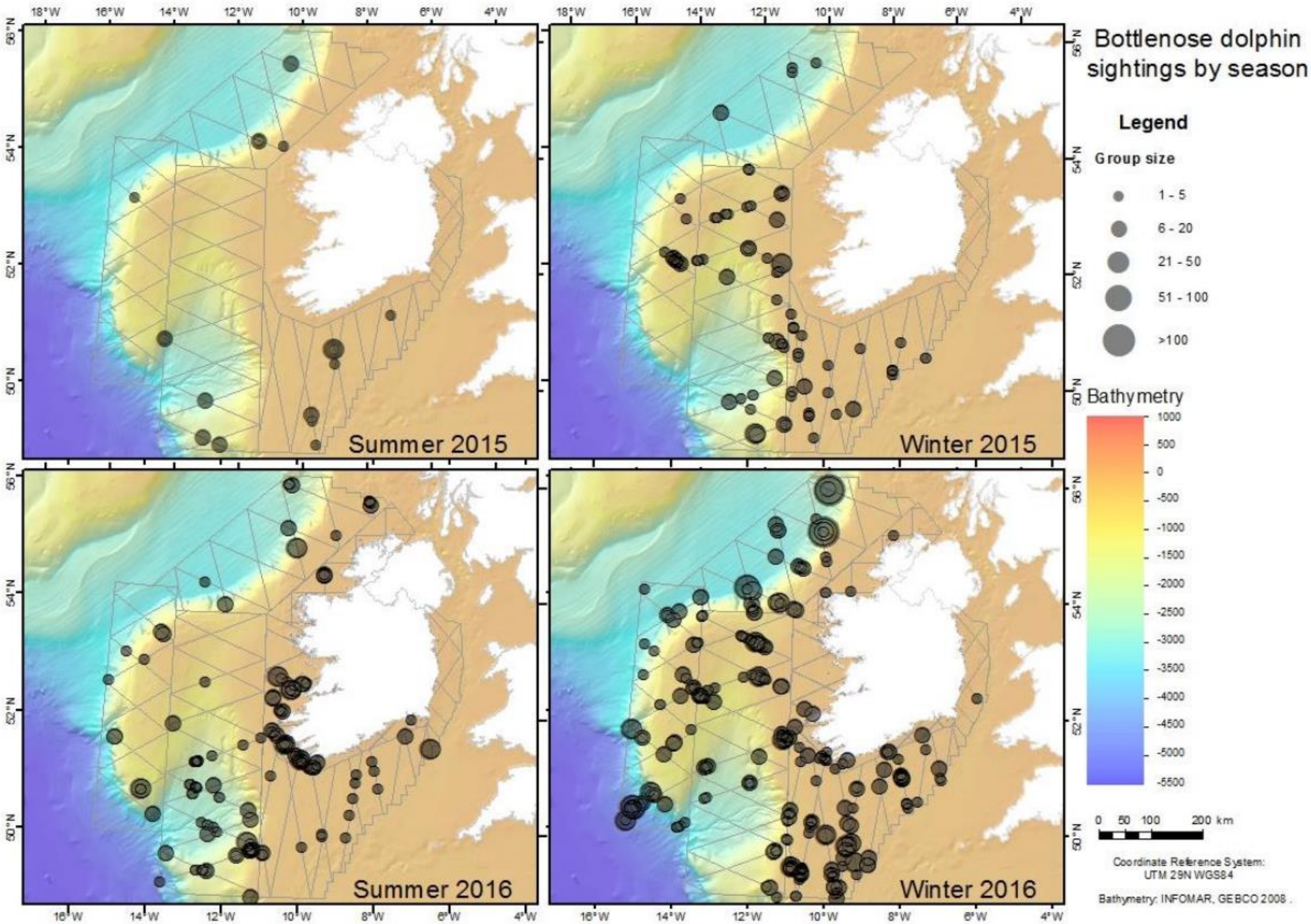

Figure 13.15: Sightings of bottlenose dolphin in each survey period during ObSERVE Phase I. Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the estimated number of dolphins seen in each sighting (from Rogan et al.,

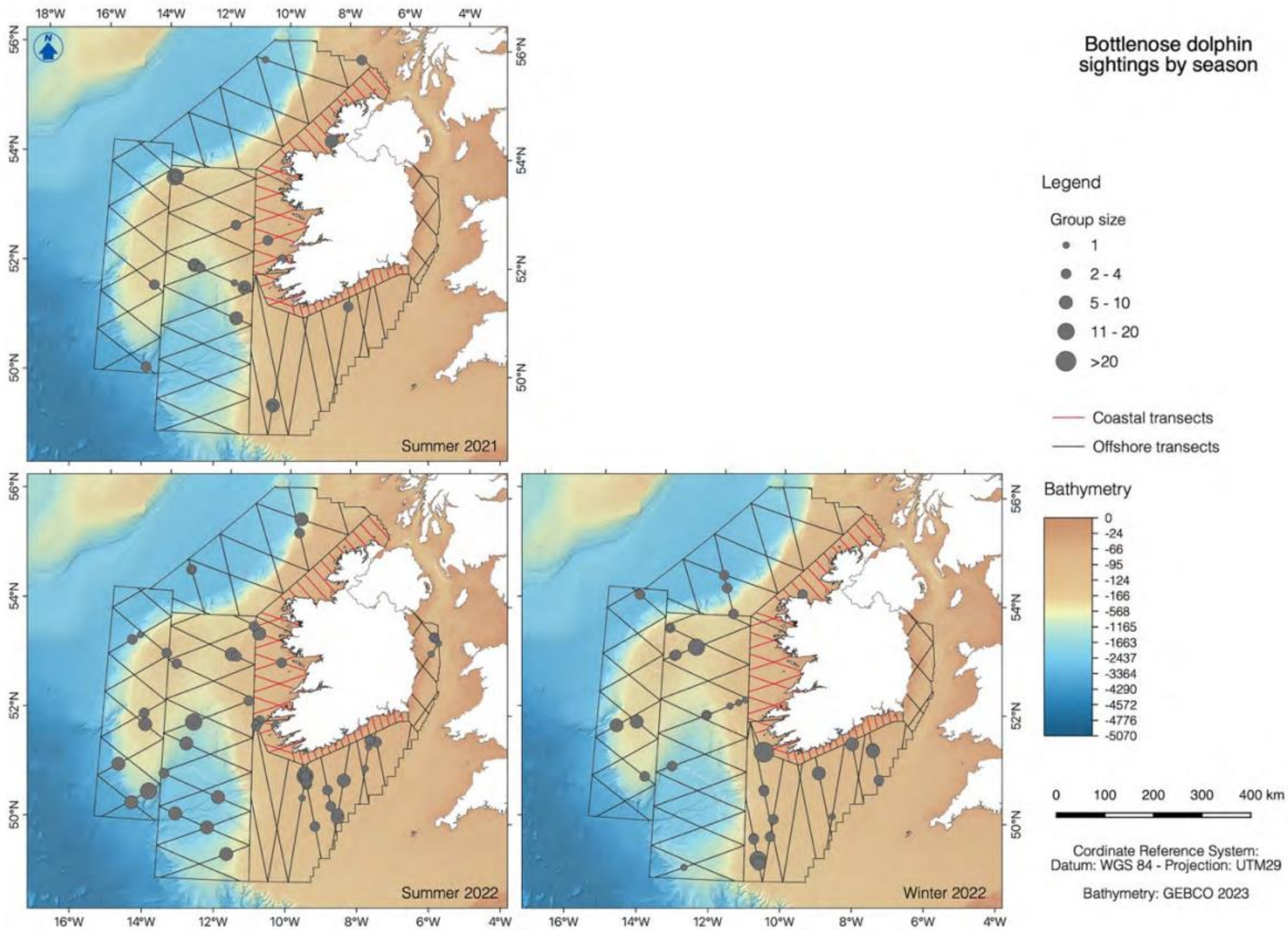

Figure 13.16: Sightings of bottlenose dolphin in each survey period during ObSERVE Phase II. Note that no surveys were carried out in winter 2021. Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the estimated number of dolphins seen in each sighting (from Giralt Paradell et al., 2024).

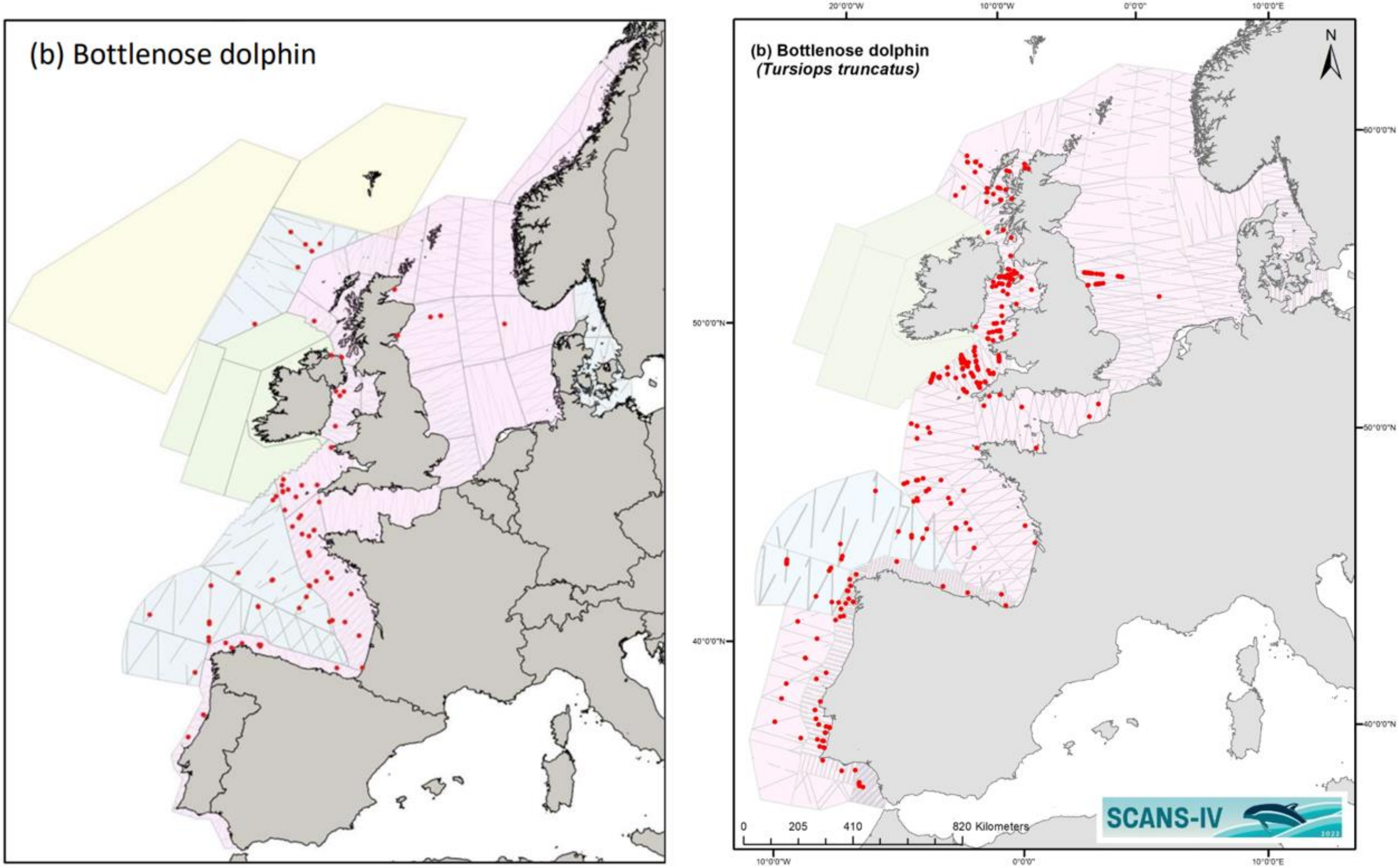

Figure 13.17: Distribution of sightings used in the analyses of SCANS III (left) and IV (right) surveys. Underlying effort is that used in the analysis: aerial survey - good and moderate sighting conditions; ship survey - Beaufort 0-4 for bottlenose dolphin (adapted from Hammond et al., 2021 and Gilles et al., 2023).

Common Dolphin

The short-beaked common dolphin is Ireland's most abundant cetacean species and the second most frequently reported species after the harbour porpoise[1] (Berrow *et al*., 2010). It is found in all Irish waters, with the highest abundance along the south and southwest coasts, typically in waters deeper than 50 m, where it is often observed in large groups (DAHG, 2009; Evans & Waggitt, 2020, 2023; Wall *et al*., 2013). Seasonal movement patterns show that common dolphin typically move offshore during the summer, forming large groups or superpods with hundreds of individuals, and migrate inshore during autumn. These movements, which continue eastward over the winter, are likely linked to prey availability, including pelagic fish such as mackerel, herring, and sprat (Marine Institute, 2013), as well as environmental conditions and reproductive behaviours (Berrow *et al*., 2010). Sightings peak off County Kerry in late summer, off County Cork from September to January, and off County Waterford from November to February (Berrow *et al*., 2010).

Foraging is a key driver of their movement patterns. Common dolphins frequently target areas of high prey concentration, exhibiting cooperative feeding behaviours such as herding schools of fish into dense aggregations to facilitate capture. Offshore banks and continental shelf waters are important feeding grounds during the summer, while inshore waters become more significant in autumn as prey species migrate closer to the coast (Marine Institute, 2013; DAHG, 2009).

Calving occurs primarily in late spring to early summer. Females give birth to a single calf in warm, productive offshore areas where prey availability can sustain the increased energy demands of lactation. Calves stay close to their mothers for several months, forming part of tightly-knit pods that provide protection and social learning opportunities (Evans & Waggitt, 2020).

Common dolphins are classified within the HF hearing group, with peak auditory sensitivity between 40 and 100 kHz and echolocation clicks typically ranging from 40 to 120 kHz. This enables them to detect prey, navigate and communicate effectively in complex marine habitats (Au, 1993; Richardson *et al*., 1995), but it also makes them vulnerable to underwater noise, particularly impulsive sounds such as piling (Southall, *et al*., 2019).

Survey results highlight regional variations in density and abundance. In ObSERVE Phase I, no common dolphins were detected in Stratum 5 (Irish Sea). In Stratum 8 (south and west), summer densities were relatively low, estimated at 0.056 individuals per km², equating to an abundance estimate of 1,319 individuals (range: 753 – 2,308), while winter densities dropped to 0.033 individuals per km², with an estimated abundance of 778 individuals (range: 325 – 1,862) (Figure 13.18; Rogan *et al*., 2018). ObSERVE Phase II recorded low densities off the southeast coast, with model-based density estimates of 0.411 dolphins per km² in summer and 0.792 dolphins per km² in winter 2022, but no sightings were recorded in coastal waters off the south coast (Stratum 6C; Figure 13.19; Giralt Paradell *et al*., 2024).

SCANS III survey did not provide density or abundance estimates for Block E (Figure 13.20; Hammond *et al.*, 2021). However, in SCANS IV, Block CS-D recorded a density of 0.0272 individuals

[1] The harbour porpoise is commonly reported in cetacean surveys and sightings around Ireland, which makes it the most frequently reported species, despite the common dolphin being more numerous overall

per km², with an estimated abundance of 949 individuals (range: 32 – 2,990) (Figure 13.20; Gilles *et al*., 2023).

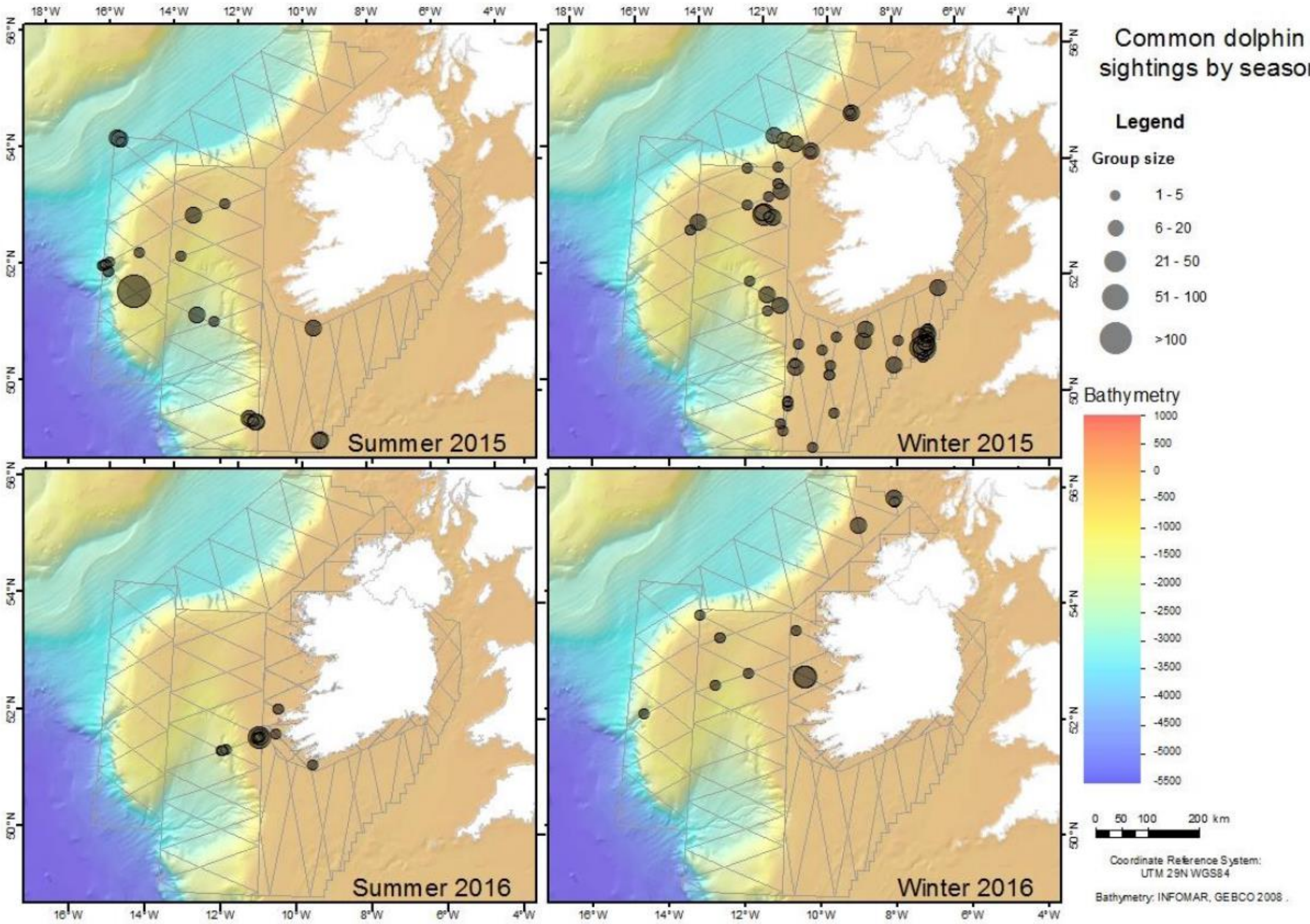

Figure 13.18: Sightings of common dolphin in each survey period during ObSERVE Phase I. Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the estimated number of dolphins seen in each sighting (from Rogan et al., 2018).

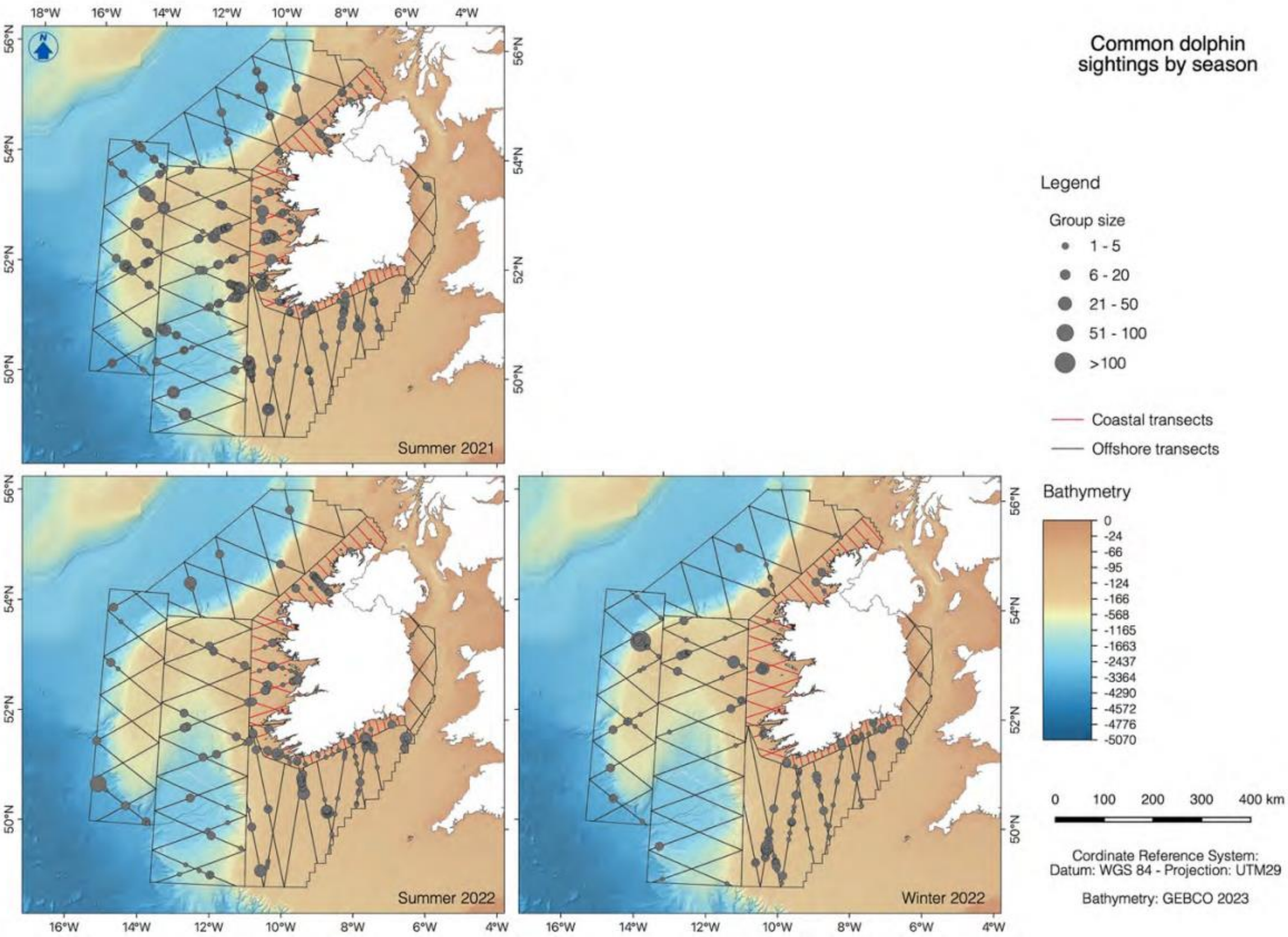

Figure 13.19: Sightings of common dolphin in each survey period during ObSERVE Phase II. Note that no surveys were carried out in winter 2021. Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the estimated number of dolphins seen in each sighting (from Giralt Paradell et al., 2024).

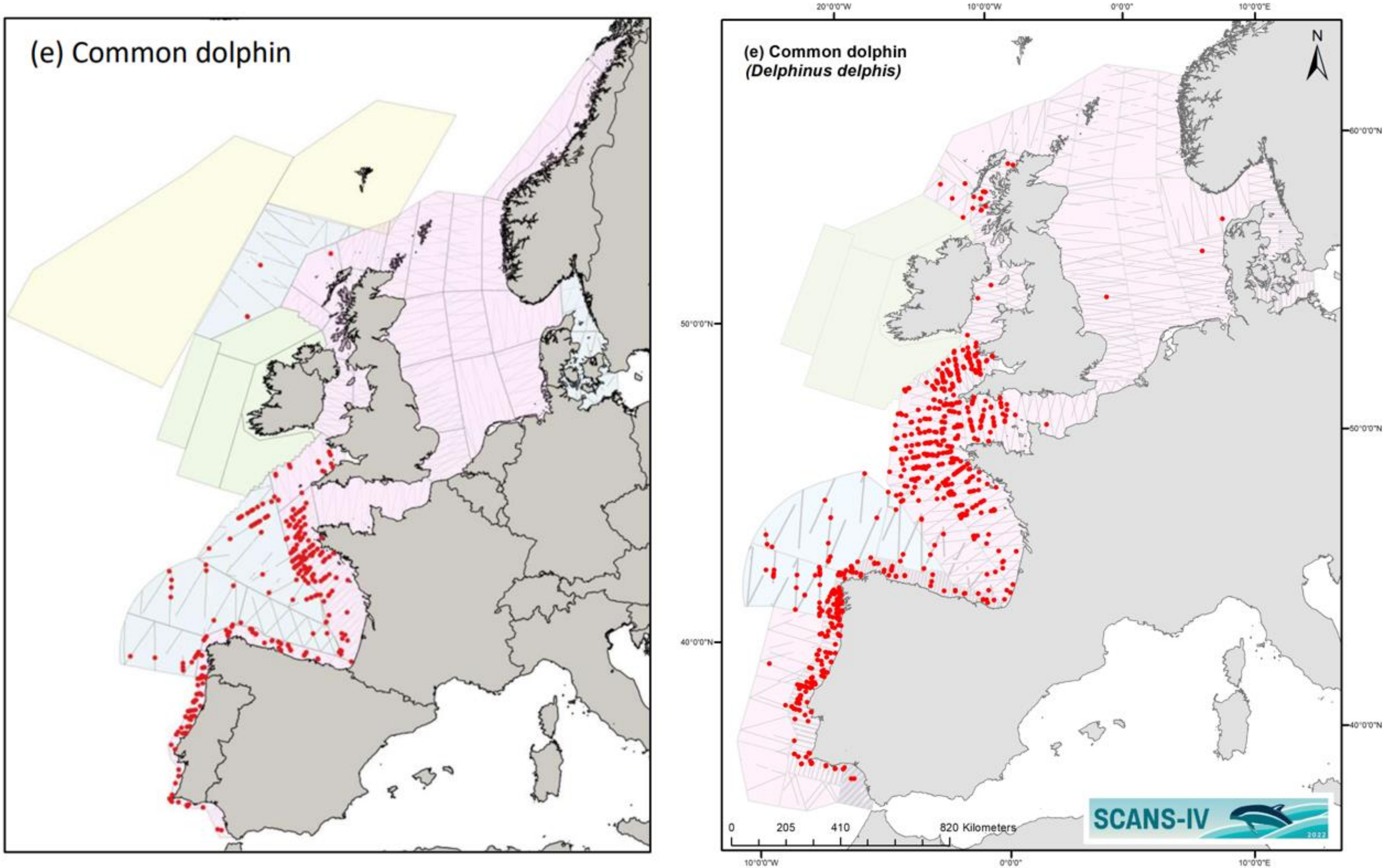

Figure 13.20: Distribution of sightings used in the analyses of SCANS III (left) and IV (right) surveys. Underlying effort is that used in the analysis: aerial survey - good and moderate sighting conditions; ship survey - Beaufort 0-4 for common dolphin (adapted from Hammond et al., 2021 and Gilles et al., 2023).

Risso's Dolphin

Risso's dolphins are frequently observed in Irish waters, exhibiting a distinct preference for inshore waters and offshore islands during summer. Key areas include the Saltee Islands off County Wexford, the County Cork coast, and the Blasket Islands off County Kerry. This preference contrasts with their typical habitat in deeper waters elsewhere in the world (IWDG, 2024a). Their distribution is most concentrated along the northwest and southeast coasts, and most records in the UK and Ireland are within 11 km of the shore (DAHG, 2009; Evans & Waggitt, 2020, 2023). Seasonal movements show individuals migrating inshore during late spring and summer, likely following prey aggregations, and returning offshore in winter as cephalopod availability shifts (Berrow *et al*., 2010; Wall *et al.,* 2013; Marine Institute, 2013)). Photo-identification studies suggest some level of residency, particularly along the southeast and northwest coasts, although the species is also known for its long-range movements across open oceanic habitats (IWDG, 2024a; DAHG, 2009).

Risso's dolphins forage primarily on cephalopods, particularly squid and octopus, which are abundant in coastal and continental shelf waters during summer. Foraging often involves nocturnal hunting, exploiting the vertical migrations of prey in deeper water columns. This prey preference is a key driver of their seasonal movements closer to shore (DAHG, 2009; Evans & Waggitt, 2020).

Calving occurs in summer and early autumn when prey availability peaks, providing a rich food source to support lactating females. Sheltered coastal areas, particularly near offshore islands, likely serve as key calving and nursery grounds. Calves remain closely associated with their mothers for up to two years, learning foraging techniques and social behaviours within these pods (Berrow *et al*., 2010; Wall *et al*., 2013).

Risso's dolphins are classified within the HF hearing group, with peak auditory sensitivity ranging between 40 and 80 kHz, though they can detect sounds up to 150 kHz. Their echolocation clicks typically range from 40 kHz to 100 kHz, which they use primarily for navigation and foraging in deep waters. They also use clicks, whistles, and burst-pulse sounds for social interactions. Their reliance on sound makes them vulnerable to anthropogenic noise, particularly from shipping, sonar, and seismic exploration, which can disrupt echolocation and communication.

Survey data indicate variations in density and abundance. In 2010, Berrow *et al.* reported frequent sightings of Risso's dolphins in the Irish Sea, with counties Wicklow and Wexford accounting for 41% of all inshore sightings. During the 2014 Celtic Sea Herring Acoustic Survey (CSHAS), a Risso's dolphin was recorded outside Cork Harbour (Nolan *et al*., 2014), but none were observed off the south coast of Ireland between 2016 and 2020.

During ObSERVE Phase I, low densities of Risso's dolphins were recorded in the Irish Sea (Stratum 5) in summer 2015, with an estimated density of 0.0032 individuals per km² and an abundance of 35 individuals (range: 7 – 188). In Stratum 8 (south and west), densities were higher, at 0.0565 individuals per km², with an estimated abundance of 548 individuals (range: 204 – 1,477) (Figure 13.21; Rogan *et al.,* 2018). During ObSERVE Phase II, sporadic sightings occurred in the Irish Sea (Stratum 5) in summer 2022; however, no abundance estimates were generated due to the low number of sightings (Figure 13.22; Giralt Paradell *et al.,* 2024).

SCANS III data for Block E estimated a density of 0.313 individuals per km² in waters north of Rosslare, with an estimated abundance of 1,090 individuals (range: 0 – 2,843) (Figure 13.23;

Hammond *et al*., 2021). In SCANS IV, Block CS-D recorded a density of 0.0022 individuals per km² and an estimated abundance of 75 individuals (range: 2 – 259) (Figure 13.23; Gilles *et al.,* 2023).

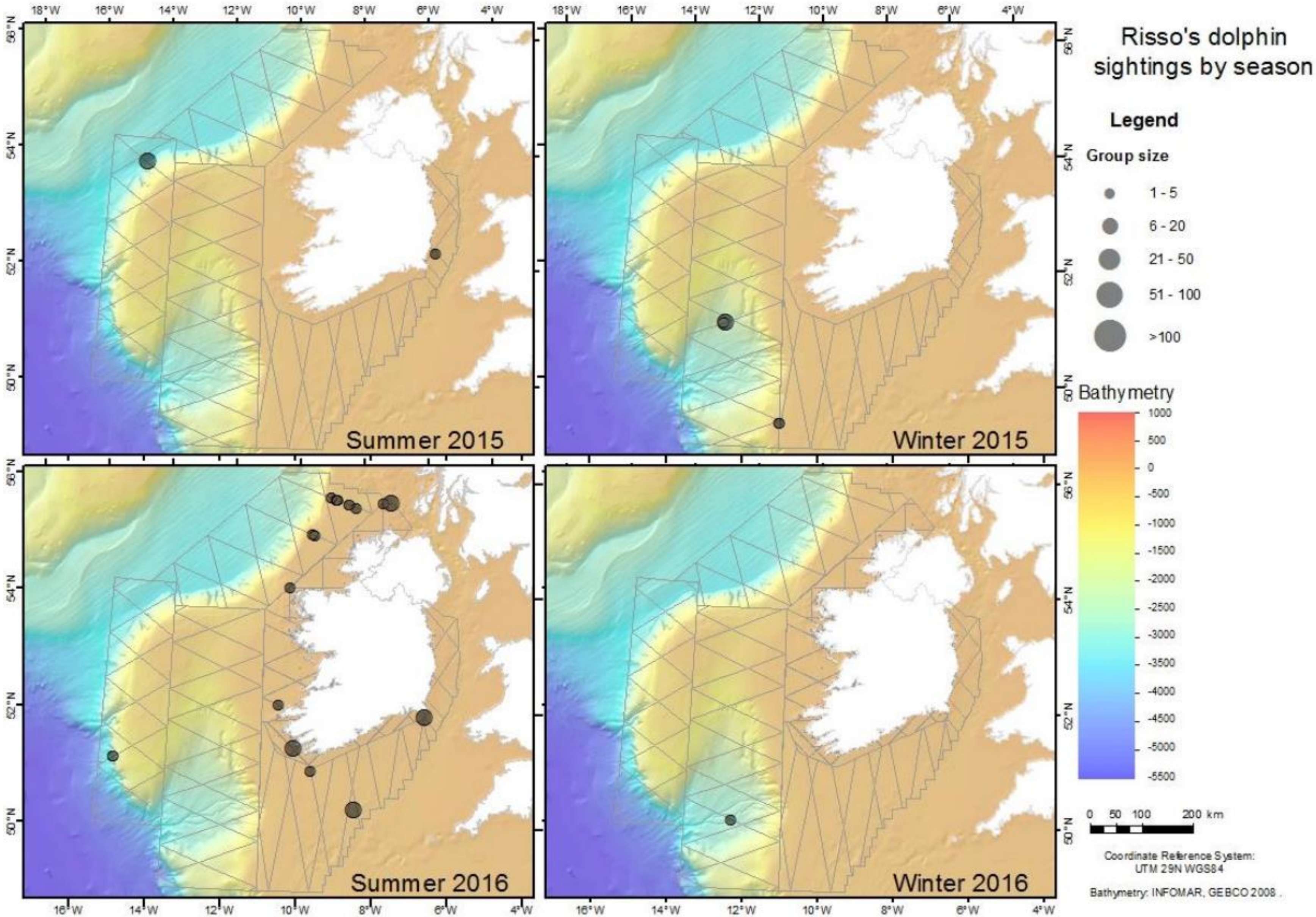

Figure 13.21: Sightings of Risso's dolphin in each survey period during ObSERVE Phase I. Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the estimated number of dolphins seen in each sighting (from Rogan *et al*., 2018)

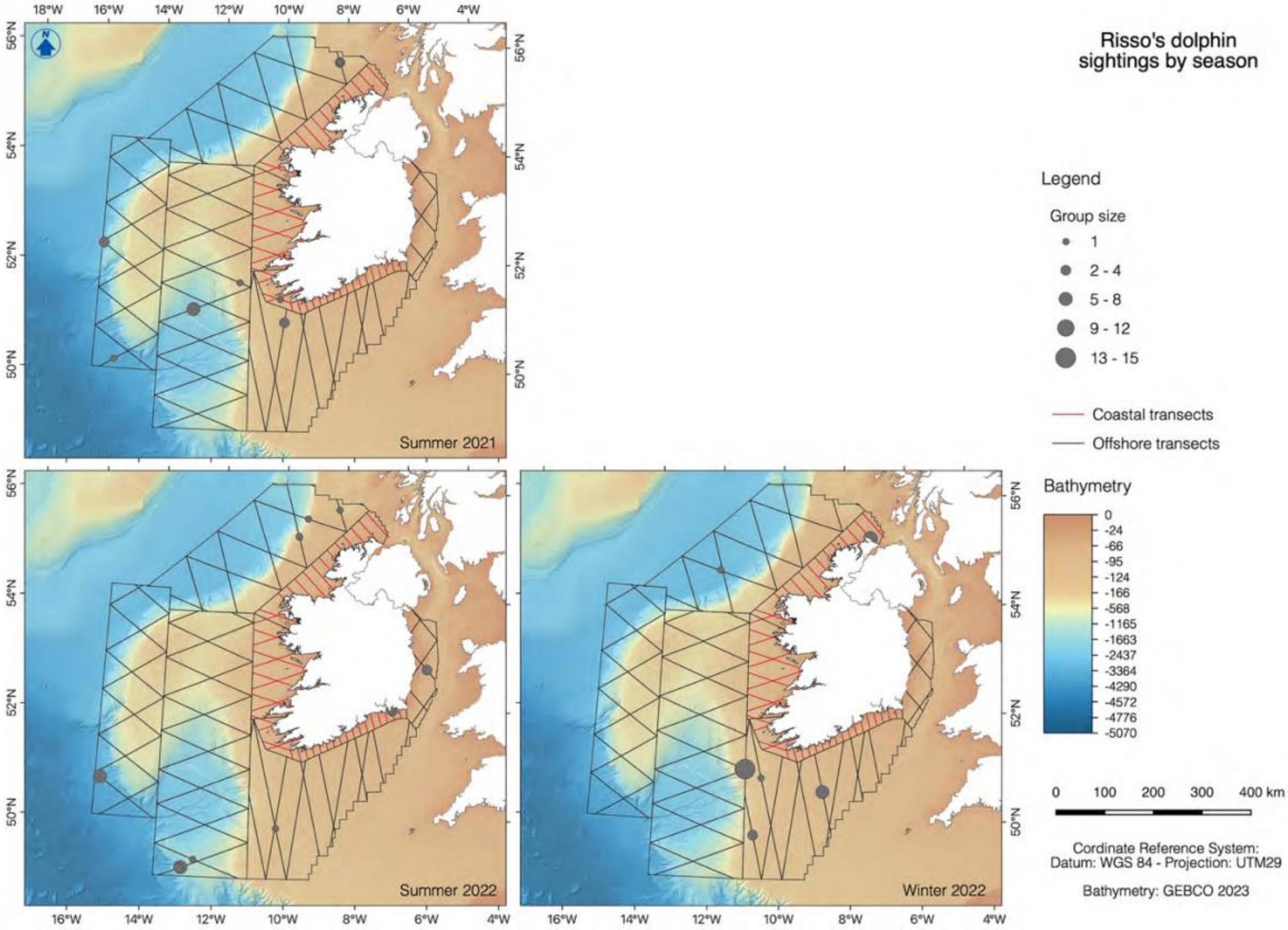

Figure 13.22: Sightings of Risso's dolphin in each survey period during ObSERVE Phase II. Note that no surveys were carried out in winter 2021. Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the estimated number of dolphins seen in each sighting (from Giralt Paradell *et al.*, 2024)

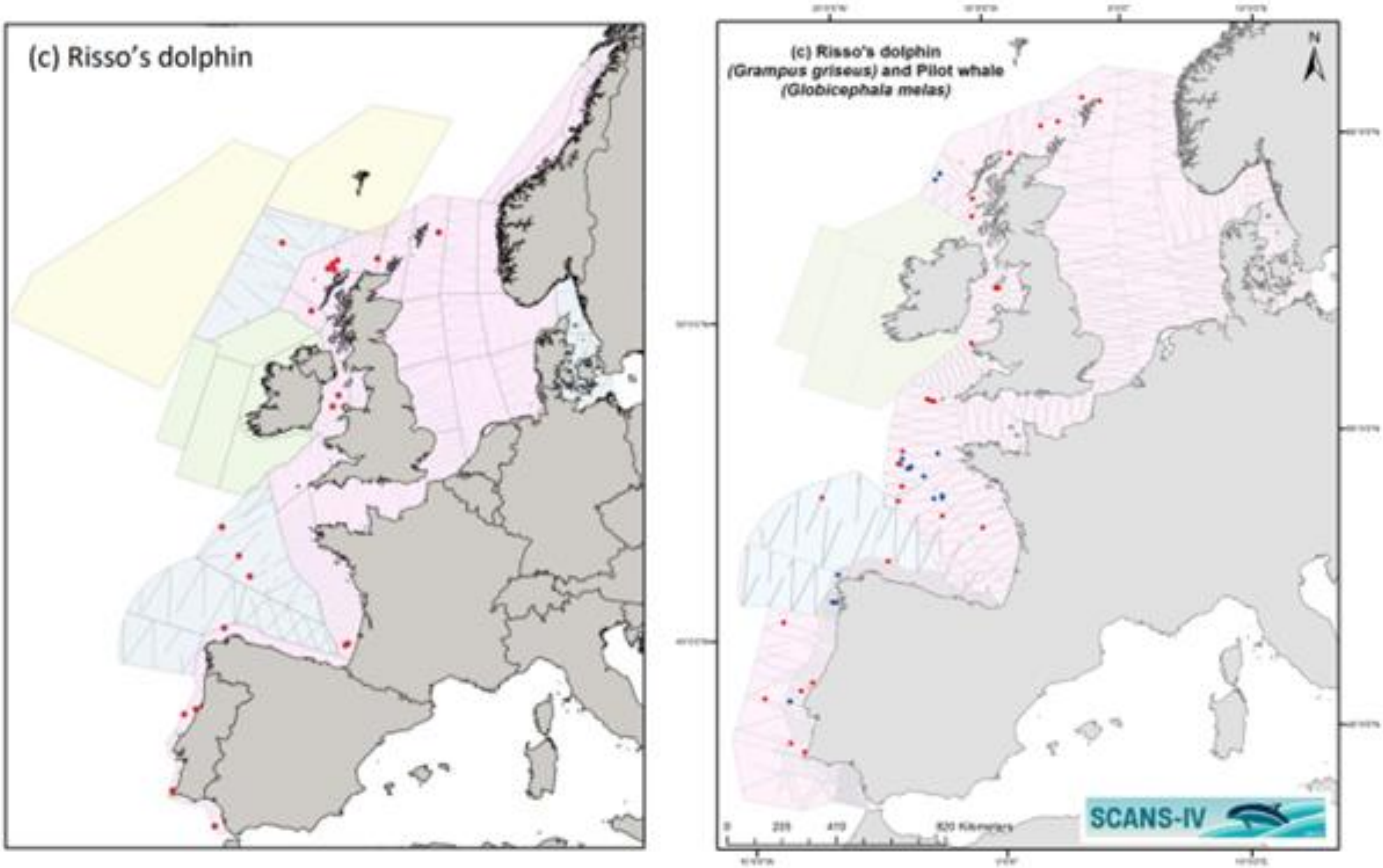

Figure 13.23: Distribution of sightings used in the analyses of SCANS III (left) and IV (right) surveys. Underlying effort is that used in the analysis: aerial survey - good and moderate sighting conditions; ship survey - Beaufort 0-4 for Risso's dolphin. Risso's dolphin are represented as red dots in SCANS IV sightings map (adapted from Hammond *et al*., 2021 and Gilles *et al*., 2023)

White-beaked Dolphin

White-beaked dolphins are easily identified by their relatively short beak and tall, curved dorsal fin. They occasionally breach and are sometimes seen associating with other marine species or near vessels, although they are not frequent bow-riders (IWDG, 2024b). In Irish waters, white-beaked dolphins are relatively rare, with most sightings historically reported off the west coast. Occasional sightings off County Wexford prior to 2010 suggested their potential presence in the region, albeit in low numbers (Lysaght & Marnell, 2016). However, more recent surveys have not recorded this species in the area. The species is sporadic in Irish waters, with occasional records from the Irish Sea, such as the single sighting during summer 2022 (Rogan *et al*., 2018; Giralt Paradell *et al*., 2024).

White-beaked dolphins are opportunistic feeders, primarily targeting midwater schooling fish such as herring, mackerel, and cod, along with cephalopods and other invertebrates. They are known to forage in cold-temperate and subarctic waters, often near underwater features like banks or shelf edges where prey is abundant. Their distribution and seasonal movements are closely linked prey availability, which influence their presence in coastal and shelf waters during summer and autumn. Observations in Irish waters suggest that foraging activity may be limited due to the species' rarity and low population density in the region (DAHG, 2009; Evans & Waggitt, 2020, 2023; IWDG, 2024b).

This species is classified within the HF hearing group, with peak auditory sensitivity generally above 150 kHz (Southall *et al*., 2019). Like other odontocetes, they rely heavily on echolocation for foraging, navigation, and social communication. Their acute hearing sensitivity to high-frequency sounds enables them to detect small prey within their environment (e.g., Yang *et al*., 2021). However, this heightened sensitivity also makes them vulnerable to anthropogenic noise, particularly from activities like seismic surveys, sonar, and vessel traffic, which can interfere with their communication and foraging abilities (Southall *et al*., 2008).

Information on calving in Irish waters is sparse, but calving typically occurs in summer or early autumn in other parts of the white-beaked dolphin's range. Calves are occasionally observed in regions of high prey abundance, suggesting that these areas may serve as seasonal nursery grounds. The single sighting during the ObSERVE Phase II survey involved an adult individual, with no evidence of calves observed in Irish waters to date (Giralt Paradell *et al*., 2024).

Survey data confirm the rarity of white-beaked dolphins in Irish waters. No evidence of this species was recorded during ObSERVE Phase I (Rogan *et al*., 2018), SCANS III (Block E) (Figure 13.7; Hammond *et al*., 2021), or SCANS IV (Block CS-D) (Figure 13.8; Gilles *et al*., 2023). However, the ObSERVE Phase II survey recorded a single individual in the Irish Sea in summer 2022, providing the first evidence of the species in the region in recent years (Giralt Paradell *et al*., 2024).

Killer Whale

Killer whales, the largest members of the delphinid family, can reach lengths of up to 9.5 m. As the most widely distributed cetacean globally (Shirihai & Jarrett, 2006), killer whales have been recorded off all Irish coasts across all seasons, though sightings are notably rarer in the Irish Sea. They are predominantly found in shallow continental shelf waters (DAHG, 2009). Off Ireland's south coast, a small number of killer whales are observed, primarily during summer (Wall *et al*., 2013), including occasional records in waters off County Wexford (Lysaght & Marnell, 2016). Photo identification studies have linked killer whales sighted off Ireland to the "West Coast Community" of Scotland, a group known for its strong residency patterns in Scottish waters and specialised hunting tactics (Berrow *et al*., 2010).

This cetacean species is also classified within the HF hearing group, with peak auditory sensitivity between 18 and 42 kHz, though they can detect sounds ranging from 1 kHz to over 100 kHz (Szymanski *et al.,* 1999). Their reliance on echolocation and complex vocalisations for hunting, navigation, and social interactions makes them highly dependent on an acoustic environment free from excessive noise. Anthropogenic noise, particularly from ship traffic, seismic surveys, and sonar, can interfere with their communication and foraging efficiency, potentially leading to stress or displacement from critical habitats (Erbe, 2002; Foote *et al*., 2004).

Killer whale calving patterns are typically tied to the pod's location and prey availability. While no direct evidence of calving has been documented in Irish waters, the presence of individuals from the "West Coast Community" suggests that calving may occur seasonally in nearby regions. Off Scotland, calving is observed year-round but peaks in the summer months, suggesting that similar seasonal calving patterns may occur for killer whales in Irish waters (Berrow *et al*., 2010).

Despite these occasional sightings, no killer whales were recorded during the ObSERVE Aerial Phase I or Phase II surveys in the Irish Sea (Rogan *et al*., 2018; Giralt Paradell *et al*., 2024). Similarly, no abundance estimates were provided for killer whales during the SCANS III or SCANS IV surveys (Hammond *et al.,* 2021; Gilles *et al.,* 2023).

Minke Whale

The minke whale, the smallest species of baleen whale, averages 8.5 m in length and is commonly observed singly or in small groups. It is the most common and widely distributed baleen whale in Ireland, frequently encountered in shallow waters and over offshore banks, particularly in southern and southwestern regions (DAHG, 2009; Evans & Waggitt, 2020, 2023; Wall *et al*., 2013). While minke whales occur year-round off Ireland's south coast they are most frequently observed from April to November, while peak numbers in the Celtic Deep and southern Irish Sea occur between July and September, with sightings declining markedly from October to March as whales migrate to wintering grounds farther south, possibly in subtropical waters (Berrow *et al*., 2010; DAHG, 2009). Minke whales exhibit clear seasonal migration patterns, moving into southern and southwestern coastal areas during spring and early summer to take advantage of increased prey availability. While most migrate southward during winter, some individuals remain in Irish waters year-round, particularly off the south coast, where prey remains abundant (Berrow *et al.*, 2010; DAHG, 2009).

Minke whales are opportunistic feeders, targeting a variety of prey including small schooling fish such as herring, sprat, and mackerel, as well as krill and other zooplankton. Foraging activity peaks during the summer and autumn months when prey abundance is highest. Their feeding strategy often includes lunge feeding at the surface and subsurface feeding in areas of high prey concentration, such as tidal fronts and upwelling zones commonly found near the Irish coastline (DAHG, 2009; Evans & Waggitt, 2020).

Minke whales exhibit a wide range of swimming speeds depending on their activity and environmental context. In North Atlantic feeding areas, their speeds range from 0.3–6.8 m/s, with an average speed of 1.6 m/s for undisturbed individuals (Helble, *et al.* 2023, and references therein). Their most efficient swimming speeds are suggested to fall between 2.5–7.0 m/s. Under specific circumstances, minke whales can notably increase their speed. For example, when chased by killer whales, they can sustain maximum speeds of 8.3 m/s for up to an hour. Similarly, exposure to stimuli like sonar or proximity to whale-watching boats can cause them to shift from slower, undirected swimming (0.5–1.6 m/s) to faster, more directional swimming at speeds up to 2.4 m/s (Helble, *et al.* 2023, and references therein).

While little is known about specific calving sites in Irish waters, minke whales generally calve during winter in warmer, lower-latitude regions. Females and calves are occasionally observed in Irish waters during the summer and autumn, suggesting these areas may serve as seasonal nursery grounds for mother-calf pairs during migration or foraging periods (Wall *et al.,* 2013).

They are classified within the LF hearing group, with peak auditory sensitivity in the range of 7 to 35 kHz, although a recent study suggests that minke whales are sensitive to sound frequencies as high as 45 to 90 kHz (Houser *et al.*, 2024). They rely heavily on acoustic cues for navigation, foraging, and communication, making them potentially susceptible to anthropogenic noise in their environment from sources such as piling.

Survey data highlight regional variations in density and abundance. Minke whales exhibit a clear seasonal migration pattern in Irish waters. They move into southern and southwestern coastal areas during spring and early summer, coinciding with the seasonal increase in prey availability. Peak abundance occurs between July and September, after which sightings decline notably as whales migrate to wintering grounds farther south, possibly in subtropical waters. However, some individuals remain in Irish waters year-round, particularly off the south coast, where prey may be available year-round (Berrow *et al*., 2010; DAHG, 2009).

In ObSERVE Phase I, minke whales were recorded in the Irish Sea (Stratum 5) and southern and western waters (Stratum 8) during summer (Figure 13.24). Estimated densities were 0.014 individuals per km² in Stratum 5 and 0.07 individuals per km² in Stratum 8, with abundance estimates of 495 individuals (range: 221 – 1,105) and 2,242 individuals (range: 1,029 – 4,882), respectively. These results indicate relatively high summer abundance in southern and western Ireland, with lower densities in the southeast and Irish Sea (Rogan *et al*., 2018).

During ObSERVE Phase II, minke whales were the most frequently observed baleen whales, sighted in all seasons except winter. Observations were recorded in all strata except Stratum 6A (north coast), primarily in continental shelf waters < 200 m. Model-based density estimates showed 0.014 whales per km² in Stratum 5 (Irish Sea) and 0.039 whales per km² in Stratum 6C (south coast) in summer 2021, while summer 2022 estimates for Stratum 5 dropped slightly to 0.009 whales per km² (Figure 13.25; Giralt Paradell *et al.,* 2024).

In SCANS III, Block E (overlapping Stratum 5) recorded a density of 0.0173 individuals per km², translating to an estimated abundance of 603 individuals (range: 134 – 1,753) (Figure 13.26; Hammond *et al*., 2021). In SCANS IV, Block CS-D reported a density of 0.0137 individuals per km², with an estimated abundance of 477 individuals (range: 85 – 1,425) (Figure 13.26; Gilles *et al.,* 2023).

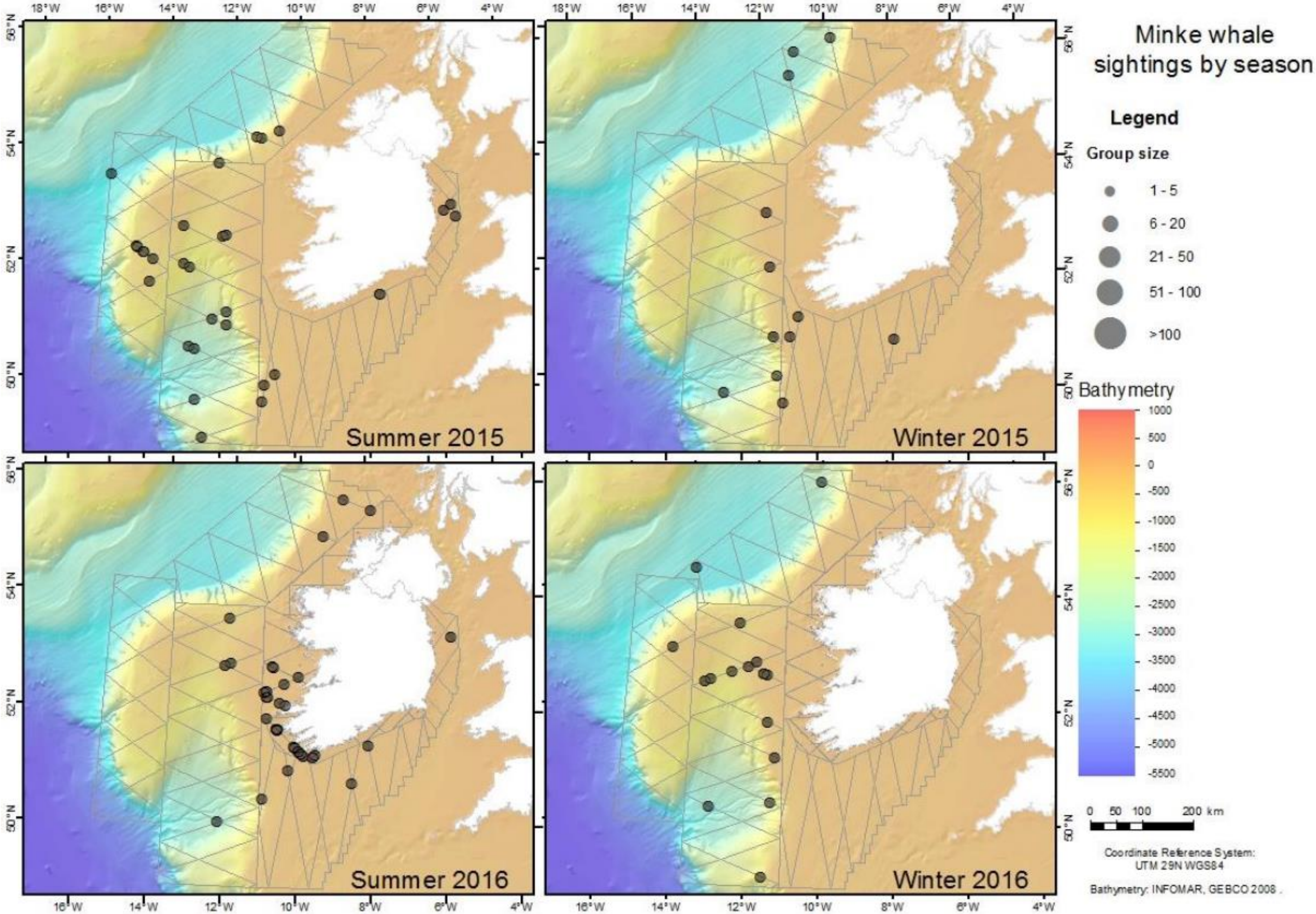

Figure 13.24: Sightings of minke whale in each survey period during ObSERVE Phase I. Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the estimated number of whales seen in each sighting (from Rogan *et al.,* 2018).

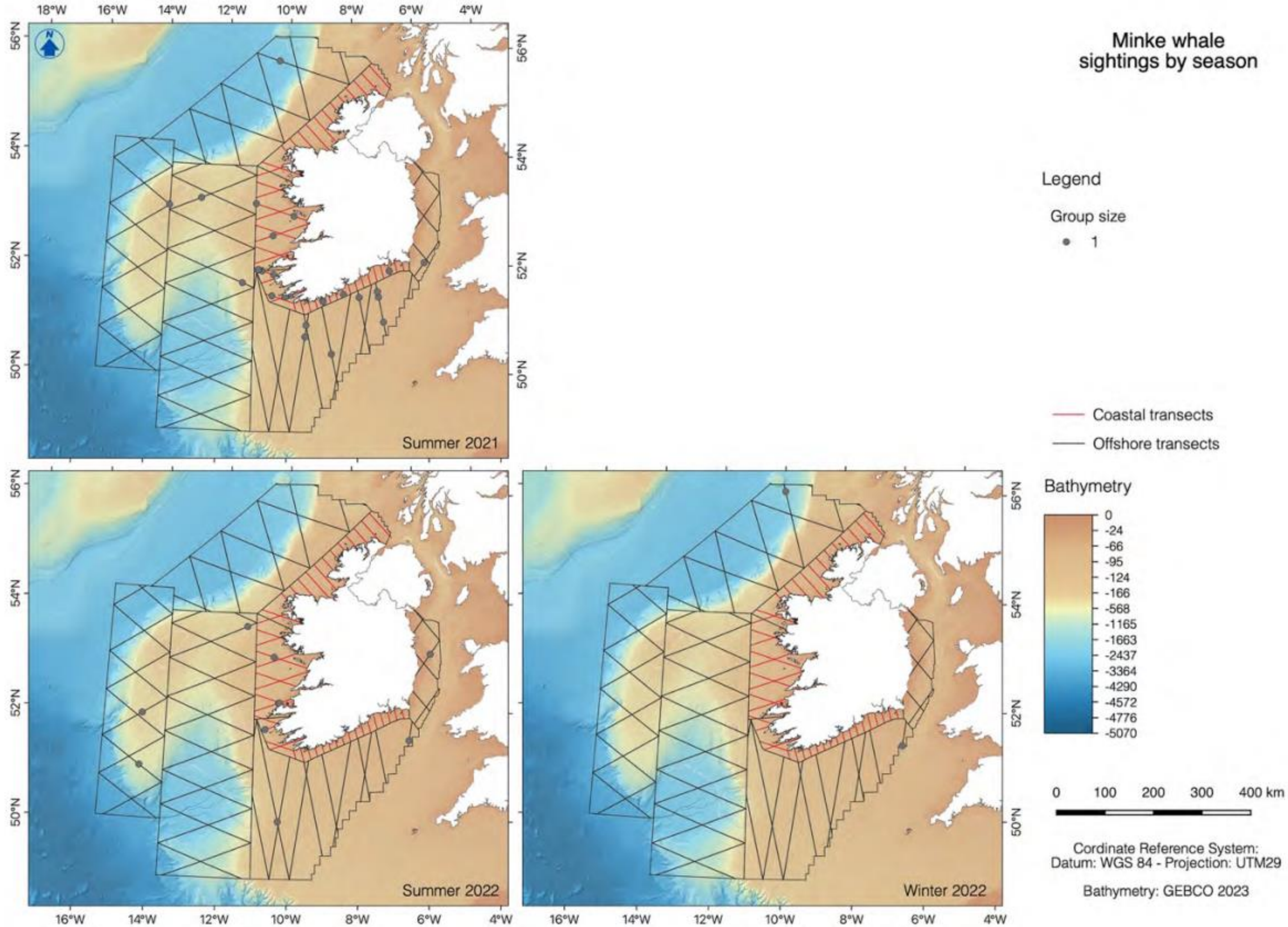

Figure 13.25: Sightings of minke whale in each survey period during ObSERVE Phase II. Note that no surveys were carried out in winter 2021. Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the estimated number of whales seen in each sighting (from Giralt Paradell *et al.,* 2024).

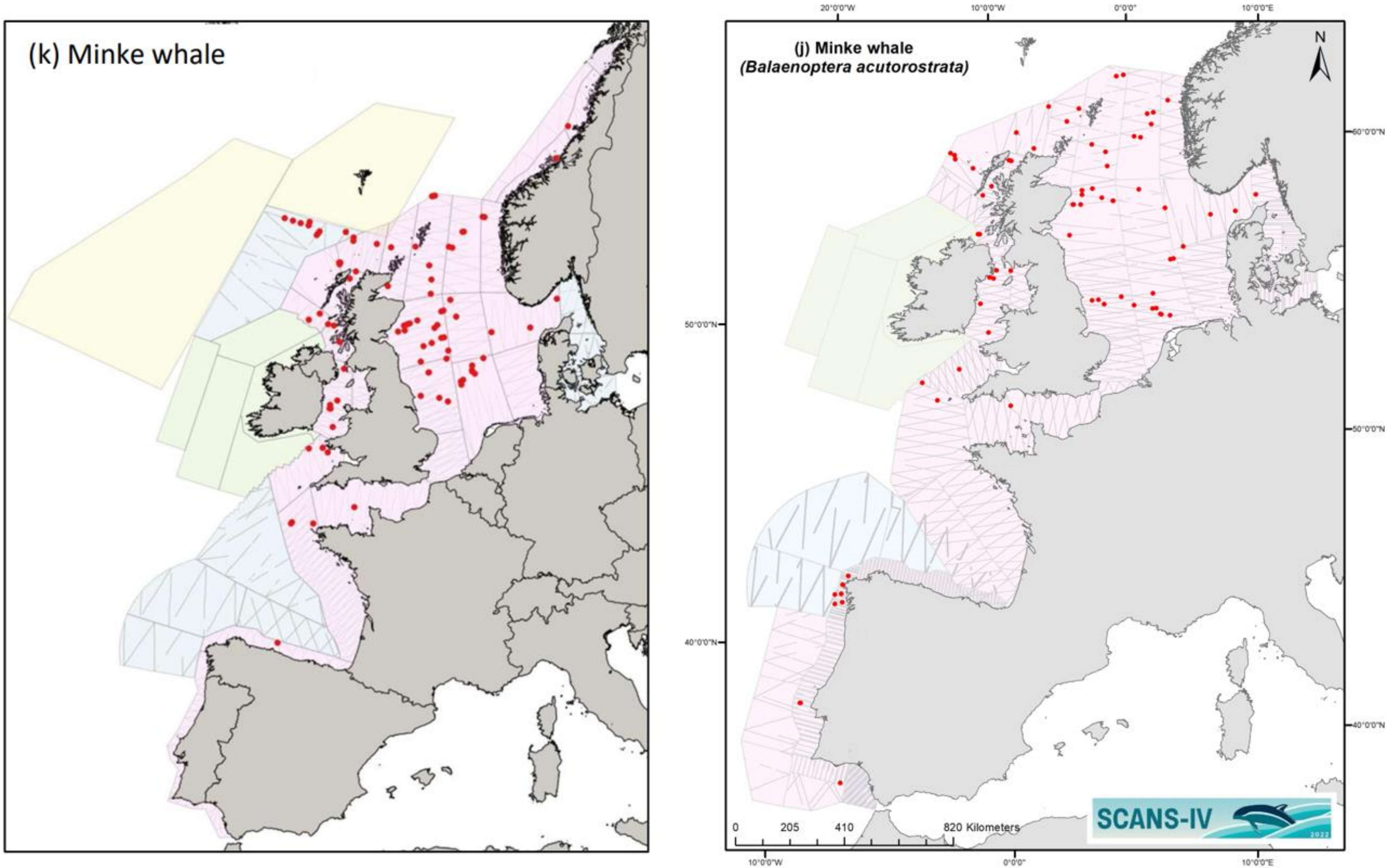

Figure 13.26: Distribution of sightings used in the analyses of SCANS III (left) and IV (right) surveys. Underlying effort is that used in the analysis: aerial survey - good and moderate sighting conditions; ship survey - Beaufort 0-4 for minke whale (adapted from Hammond et al., 2021 and Gilles et al., 2023).

Fin Whale

Reaching lengths of up to 24 m, fin whales are the second-largest animals in the world, surpassed only by the blue whale (*Balaenoptera musculus*). They are broadly distributed, primarily inhabiting temperate and polar seas worldwide (Shirihai & Jarrett, 2006). Off the coast of Ireland, fin whales are the largest baleen whales likely to be seen nearshore. In Irish waters they are often found in productive areas such as the Celtic Sea, particularly along the southern and southwestern coasts, where prey concentrations are abundant during autumn and winter (Berrow *et al.,* 2010; Evans & Waggitt, 2020, 2023; Whooley *et al*., 2011).

Fin whales are filter feeders, relying on their baleen plates to capture large quantities of small prey, including krill, fish, and squid. Their reliance on prey-rich areas suggests that they may be using Irish waters as a primary foraging ground during colder seasons (Berrow *et al*., 2010; Evans & Waggitt, 2020, 2023).

Fin whales are classified within the LF hearing group, with peak auditory sensitivity typically ranging from 20 to 40 kHz, although they can detect sounds up to around 100 kHz (Southall *et al*., 2008; Holt *et al*., 2009). This broad range enables them to detect low-frequency vocalisations for communication and navigation (e.g., Cranford & Krysl, 2015). Fin whales produce long-range calls for social interactions, but their sensitivity to low-frequency noise makes them vulnerable to anthropogenic activities, such as shipping and seismic surveys, which can disrupt communication, alter behaviour and migratory patterns or cause displacement from critical feeding and mating habitats (Southall *et al*., 2008, 2019).

Survey data highlight fluctuations in fin whale presence in Irish waters. During the ObSERVE Phase I Aerial surveys, sightings were comparable in summer and winter 2015 but increased nearly ninefold in the winter of 2016-2017 (n = 17) compared to summer 2016 (n = 2). Most sightings involved solitary individuals along the edge of the continental shelf (Strata 1 – 3), with only one coastal sighting (Stratum 8) during winter 2016 – 2017 (Figure 13.5; Rogan *et al*., 2018). No fin whales were recorded in the SCANS III (Block E) or SCANS IV (Block CS-D) surveys (Figure 13.7; Hammond *et al*., 2021; Figure 13.8; Gilles *et al*., 2023) and they were also absent from Stratum 5 (Irish Sea) and Stratum 6C during the ObSERVE Phase II surveys (Figure 13.6; Giralt Paradell *et al*., 2024).

Humpback Whale

The humpback whale is a globally distributed species, found in all major ocean basins. In Irish waters, humpback whales are recorded in small numbers, primarily close inshore off the south and southwest coasts, although there are occasional records along all coasts, including the Irish Sea. Offshore sightings are relatively rare (DAHG, 2009). Over the past decade, their presence in Irish inshore waters has increased slightly, but overall numbers remain low (DAHG, 2009; Blázquez *et al*., 2023)

Humpback whales have elaborate feeding techniques, including bubble net feeding, where they work together in groups to trap prey, such as herring and sprat, in concentrated areas. In Irish waters, the Celtic Sea serves as a key foraging ground, especially during the autumn and winter, with sightings peaking in August in the southwest and in November further east along the southern coast.

The humpback whales are likely following prey migrations, with herring and sprat being key targets (Marine Institute, 2013).

They are highly migratory, typically travelling between high-latitude feeding grounds in the summer and lower-latitude breeding and calving areas in the winter (International Whaling Commission, 2024). While specific calving areas for humpback whales in Irish waters have not been confirmed, the presence of humpbacks in these waters during autumn and winter suggests that Irish waters may function as part of their migratory route rather than a breeding ground (Marine Institute, 2013; Ryan *et al*., 2016).

Humpback whales are classified within the LF hearing group, with peak auditory sensitivity ranging from 20 to 30 kHz, although they can detect sounds up to 40 kHz (Au, 1993; Southall *et al*., 2008). This frequency range allows them to detect and produce complex low-frequency vocalisations over long distances, which is essential for communication, navigation, and mating (e.g., Kügler *et al*., 2024; Magnúsdóttir & Lim, 2019). However, their sensitivity to low-frequency noise makes them vulnerable to disturbances from shipping, sonar, and seismic exploration, potentially disrupting communication, migration, and mating behaviours (Dunlop & Noad, 2024; Ketten, 1997; Southall *et al*., 2008, 2019).

Data collected by the IWDG through Photo-ID has shown a distinct eastward movement of humpback whales along Ireland's southern coast in autumn, which is likely linked to the movement of their prey (Blázquez *et al*., 2023). Notably, some individuals have been tracked travelling long distances between Ireland and other regions such as Iceland, Norway, and the Netherlands, further demonstrating the species' migratory patterns (Ryan *et al.,* 2016).

Over the past decade, the presence of humpback whales in Irish inshore waters has increased, though their overall numbers remain low (Blázquez *et al*., 2023). No humpback whales were recorded during the SCANS III-IV surveys (Hammond *et al*., 2021; Gilles *et al*., 2023) or the ObSERVE Phase I-II surveys in the Irish Sea (Rogan *et al.,* 2018; Giralt Paradell *et al*., 2024).

13.4.2.2 PINNIPEDS

Two species of pinnipeds, harbour seals and grey seals, are regularly encountered within the Irish Sea.

Harbour Seal

The harbour seal, a relatively small pinniped species, is commonly found along the Irish coastline, with haul-out sites distributed widely across sheltered bays, estuaries, and sandy or rocky shores (Figure 13.27). These seals exhibit a strong preference for nearshore habitats and are known for their high site fidelity, consistently returning to the same haul-out locations throughout their lives (Bigg, 1981; Burns, 2009; London *et al*., 2012). Haul-out sites are essential for resting, scanning for predators, and forming social groups as an anti-predator strategy (da Silva & Terhune, 1988). Additionally, haul-out sites play a crucial role during the breeding season, providing safe locations for rearing pups, as well as during moulting, when seals replace their fur, which is essential for thermoregulation and survival (Thompson, 1989).

In contrast to grey seals, harbour seal populations along the south-east coast remain relatively small and fluctuating (Morris and Duck, 2019). The 2017/2018 aerial survey recorded 34 individuals, compared with 53 in 2011/2012 and 18 in 2003. On the east coast, the sparse harbour seal population recovered to 131 individuals in 2017/2018, representing just 3% of the national total. Within these regions, locally important haul-out groups continue to be supported in designated sites, including 32 harbour seals in the Slaney River Valley SAC (the closest SAC to the Rosslare ORE Hub Proposed Development) and 60 individuals at Lambay Island SAC in County Dublin. Harbour seals were primarily associated with sheltered estuarine and coastal habitats (Figure 13.27).

Harbour seals give birth in May and June on sheltered shores with ready access to the sea. Their pups are highly precocial and well-developed at birth, with eyes open and the ability to swim and follow their mothers within hours (Knudtson, 1977). Uniquely among pinnipeds, harbour seal pups typically enter the water on the day they are born and remain highly active and aquatic throughout the nursing period (Jørgensen et al., 2001). Born with a shorter, darker coat (having moulted their lanugo in utero), pups remain dependent on their mothers for three to four weeks. During this time, females continue to forage at sea and return regularly to nurse. Pups accompany their mothers on foraging trips, learning to hunt first for shrimp and bottom-dwelling crustaceans, and later progressing to fish. Mothers are able to recognise their pups through vocalisations and scent, and weaning occurs abruptly. This flexible rearing strategy is well suited to the dynamic intertidal habitats typically used by the species.

In July and August, harbour seals haul out in large groups to moult, remaining ashore for extended periods. This moulting season provides an opportunity for population monitoring, as individuals are more easily observed at haul-out sites during this time.

Despite their widespread presence along the Irish coast, there is limited information on the current trends of harbour seal populations. The most comprehensive population estimates were conducted in the early 2000s, which suggested a population of approximately 2,905 individuals (Cronin, 2010; Cronin, *et al*., 2007, 2014; Kavanagh, *et al*., 2010a).

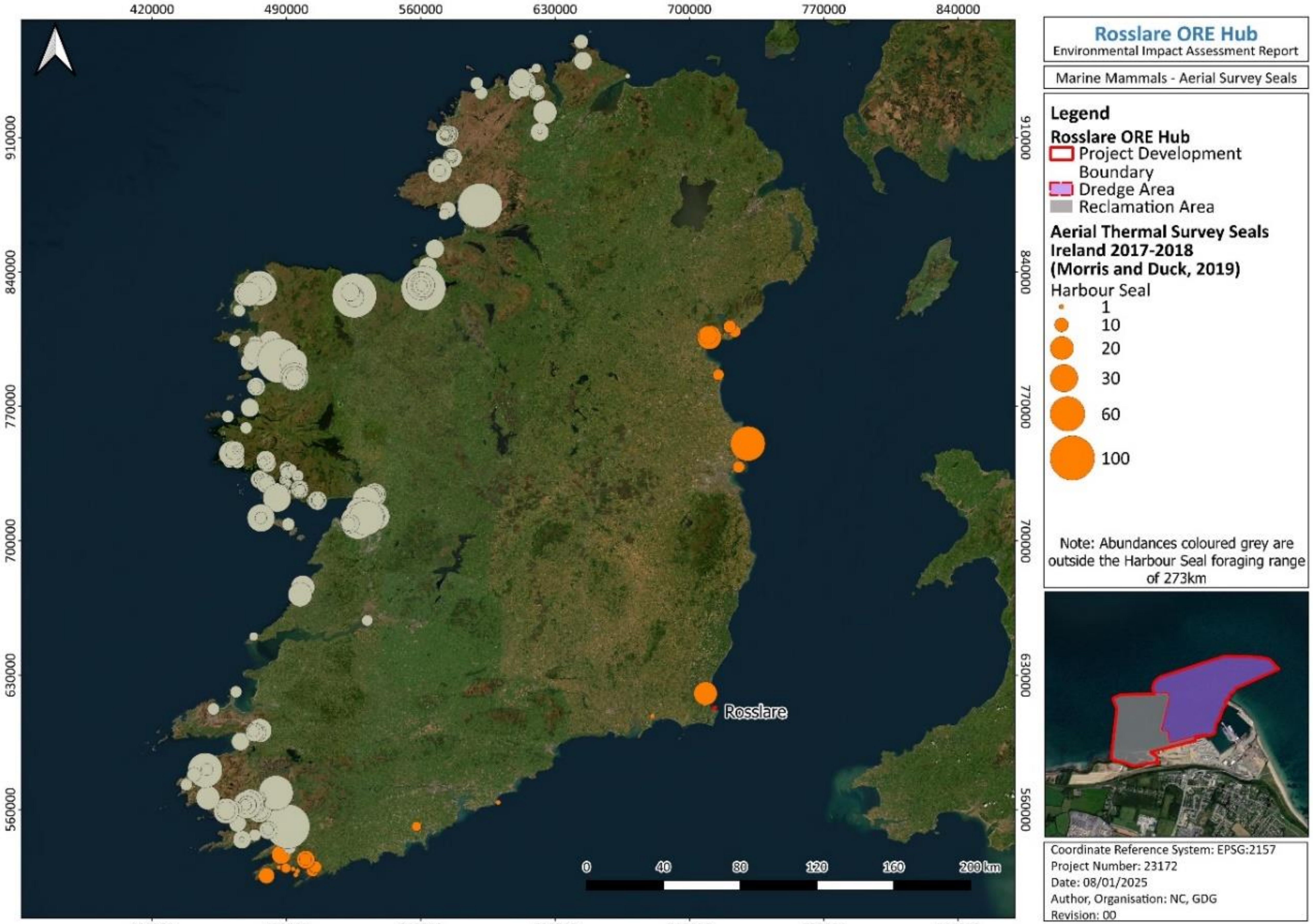

Figure 13.27: Distribution of harbour seals in Ireland during August 2017 and 2018 (adapted from Morris & Duck, 2019). Grey circles indicate abundances recorded beyond the typical harbour seal foraging range (273 km) from the Proposed Development.

Grey Seal

The grey seal, notably larger than the harbour seal, is widely distributed along the Irish coastline, with significant populations occurring in specific areas (Figure 13.28). Grey seals demonstrate distinct seasonal patterns in their distribution (e.g., Jones *et al*., 2015; Kiely *et al*., 2000; Sayer *et al*., 2019), spending the majority of their time at sea, often below the surface (Harrison *et al*., 2006). Like harbour seals, grey seals exhibit high site fidelity, frequently returning to the same haul-out sites for resting, moulting and reproduction (Gerondeau *et al*., 2007). These sites are typically located in remote locations, such as rocky coasts with cliffs and caves or offshore islands, which offer protection from human disturbance and predators (Bonner, 1972; Kiely *et al*., 2000).

The 2017/2018 national aerial thermal-imaging survey of seals (Morris and Duck, 2019) reported the highest national summer counts for grey seals to date, indicating that populations are generally stable or increasing (Figure 13.28). Along the south-east coast (Wexford to east Cork), numbers rose substantially from 189 individuals in 2003 to 556 in 2017/2018, reflecting a consistent regional increase. A similar pattern was observed along the east coast, where grey seal abundance increased to 418 animals in 2017/2018. Grey seals were observed more frequently on exposed shorelines and offshore islands, with little spatial overlap with harbour seal haul-out sites.

Grey seals typically breed between September and December in Ireland, selecting remote, generally undisturbed locations such as offshore islands and isolated coastal sites. Pups are born with a thick white lanugo coat that provides insulation while they remain on land, but they are not able to swim immediately after birth. During the early weeks, the mother remains ashore with the pup, providing rich, high-fat milk that supports rapid weight gain. The nursing period typically lasts 16 to 21 days, after which the mother abruptly leaves. Pups remain ashore, fasting and gradually moulting their white natal coat over the following two to three weeks, only entering the water once their adult coat has developed and they are capable of independent swimming and foraging (Wilson, 2024).

Grey seals breed at the Saltee Islands, located c. 21 km south of Rosslare, which remains a consistent and regionally important pupping site with ~140 pups recorded in 2023 (NPWS, 2024). While pup production here has remained broadly stable since 2013, Lambay Island SAC on the east coast has shown recent variability, with numbers declining from ~213 pups in 2017 to ~108 in 2023. At the national scale, grey seals remain in favourable conservation status, but the stability of the Saltee Islands colony highlights its importance for maintaining breeding populations in southeast Ireland.

Grey seal rearing is a more capital-based strategy, where mothers fast throughout the lactation period, relying on stored energy reserves rather than foraging. Pup development is relatively passive during this time, and unlike harbour seals, grey seal pups do not follow their mothers into the water or during foraging trips. After weaning, pups are left entirely on their own and must learn to swim and feed independently.

Grey seals undergo moulting in the spring months, during which they haul out for prolonged periods, similar to the breeding season. As with harbour seals, population monitoring is conducted during the pupping and moulting periods when haul-out attendance is highest and individuals are more easily observed.

Grey seal populations in Ireland are estimated to range between 7,284 and 9,365 individuals, accounting for approximately 6% of the species' populations in Western Europe (Ó Cadhla *et al.*, 2013; OSPAR Commission, 2017). Recent studies suggest a positive trend in population numbers, with an estimated 25% increase from the counts by Ó Cadhla *et al*. (2013) during the 2009-2012 period to those conducted by Morris and Duck (2019) in 2017-2018 (Pérez Tadeo, 2022). This growth reflects ongoing conservation efforts and favourable environmental conditions supporting the species' recovery and sustainability.

Both harbour and grey seals are central place foragers, typically spending the majority of their foraging time within 50 km of the coast (Jones *et al*., 2015). However, much longer distances have been recorded, with harbour seal pups travelling up to 300 km (Bonner & Whitthames, 1974) and grey seal pups reaching distances of up to 1,280 km (Riedman, 1990). Seals generally undertake foraging trips lasting a few days - harbour seal trips in Scotland have been recorded as lasting 1-3 days (Thompson *et al*., 1996, 1998), while grey seals in the Baltic Sea spend 2-5 days at sea (McConnell *et al*., 1999; Sjöberg *et al*., 1995). These foraging trips are interspersed with returns to shore, as seals are restricted to onshore haul-outs between trips (Matthiopoulos *et al*., 2004).

Furthermore, both pinniped species are classified within the phocid carnivore hearing group, with auditory sensitivity primarily in the low- to mid-frequency range, typically between 1 and 40 kHz, although they can detect sounds up to 75 kHz (Kastak & Schusterman, 1998; Southall *et al*., 2008). This range allows them to detect environmental sounds and vocalisations critical for communication, especially during breeding and haul-out periods. While less sensitive to high-frequency sounds than cetaceans, they remain vulnerable to impulsive noise from activities like piling, which can disrupt vocalisations. Prolonged noise exposure can lead to displacement, communication masking, and interference with critical behaviours such as foraging and mating (Southall *et al.,* 2019; Ketten, 1998). Vocalisations recorded in the area suggest a variety of social and territorial behaviours, which could be disrupted by elevated noise levels.

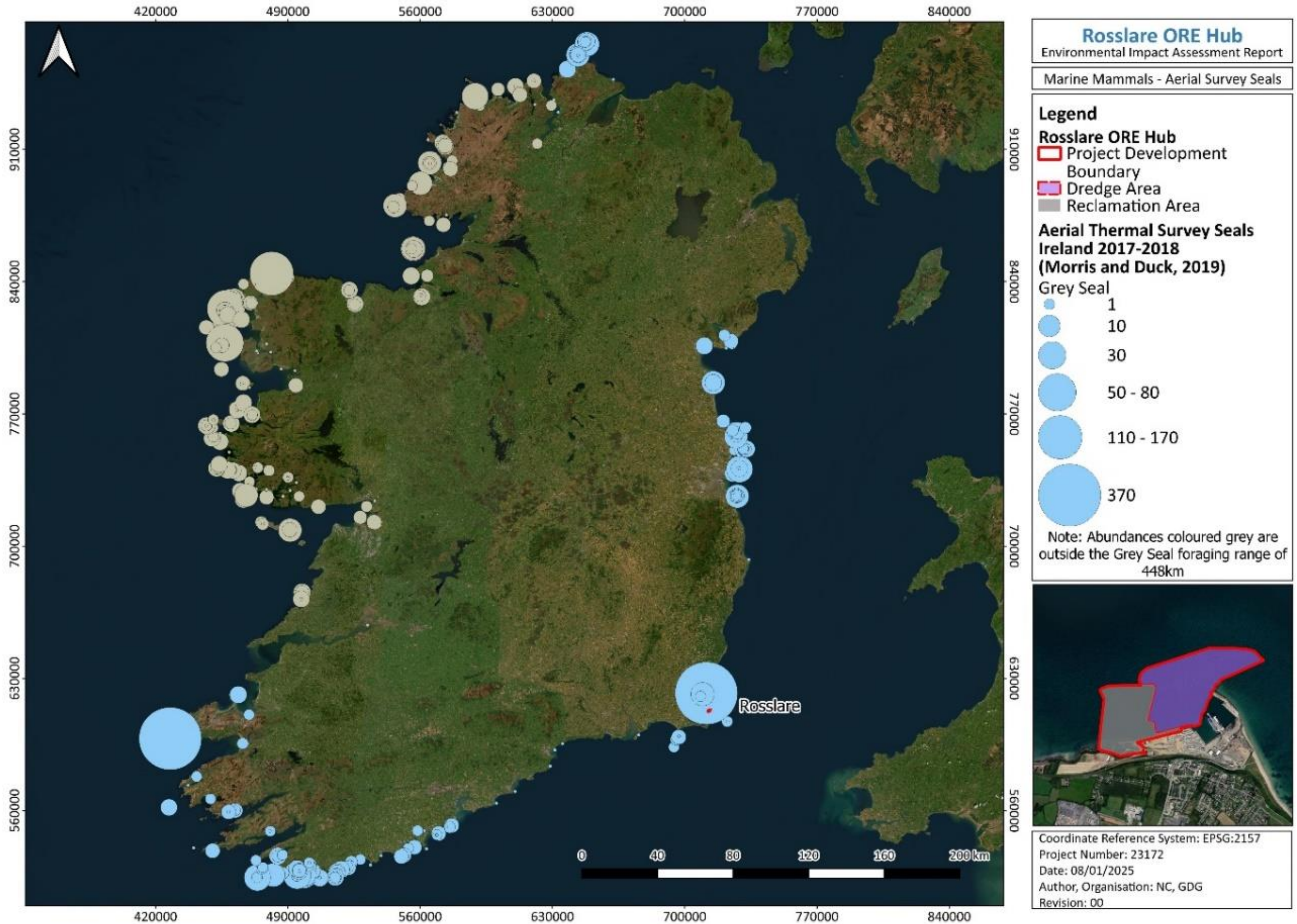

Figure 13.28: Distribution of grey seals in Ireland during August 2017 and 2018 (adapted from Morris & Duck, 2019). Grey circles indicate abundances recorded beyond the typical grey seal foraging range (448 km) from the Proposed Development.

During the ObSERVE Phase I Aerial surveys, pinnipeds were not generally identified to species level but were observed in all seasons, primarily in coastal waters and the Irish Sea (Figure 13.29; Rogan *et al*., 2018). A total of 80 sightings were documented, including 49 occurrences in offshore waters and 40 nearshore sightings. Seals were frequently recorded near the Saltee Islands, off County Wexford, in all seasons, and near the Inishkea Islands, off County Mayo, in winter 2016–2017 (Rogan *et al.*, 2018). Abundance estimates were not derived for this group.

In ObSERVE Phase II, pinnipeds were also observed throughout the year, with 144 sightings comprising 183 individuals. Sightings were recorded throughout Irish coastal and offshore waters, including the Irish Sea; however, the highest densities were recorded off the northwest coast. Most were observed further offshore, suggesting they were grey seals, known for their long-distance movements. A single individual was recorded in the deep waters of the Rockall Trough (Figure 13.29; Figure 13.30; Giralt Paradell *et al*., 2024).

Numerous sightings of both seal species have been reported in the Regional Marine Mammal Study Area off the coasts of County Waterford and County Wexford by the National Biodiversity Data Centre (NBDC) over the years (National Biodiversity Data Centre, accessed 2024). Additionally, tracking studies have verified the presence of grey seals within these waters (Figure 13.31; Carter *et al.,* 2020).

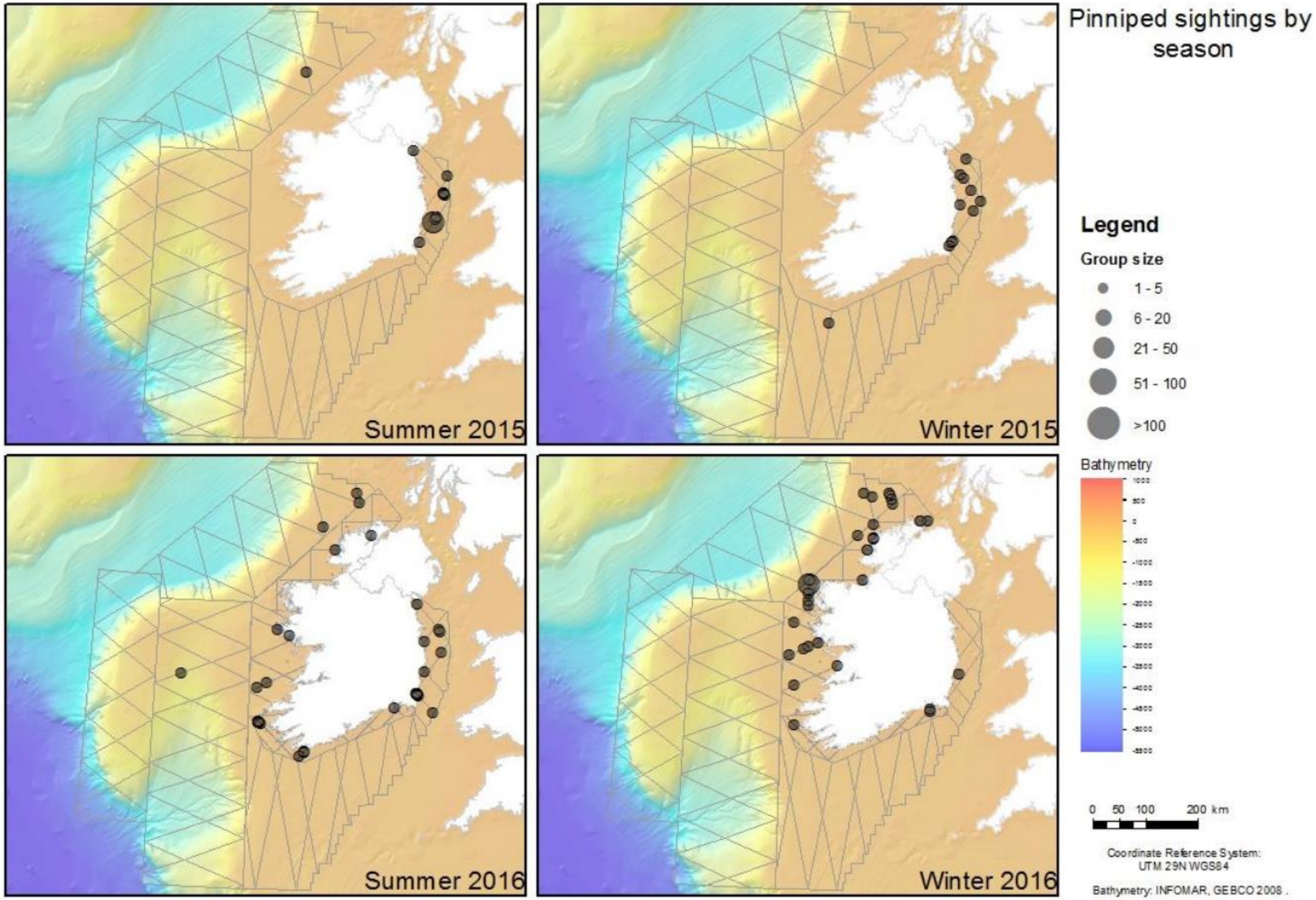

Figure 13.29: Sightings of pinnipeds in each survey period during ObSERVE Phase I. Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the number of individuals in each sighting (from Rogan *et al*., 2018).

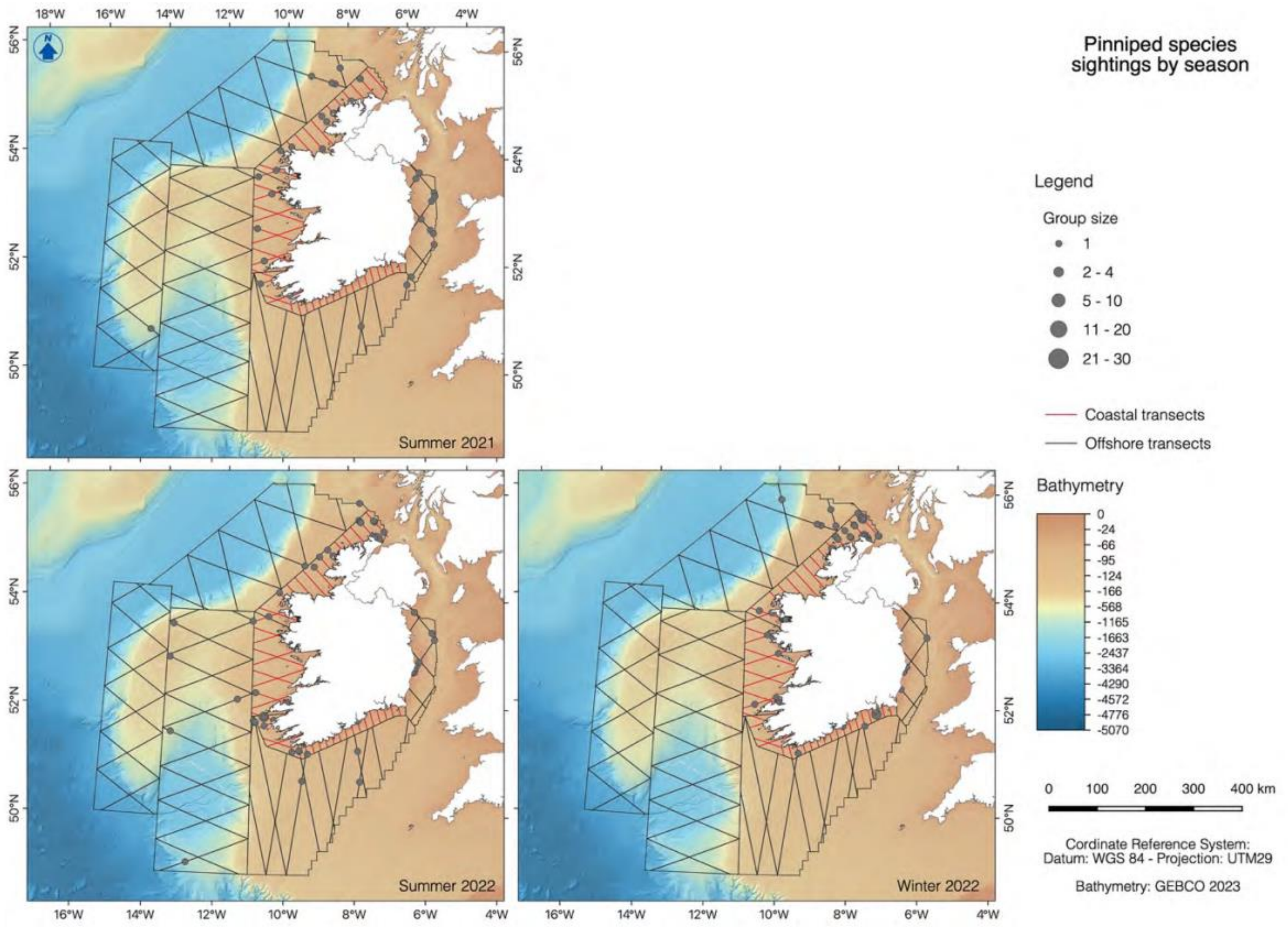

Figure 13.30: Sightings of pinniped species in each survey period during ObSERVE Phase II. Note that no surveys were carried out in winter 2021. Grey lines indicate the survey tracklines in the offshore strata and red lines indicate the tracklines in the coastal strata. Circles are proportional to the number of pinnipeds in each sighting (from Giralt Paradell et al., 2024).

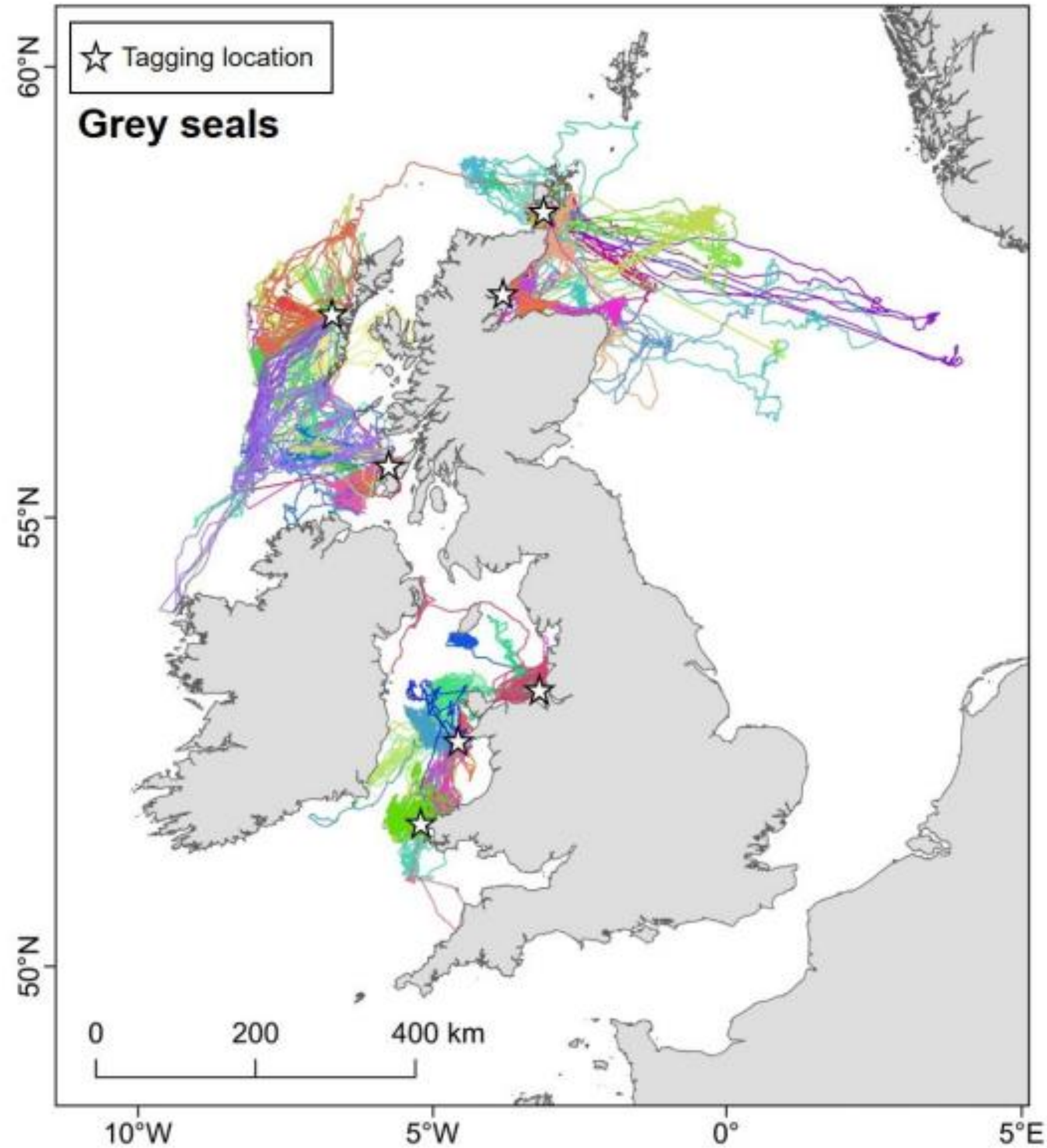

Figure 13.31: Grey seal GPS tracking data from tags deployed during Carter et al. (2020) study. Tracks are coloured by individual (n=100). White stars denote deployment locations (clockwise from bottom left); Ramsey & Skomer Islands, Bardsey Island, Dee Estuary, Islay & Oronsay (West Scotland), the Monach Isles (Western Isles), Orkney & Pentland Firth (North Scotland & Northern Isles), Dornoch Firth (Moray Firth) (from Carter et al., 2020).

13.4.3 SURVEY AREA

The Marine Mammal Survey Area for this assessment encompasses the waters to the west of Rosslare Europort, extending into the Irish Sea. The region is characterised by dynamic physical conditions, including varying water depths, tidal currents, and ambient noise from port operations, which collectively influence marine life distribution and behaviour. Seals, dolphins, and occasionally whales frequent the area for feeding and migration.

The bathymetry of the Marine Mammal Survey Area is predominantly shallow, with water depths ranging from 0 m at the coast to approximately 30 m further offshore (see Chapter 8: Coastal Processes). This variation in water depth supports intertidal and subtidal habitats critical for marine ecosystems, influencing prey distribution and foraging behaviour.

Moreover, currents in the Marine Mammal Survey Area are influenced by tidal movements, with semi-diurnal tides producing fluctuations in water levels approximately every 12 hours. During spring tides, tidal currents can reach speeds of up to 1.1 m/s, driving sediment transport and nutrient cycling (see Chapter 8: Coastal Processes). These dynamics, combined with wind-driven currents, support nutrient mixing and prey availability for marine mammals.

Ambient noise generated by port operations, including ferry traffic, cargo vessels, and other maritime activities, is a significant factor influencing marine mammals in the Marine Mammal Survey Area. Shipping activities predominantly produce low-frequency noise from vessel engines and propeller cavitation, which can propagate extensively underwater (see Chapter 20: Shipping and Navigation). Such anthropogenic noise can disrupt marine mammal communication, echolocation, and navigation, potentially causing behavioural changes. Dolphins, in particular, rely heavily on sound for foraging, communication, and orientation, while whales similarly depend on sound for functions such as communication and navigation. Shipping noise can mask important acoustic signals, reducing their ability to detect prey, communicate, and navigate. Prolonged exposure to elevated noise levels may induce stress, disorientation, and alterations in migratory patterns, potentially impacting their long-term health and behaviour.

The marine mammal species identified as present in the Marine Mammal Regional Study Area from the site-specific surveys and existing baseline data are listed in Table 13.6, along with key prey species.

Table 13.6: Key prey species of the marine mammal species found in the Regional Marine Mammal Study Area

Marine mammal species	Key prey species	Reference
Harbour Porpoise	Small cod (*Trisopterus* spp), various Clupeoids, whiting (*Merlangius merlangus*), herring, and cephalopods	Berrow and Rogan (1995), Hernandez-Milian *et al.* (2011)
Bottlenose Dolphin	Catsharks (Scyliorhinidae) , conger eel (*Conger conger*), Atlantic salmon (*Salmo salar*), blue whiting (*Micromesistius poutassous*), whiting (*Merlangius merlangus*), haddock (*Melanogrammus aeglefinus*), pollock (*Pollachius pollachius*), Norway pout	Hernandez-Milian *et al.* (2015)

Marine mammal species	Key prey species	Reference
	(*Trisopterus esmarkii*), pout (*Trisopterus luscus*), small cod, silvery cod (*Gadiculus thori*), ling (Molva molva), hake (*Merluccius merluccius*), Atlantic horse mackerel (*Trachurus trachurus*), Atlantic mackerel (*Scomber scombrus*), gobies (Gobiidae), sand smelt (*Atherina presbyter*), lanternfish (Myctophidae), flounder (*Platichthys flesus*), plaice (*Pleuronectes platessa*), dab (*Limanda limanda*), brill (*Scophthalmus rhombus*), sole (*Solea solea*), various squid, and octopus sp	
Common Dolphin	Seabass (*Dicentrarchus labrax*), goby (*Pomatoschistus microps*), cod (*Gadus morhua*), cephalopods, mackerel, lanternfish (*Myctophidae*), blue whiting	Brophy *et al.* (2009)
Risso's Dolphin	European flying squid (*Todarodes sagittatus*) , shortfin squid (*Illex coindetii*), common cuttlefish (*Sepia officianlis*), cod, crustaceans, and octopus spp	Sea Watch Foundation (2020), Luna *et al*. (2022)
Minke Whale	Sandeel (*Ammodytes tobianus*), herring, sprat, mackerel, goby (*Pomatoschistus microps*), Norway pout/poor cod (*Tisopterus minutus*)	Pierce *et al.* (2004)
Grey Seal	Atlantic herring, sprat, salmonids, pollock, haddock, saithe (*Pollachius virens*), whiting, poor cod, rockling (*Gaidropsarus mediterraneus*), ling (*Molva molva*), wrasse (*Labridaea*), Atlantic horse mackerel (*Trachurus trachurus*), sandeel, dragonet (Callionymidae), red bandfish (*Cepola macrophthalma*), plaice (*Pleuronectes platessa*), flounder (*Platichthys flesus*), sole, squid and octopus species	Kavanagh *et al.* (2010b)
Harbour Seal	Lamprey (*Petromyzontiformes*), eels (*Anguilliformes*), herring, salmonids, haddock, pollock, saithe, whiting, blue whiting, Norway pout, poor cod, bib (Trisopterus luscus), rockling (*Gaidropsarus mediterraneus*), ling, hake (*Merluccius merluccius*), perch (*Perca*), scad (*Decapterus macarellus*), wrasse (*Labridae*), sandeel (*Ammodytes tobianus*), goby, mackerel, flounder, dab, sole, witch (*Gyptocephalus cynglossus*), halibut (*Hippoglossus stenolepis*), and squid species	Gosch *et al.* (2014)

Summary maps of all species visually recorded during Year 1 is presented in Figure 13.34 and Figure 13.35. Summary maps of all species visually recorded during Year 2 is presented in Figure 13.36 and Figure 13.37.

Marine mammal sightings within the Proposed Development Boundary across all survey watches are shown in Figure 13.38. Observations include grey seal, bottlenose dolphin, and harbour porpoise within the boundary, which encompasses the Proposed Dredge and Reclamation Areas.

13.4.3.1 HARBOUR PORPOISE

During the Vantage Point (VP) visual surveys, harbour porpoises were recorded throughout the year, with sightings occurring on 50% of survey days during both Year 1 and Year 2. In total, 36 sightings of harbour porpoises were documented within the proposed dredge area, accounting for 77 individual porpoises. Of these, 19 sightings with 53 individuals were recorded in Year 1, and 14 sightings with 24 individuals were recorded in Year 2. Notably, these sightings were located more than 500 m northeast of the Reclamation Area and over 100 m north of the existing harbour breakwater. Additionally, seven harbour porpoises were observed during the ornithology VP surveys, with five sightings in July 2023 and two in August 2023.

Narrowband high-frequency (NBHF) detections, indicative of harbour porpoises, were recorded on an average of 72% of survey days at Site 1 and 51% of survey days at Site 2 from SAM results (Figure 13.32; refer to EIAR Technical Appendix 13: Marine Mammals for further details). The mean number of porpoise detections, measured in Porpoise Positive Minutes (porpoise DPM), was 25.4 per survey day at Site 1 and 10.7 per survey day at Site 2. These results indicate that the Marine Mammal Survey Area is regularly used by harbour porpoise. Porpoises were detected more frequently at Site 1, which is located further away from the shipping channel and in shallower water, refer to Figure 13.32.

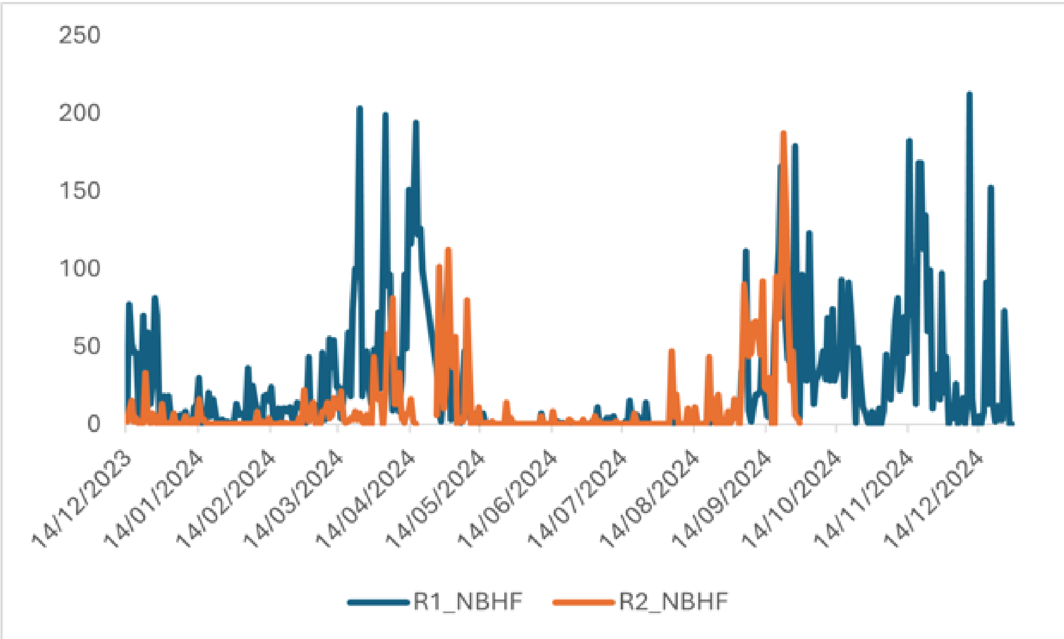

Figure 13.32: Summary of the SAM survey results from Rosslare Site 1 (R1) and Site 2 (R2). NBHF = Harbour Porpoise DPM per day (14/12/2023 – 14/12/2024). Date is the X-axis and total detections is on the Y-axis.

13.4.3.2 BOTTLENOSE DOLPHIN

Bottlenose dolphins were observed during the Year 1 and Year 2 VP watches in September and April of both years, as well as in May, June and August of Year 2. A total of 11 sightings were recorded, identifying 17 individual dolphins. Specifically, there were two sightings with six individuals in Year 1, and nine sightings with 11 individuals in Year 2. These dolphins were located within the Proposed Dredge Area, more than 500 m to the northeast of the Reclamation Area and over 100 m to the north of the existing harbour breakwater. The VP visual surveys were conducted between July 2022 and August 2024, with incidental marine mammal observations recorded.

Since F-PODs do not differentiate between dolphin species, SAM results for both common and bottlenose dolphin are presented together. The mean dolphin Detection Positive Minutes (dolphin DPM) at Site 1 was 25.6, compared with 19.6 at Site 2, which is located off the breakwater. Dolphins were recorded on 73% of survey days at Site 1 and 78% of survey days at Site 2 (Figure 13.33; refer to EIAR Technical Appendix 13: Marine Mammals for further details). Dolphins were detected for longer periods at Site 1, which is located further away from the shipping channel and in shallower water, as illustrated in Figure 13.2.

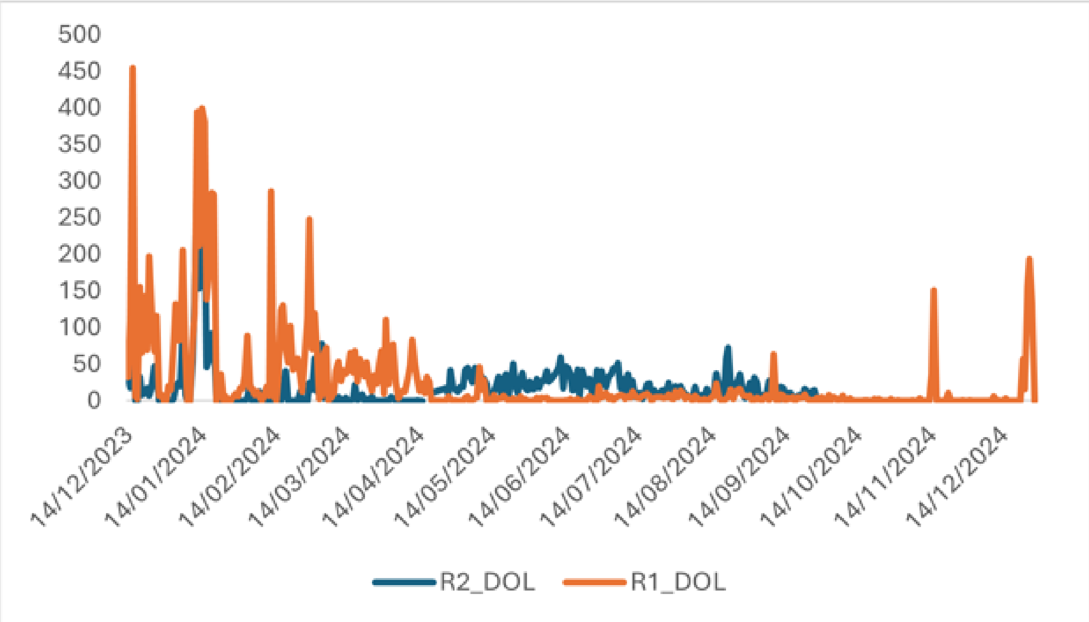

Figure 13.33: Summary of the SAM survey results from Rosslare Site 1 (R1) and Site 2 (R2). DOL = Dolphin Detection Positive Minutes per day (DPM) (14/12/2023 – 14/12/2024). Date is the X-axis and total detections is on the Y-axis.

13.4.3.3 COMMON DOLPHIN

Common dolphins were observed in November (2022), February (2023), October (2023), December (2023). Four sightings of common dolphins, identifying 57 - 72 individuals (two sightings, 12 dolphins during Year 1 and 2 sightings, 45 - 60 individuals during Year 2) were recorded during VP visual surveys; however, such sightings were all located outside of the Proposed Development Boundary.

SAM results for common and bottlenose dolphin are presented together in Figure 13.32 and Figure 13.33

13.4.3.4 RISSO’S DOLPHIN

Single Risso’s dolphins were observed in July of Year 1, and in January, March and June of Year 2. A total of four sightings, comprising four individual Risso’s dolphins (one sighting with one individual in

Year 1 and three sightings with three individuals in Year 2), were recorded during VP visual surveys. However, such sightings were all located outside of the Proposed Development Boundary.

F-POD data can distinguish Risso's dolphin clicks from bottlenose and common dolphin clicks, as Risso's dolphins tend to have more irregular, higher-frequency clicks with a lower repetition rate and unique patterns, different from those of bottlenose and common dolphins. No Risso's dolphins were detected during the acoustic monitoring programme.

13.4.3.5 MINKE WHALE

Single minke whales were recorded in November of Year 1, and in October and November of Year 2. A total of four sightings identified four minke whales (one sighting with one individual in Year 1 and three sightings with three whales in Year 2). In addition, there was a possible minke whale sighting in August of Year 2, but the surveyor could not confirm the identification. All individuals were sighted outside of the Proposed Development Boundary.

No minke whale was detected during the acoustic monitoring programme. Given that the Marine Mammal Survey Area is a noisy port environment, minke whale calls might have been masked by the existing ambient noise levels.

13.4.3.6 HARBOUR SEAL

Single harbour seals were recorded throughout the year on just over a quarter (27.1%) of watches. There were no sightings during Year 1 and a total of seven sightings comprising seven harbour seals were observed during VP visual surveys in Year 2; however, all sightings were located outside of the Proposed Development Boundary.

A total of 46 harbour seal vocalisations (35 adult and 11 pup vocalisations) were detected by the SoundTrap deployed at Site 2 during May and June over 13 days of the deployment, which coincided with the species' breeding season. Vocalisations were classified into seven vocalisation types. 85.71% of adult harbour seal calls were detected during the day and 90.91% of pup calls were detected during the night. Despite the low number of calls, adult harbour seals exhibited a range of vocal behaviours (five call types). Additionally, harbour seal pups were recorded in two distinct contexts: emitting typical mother-attraction calls and in an aggressive context, producing aggressive vocalisations (Khan *et al*., 2006). Note that the high levels of ambient noise may have masked the lower frequency calls produced by these pinniped species.

13.4.3.7 GREY SEAL

Grey seals were recorded on every watch, with a maximum of seven individuals present in February 2024. A total of 105 sightings comprising 116 grey seals (33 sightings, 40 individuals during Year 1 and 72 sightings, 76 individuals during Year 2) were observed within the Proposed Development Boundary, which includes the proposed dredge area and reclamation area. Among the recorded species, only grey seals were observed in and near the Proposed Reclamation Area. In addition, four grey seals were recorded during the ornithology VP surveys (three in July 2023 and one in August 2023).

As part of the SAM programme, a SoundTrap was deployed at Site 2 for 72 days (April 21st – July 2nd, 2024). A total of 6,720 grey seal vocalisations were detected during 44 days of the deployment. Ten vocalisation types were found. Call type and number of detections per type differed between day and night and by month. The mean grey seal vocalisation rate was considerably higher during the day at 9.04 calls/min (±6.65), than during the night, 2.47 calls/min (±2.54). The number of vocalisations per minute was also significantly higher in June (7.99 ± 6.57 calls/min) compared to May (1.07 ± 0.57 calls/min), despite elevated ambient noise levels (O'Brien *et al*., 2024). Higher vocalisation rates have been observed towards the end of pre-breeding and during breeding seasons (Prawirasasra *et al*., 2021; Pozo Galvan *et al*., 2024) with the opposite trend also reported (Pérez Tadeo, 2022). In this case, the vocalisation rate may have been higher than recorded, but masking effects likely obscured detection, especially in May and June, both of which were generally very noisy months.

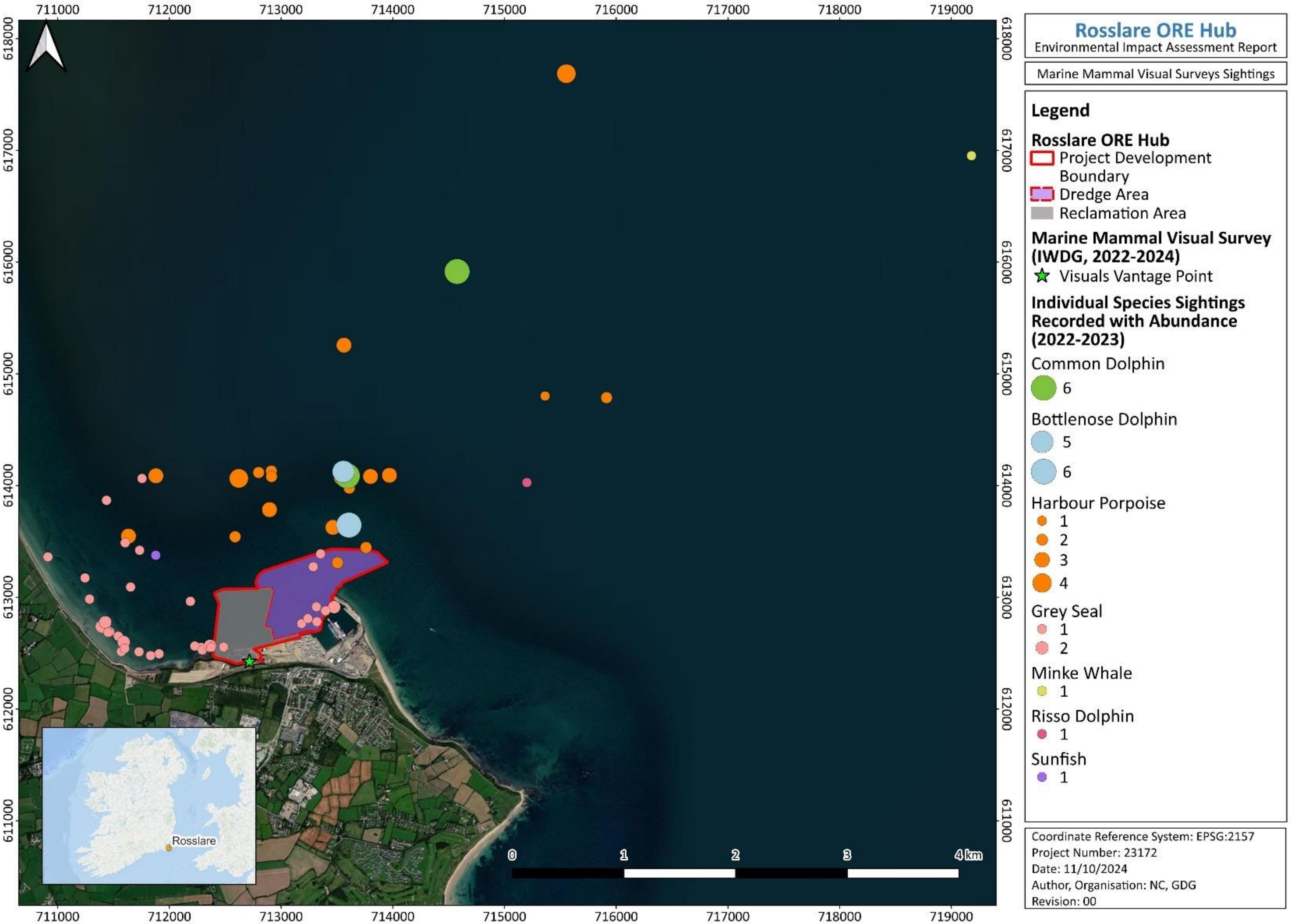

Figure 13.34: Year 1 (July 2022 - June 2023) All marine mammal sightings

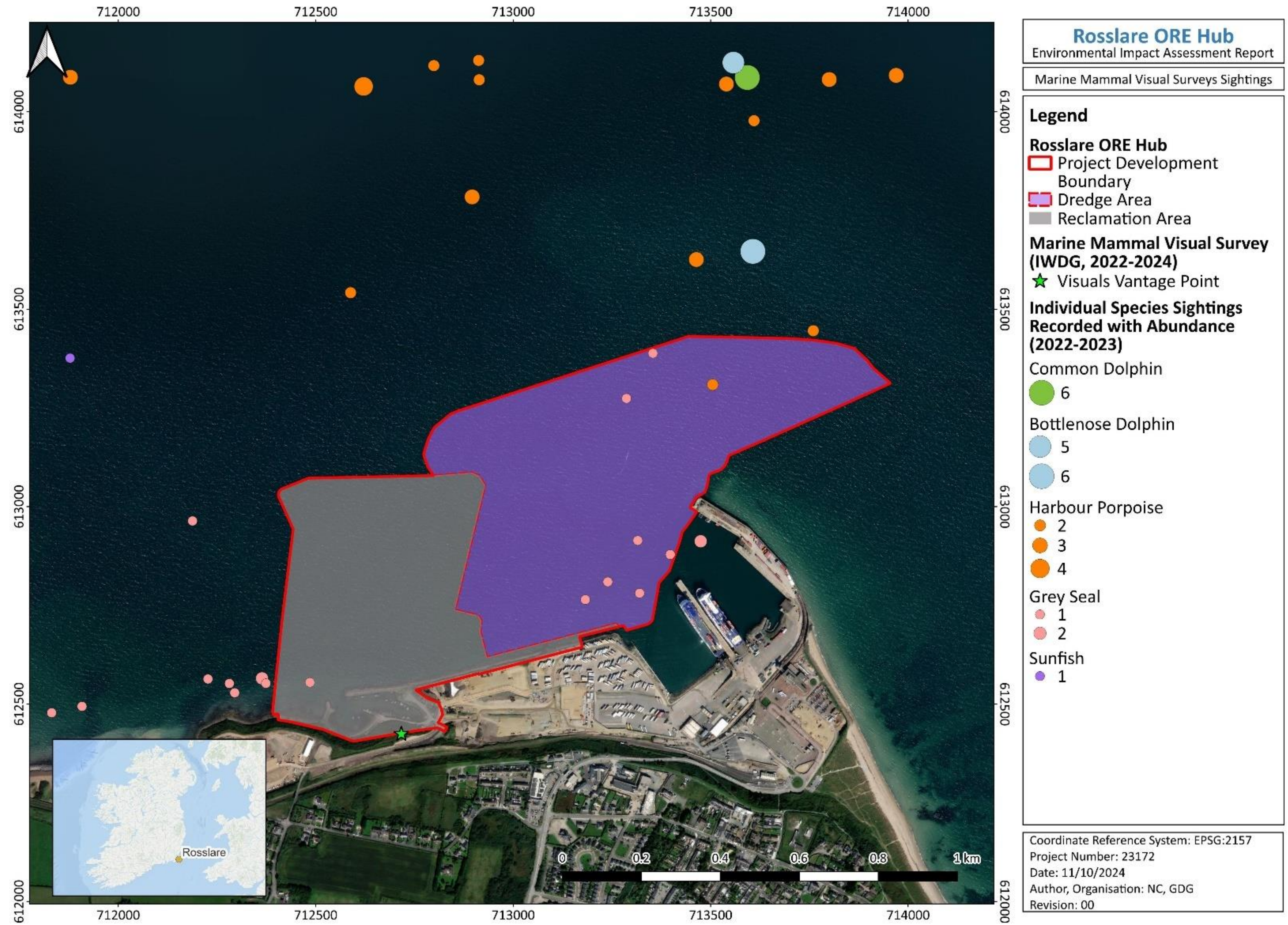

Figure 13.35: Year 1 (July 2022 - June 2023) Marine mammal sightings within and near to Proposed Development Boundary

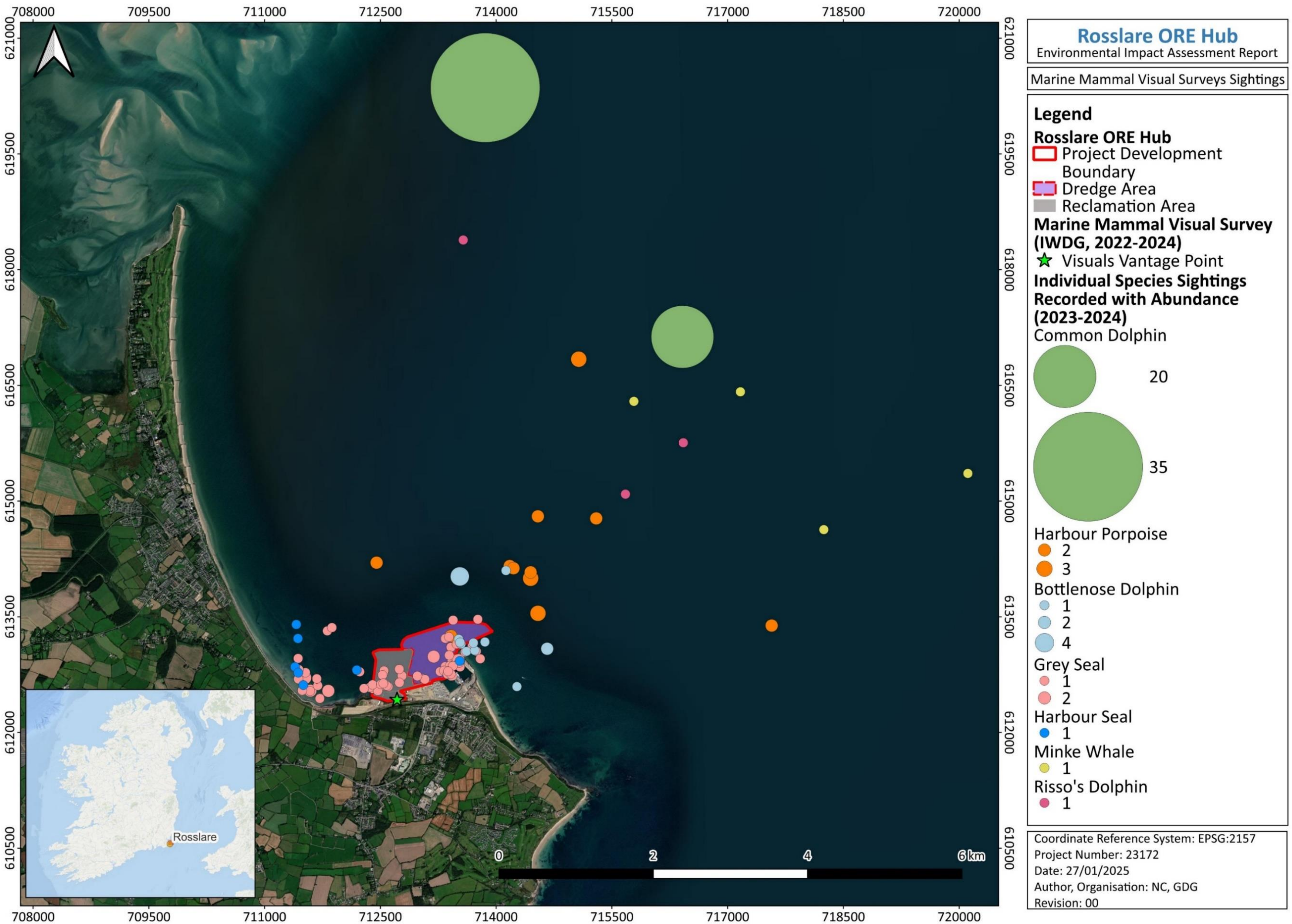

Figure 13.36: Year 2 (September 2023 - August 2024) All marine mammal sightings

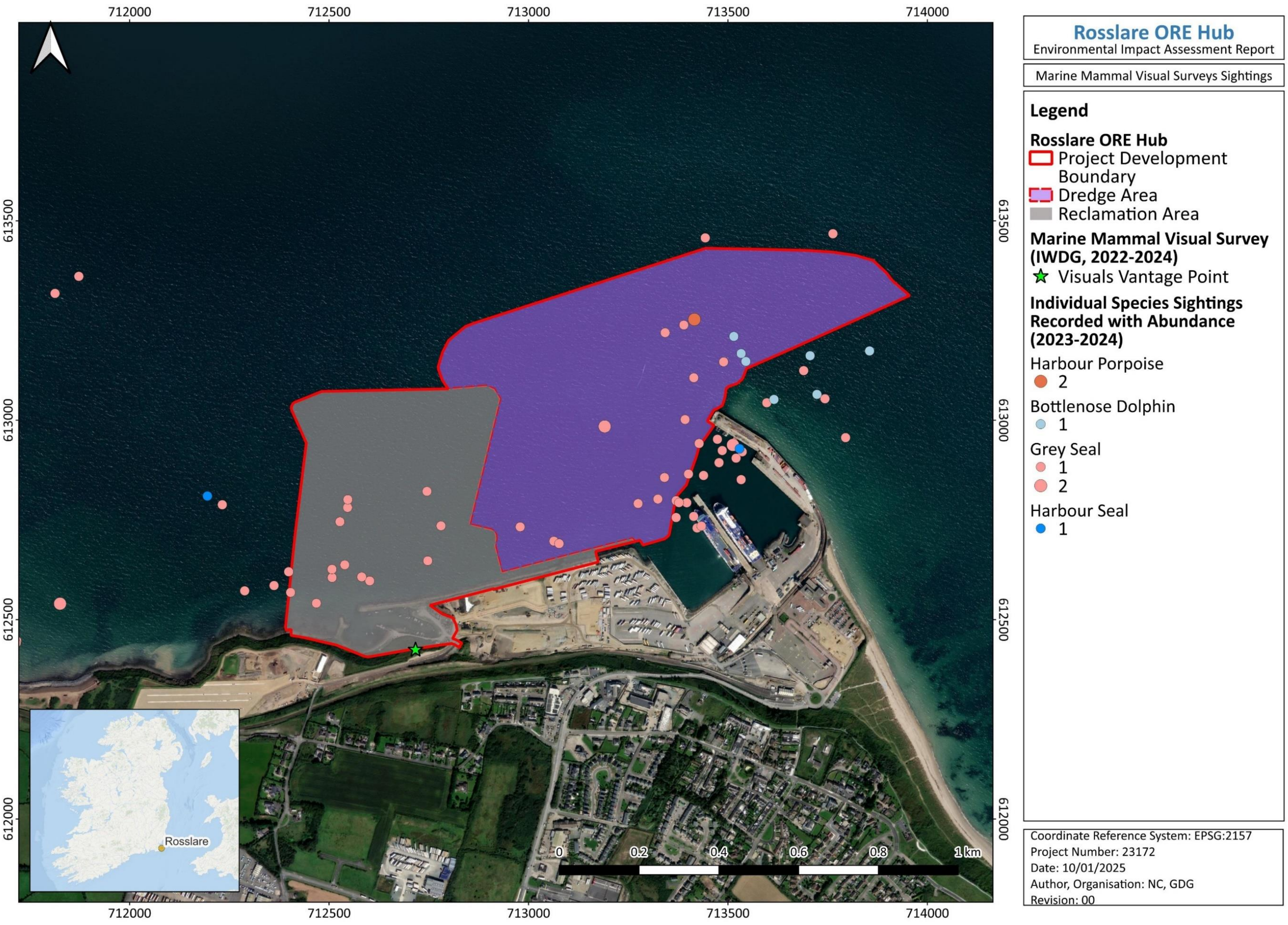

Figure 13.37: Year 2 (September 2023 - August 2024) Marine mammal sightings within and near to the Proposed Development Boundary

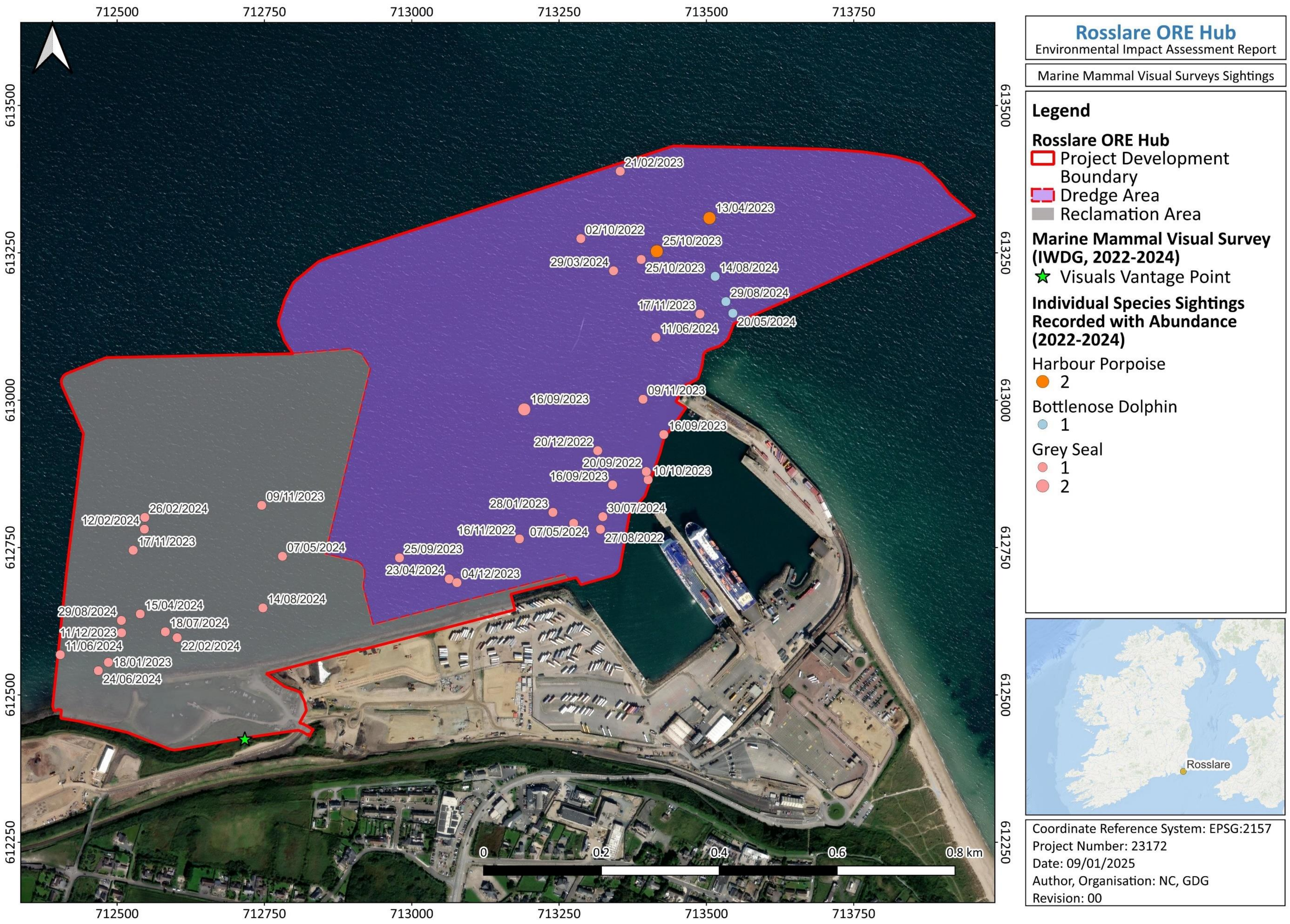

Figure 13.38: Summary of survey sightings (2022-2024) within the Proposed Development Boundary

13.5 ASSESSMENT OF IMPACTS

13.5.1 "DO-NOTHING" SCENARIO

The 'Guidelines on the information to be contained in Environmental Impact Assessment Reports' from the Environmental Protection Agency (EPA, 2022) establishes the importance of thoroughly considering a range of scenarios, including the "Do-Nothing" scenario, when assessing potential environmental impacts.

In this EIAR, the term 'Do Nothing' scenario refers to the evolution of the baseline without the Proposed Development.

In the "Do-Nothing" Scenario, the Proposed Development would not proceed, and existing environmental conditions for marine mammals within the Zone of Influence (ZoI) would remain undisturbed by construction or additional operational activities. The marine environment would continue as it currently is, with no alteration to marine mammal habitats or increased vessel traffic related to the Proposed Development. Marine mammals would continue using existing routes and habitats, with no change to their natural patterns or distribution as a result of the development.

This scenario would result in a neutral impact on marine mammal biodiversity within and around the area of the Proposed Development. Natural ecological processes, including seasonal migrations and habitat use patterns, would continue unaffected. However, it is important to note that ongoing environmental pressures unrelated to the Proposed Development, such as prey availability, water quality issues or pollution, could still influence marine mammal ecology over time, as could pressures including increasing vessel activity and maintenance dredging activities at the port.

The baseline marine environment, as outlined in Section 13.3.3, reflects current conditions in and around Rosslare Europort, a commercialised area where existing operations already place some pressure on marine resources and habitats. A total of 5,910 transits took place between 1st May 2023 and 30th April 2024 by 383 unique vessels (see Chapter 20: Shipping and Navigation for more information about shipping in the area). Due to limited historical data on marine mammals in the immediate Study Area, establishing precise trends for local marine mammal populations is challenging. However, any existing and projected trends in habitat use are likely shaped by the ongoing commercial activities at the Europort and in surrounding waters. Lands within the Rosslare Europort are designated for port-related purposes under the Wexford County Development Plan 2022-2028, suggesting that marine biodiversity in the area will continue to need to adapt to this baseline of commercial activity. Additionally, surrounding zones in Rosslare are predominantly designated for residential, commercial, or industrial uses, which may maintain or slightly intensify pressures on waterbodies. Consequently, biodiversity trends related to marine mammals are expected to persist in a similar manner, following the established baseline patterns.

13.5.2 PRIMARY MITIGATION

Primary mitigation refers to measures that are fully integrated into the design and methodology of the Proposed Development to avoid or substantially reduce potential impacts on KERs. These measures are incorporated at the project design stage and will operate throughout both the construction and operational phases.

13.5.2.1 PERIMETER BUND AND NOISE ATTENUATION MEASURES FOR PILING

NPWS (2014) recommends incorporation of the use of fully enclosing or confined bubble curtains, encircling absorptive barriers (e.g., isolation casings, cofferdams) or other demonstrably effective noise reduction methods at the immediate works site, in order to reduce underwater sound propagation from on-site operations, as studies have shown that such methods can provide a significant reduction in sound input to the wider aquatic environment in the order of 10-30 dB. Use of these recommended risk minimisation measures is further supported by modelling undertaken by Stokes *et al*. (2010), which predicted noise reductions of approximately 20 dB when employing large de-watered cofferdams, and a review completed by JNCC (2024), which found physical noise abatement systems used for offshore piling can reduce underwater noise levels by up to 24 dB.

As described and shown in Chapter 6: Project Description, a perimeter bund of rockfill will be constructed in advance of piling activities. This integrated design feature will act as a physical barrier between the piling works and the open marine environment. These bunds serve dual functions: (i) providing a safe and stable platform for land-based piling equipment, and (ii) significantly attenuating underwater noise transmission into the wider marine environment. At the ORE Berth 1 and ORE Berth 2 quay walls, bunds will be progressively advanced from the shoreline, ensuring that piling is always carried out within an enclosed environment. As piling progresses, the bunds will be excavated and repositioned forward, ensuring that piling always occurs within an enclosed environment.

For piling at the new small boat harbour, the rockfill bunds forming part of the permanent perimeter of the reclamation area will be temporarily extended to fully enclose the Small Boat Harbour to contain underwater noise generated by impact piling. This will create a closed lagoon during piling works, shielding the open sea from underwater noise propagation. Once piling within the Small Boat Harbour is complete, the temporary rockfill closure will be removed and the material reused in subsequent phases of the works.

This bunded piling approach will result in a substantial reduction in noise transmission into open water compared to conventional offshore piling operations. By acting as a natural noise barrier, the bund will limit the spatial extent of auditory injury and behavioural disturbance for marine mammals. The containment of piling noise within the bunded area considerably reduces noise propagation into open water, thereby lowering the potential impact on sensitive marine species.

13.5.2.2 ROTARY BORED PILING TECHNIQUE AND NOISE REDUCTION

The bearing piles for the two main quays will generally comprise rotary bored piles due to the presence of underlying rock that does not ideally allow for impact driving. Rotary bored piling uses slow, controlled drilling to advance piles, rather than percussive hammering. As such, rotary piling is considerably quieter than conventional impact piling. Undertaking piling from behind bunds further reduces the potential for sound propagation into the marine environment compared with piling from floating or jack-up plant.

The primary use of rotary bored piling techniques for the majority of the Proposed Development's piling activities represents a l 'designed-in' noise mitigation measure. Unlike impact piling - known to generates intense, impulsive broadband noise with peak sound pressure levels often exceeding 210-240 dB re 1 µPa @ 1m - rotary drilling produces continuous, lower-level noise. Scientific studies, such as Erbe and McPherson (2017), have measured source levels for geotechnical drilling in the range of 142-145 dB re 1 µPa rms @ 1m, demonstrating a reduction in overall noise energy and peak pressure by tens of decibels compared to impact piling. This inherent characteristic of rotary piling substantially reduces the potential for high-intensity noise exposure to marine mammals. The modelled worst-case impacts for impact piling (110m PTS, 1800m TTS) are therefore highly precautionary.

13.5.2.3 ROCK BLASTING APPROACH AND ENVIRONMENTAL CONTROLS

As part of the Proposed Development, rock blasting may be required along the quay wall to facilitate the installation of infill sheet piles between the main bearing piles. The method assumes that a line of retaining wall along the quay face will be pre-drilled and blasted using explosives to fracture the underlying rock.

NPWS (2014) recommends incorporation of the use of fully enclosing or confined bubble curtains, encircling absorptive barriers (e.g., isolation casings, cofferdams) or other demonstrably effective noise reduction methods at the immediate works site, in order to reduce underwater sound propagation from on-site operations, as studies have shown that such methods can provide a significant reduction in sound input to the wider aquatic environment in the order of 10-30 dB, with Stokes *et al*. (2010) predicting ~20 dB for de-watered cofferdams, and JNCC (2024) reporting reductions of up to 24 dB for physical abatement systems.

In this case, blasting works will be carried out from land-based equipment positioned directly on the sequentially advanced rockfill bunds along the ORE Berth 1 and ORE Berth 2 alignments. The bunds serve dual functions - providing a safe working platform for land-based piling/blasting equipment, and acting as an acoustic barrier that significantly reduces noise transmission into open waters.

To further control sound propagation, only the minimum quantity of explosives required to achieve effective rock fracture will be used, and where practicable, multiple smaller blasts will be favoured over fewer large detonations to reduce peak sound levels. In addition, explosive charges will be placed within boreholes or shallow depressions and stemmed with suitable materials (e.g. gravel, crushed rock) to further reduce propagation of underwater sound.

To ensure controlled execution and minimise environmental impacts, each blast will be spaced approximately 2–3 weeks apart, progressing sequentially along the quay wall to allow for installation of the main quay wall bearing piles. Each blast is expected to prepare a length of c. 30 m of quay wall, requiring approximately 20 individual blasting days to complete both ORE Berths. Each blast will involve up to 15No. holes, 90mm in diameter, drilled at 2m centres to a depth of c. -16 mCD. Each hole will receive 50kgs of explosive such as ‘Kemex 70’ (as used at Rossaveel Fishery Harbour Centre, Co. Galway) and will be detonated using non-electric starter line for safety considerations on site.

All drilling and blasting will be undertaken from the dry rockfill platform, with an effective rock overburden to c. +4 mCD above the blast point. This platform significantly dampens vibration and sound propagation into the water column. The bund therefore provides an effective natural acoustic barrier, materially reducing the transmission of impulsive sound waves and minimising potential impacts on marine mammals and other sensitive receptors.

13.5.2.4 POLLUTION EVENT

Chapter 7: Soils, Geology, Hydrogeology and Contamination and Chapter 9: Water Quality and Flood Risk describe primary mitigation incorporated into the design of the Proposed Development that will function during operation of the Proposed Development. These measures are integrated into the project design and aim to avoid the release of pollutants, including waste, sewage, and hydrocarbons.

The protect water quality, the design incorporates a series of specific drainage controls:

- Perimeter drainage: Perforated pipes will be installed to collect percolating water from the ORE Storage Area. These drains will run to collector chamber points and through oil/silt interceptors before discharging into the sea.
- Tide control: The level of the perimeter drains is set above the Highest Astronomical Tide (HAT) to prevent saltwater from entering the system, minimizing the risk of potential contaminants interacting with high tides.
- Additional site drainage: Flow paths for groundwater may be supplemented by herringbone filter drains, subject to detailed design.
- Slope drainage: At the toe of the vegetated slope (sea cliff), a separate drainage system will capture surface runoff and discharge it via a sea outfall, preventing uncontrolled flows onto the new access road.

13.5.2.5 SPEED LIMIT FOR VESSELS ON APPROACH TO SMALL BOAT HARBOUR

Vessels transiting to and from the new small boat harbour will be instructed to observe a 5 knot speed limit while in harbour bounds. This will reduce the risk of collision and other vessel related marine mammal disturbances.

13.5.3 TERTIARY MITIGATION

13.5.3.1 WATER QUALITY

The results of the sediment and water chemistry analysis have indicated that there are no toxic compounds within the sediment that may be disturbed and dispersed during the construction or operational phases.

The following tertiary mitigation measures will be implemented:

- Pollution Response Frameworks
  - Implementation of the Rosslare Europort Oil Spill Response Plan (OSRP, 2018), updated prior to construction and operation, to guide coordinated responses to any accidental hydrocarbon or Hazardous and Noxious Substance (HNS) spills.
  - Annual submission of Shipboard Marine Pollution Emergency Plans (SOPEPs) by all qualifying vessels to the Harbour Master, as required under MARPOL Annex I.
- Operational Environmental Management

    - Operation of the Proposed Development under the Local Port Services Plan (LPS), incorporating Standard Operating Procedures (SOPs) for oil/chemical spill response, waste handling, refuelling, and stormwater management.
    - Continuous compliance with MARPOL and relevant Irish and EU maritime legislation.
- Emergency Preparedness and Oversight
    - Maintenance of a Pollution Incident Response Plan and availability of emergency spill kits at all working areas.
    - Inclusion of Rosslare Europort within the Wexford County Council Coastal Pollution Plan, ensuring coordination with local authorities in the event of an incident.

These tertiary measures provide an additional layer of assurance that any unforeseen pollution risks will be effectively managed, thereby reducing the potential for indirect effects on marine mammals via degradation of water quality or prey resources.

13.5.4 KEY ECOLOGICAL RECEPTORS

The Key Ecological Receptors (KERs) are the marine mammal species that have the potential to be impacted by the Proposed Development. The significance of ecological features is determined based on their biodiversity, social, and economic value within an appropriate geographic framework of reference (CIEEM, 2024).

The KERs for marine mammals are focused on the species recorded or identified within the Regional Marine Mammal Study Area during field surveys, which demonstrated the use of the Proposed Development Boundary and its surrounding areas by these species. The potential effects of the Proposed Development have been evaluated in relation to these KERs to determine their significance. Marine mammal KERs have been identified based on their observed presence during surveys, ecological importance as recognised through international and national legislation, conservation status or plans, and their functional role within the context of the Regional Marine Mammal Study Area.

The Proposed Development Boundary is a coastal environment with typical water depths of < 10 m Chart Datum (CD)[2]. This relatively shallow depth restricts the use of the site as a foraging habitat for some larger marine mammals that require deeper waters to access their prey. Additionally, the Proposed Development will be developed in an already existing busy harbour, which influences the presence and behaviour of marine mammals in the area. These site-specific characteristics, including existing levels of human activity and habitat suitability, have been considered when determining the KERs. Table 13.7 provides the assigned value/importance of each marine mammal ecological feature. All marine mammals with the potential to be impacted by the Proposed Development are afforded protection under various forms of international legislation and/or hold significant conservation importance at both international and national levels. Consequently, the value of all marine mammal KERs has been determined to be of international importance.

[2] **Chart Datum** is the reference level to which tidal heights and depths on nautical charts are measured, typically representing the lowest predictable tide.

Table 13.7: KERs within the Proposed Development Marine Mammal Regional Study Area

KER	Value	Justification
Odontocetes		
Harbour Porpoise (*Phocoena phocoena*)	International	• Annex II species of EC Habitats Directive (92/43/EEC); Blackwater Bank SAC, Carnsore Point SAC, Hook Head SAC. • Annex IV of EC Habitats Directive (92/43/EEC) • OSPAR List of Threatened and Declining Species & Habitats • Wildlife Acts (1976, as amended) – 5th ScheduleCouncil Regulation (EC) No. 812/2004 • Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix II • Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) Appendix II* • Convention on Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II • Whale Fisheries Act 1937
Bottlenose Dolphin (*Tursiops truncatus*)	International	• Annex II species of EC Habitats Directive (92/43/EEC); Hook Head SAC. • Annex IV of EC Habitats Directive (92/43/EEC) • Wildlife Acts (1976, as amended) – 5th ScheduleConvention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix II* • Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) Appendix I • Convention on Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II • Council Regulation (EC) No. 812/2004 • Whale Fisheries Act 1937
Common Dolphin (*Delphinus delphis*)	International	• Annex IV of EC Habitats Directive (92/43/EEC) • Annex II of EC Habitats Directive (92/43/EEC)* • Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix II • Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) Appendix II* • Convention on Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II • Council Regulation (EC) No. 812/2004 • Wildlife Acts (1976, as amended) – 5th Schedule

KER	Value	Justification
		*Only applies in the Mediterranean region, not in Irish waters
Risso's Dolphin (*Grampus griseus*)	International	• Annex IV of EC Habitats Directive (92/43/EEC) • Wildlife Acts (1976, as amended) – 5th Schedule Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix II • Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) Appendix II* • Convention on Trade in Endangered Species of Wild Fauna and Flora Appendix (CITES) II • Council Regulation (EC) No. 812/2004 • Whale Fisheries Act 1937 * Only particular populations are protected by this Convention, but individuals of some of those populations may occur in Irish waters.
Mysticetes		
Minke whale (*Balaenoptera acutorostrata*)	International	• Annex IV of EC Habitats Directive (92/43/EEC) • Wildlife Acts (1976, as amended) – 5th ScheduleConvention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix II* • Convention on Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix I • International Convention for the Regulation of Whaling 1946 (as amended) • Council Regulation (EC) No. 812/2004 • Whale Fisheries Act 1937 * Only in the Mediterranean
Pinnipeds		
Grey Seal (*Halichoerus grypus*)	International	• Annex II species of EC Habitats Directive (92/43/EEC); Saltee Islands SAC • Annex V of EC Habitats Directive (92/43/EEC) • Wildlife Acts (1976, as amended) – 5th ScheduleConvention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix III • Wildlife (N.I.) Order of 1985

KER	Value	Justification
Harbour (Common) Seal (*Phoca vitulina*)	International	• Annex II species of EC Habitats Directive (92/43/EEC); Slaney River Valley SAC. • Annex V of EC Habitats Directive (92/43/EEC) • Wildlife Acts (1976, as amended) – 5th ScheduleConvention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) Appendix III • Wildlife (N.I.) Order of 1985

13.5.5 CONSTRUCTION PHASE IMPACTS

As previously stated, the primary focus of the Marine Mammal EIA chapter is on the assessment of noise impacts. The following section evaluates the potential noise-inducing impacts associated with construction activities, including piling, dredging, and rock blasting, and their effects on marine mammals.

Note: For the following assessments, the more impactful noise metric was used to determine significance. Where weighted cSEL thresholds resulted in a larger zone of impact than zero-to-peak SPL thresholds for PTS or TTS, the weighted cSEL values were used in the assessment. Conversely, where the zero-to-peak SPL thresholds resulted in a larger zone of impact, these values were applied in the determination of significance. This approach ensures that the most precautionary and appropriate impact distances are used in each assessment.

13.5.5.1 PILING

The primary impact of piling on marine mammals at the Proposed Development is underwater noise.

Noise modelling has been conducted to assess the potential impacts of piling, focusing on impact piling as a worst-case scenario due to its higher levels of underwater noise generation. As outlined in Chapter 6: Project Description, piling will primarily involve rotary bored piling, which produces substantially lower noise levels than impact piling, and will be conducted within contained (Small Boat Harbour) and enclosed (ORE Berths) bunded areas.

The noise modelling analysis was therefore based on impact piling with a hammer of 240 kJ, representing the most impactful piling scenario in terms of noise emission. However, the impact piling expected along the proposed New Small Boat Harbour will likely use a lower hammer energy of approximately 120 kJ, reducing the overall noise output compared to the modelled worst-case scenario.

Auditory Injury

The zero-to-peak SPL from pile strikes during impact piling at the Proposed Development have been estimated and compared to the Southall *et al.* (2019) thresholds for PTS and TTS from impulsive noise. The impact hammer was modelled operating at a maximum energy of 240 kJ, which is a conservative scenario, exceeding what is anticipated for the Proposed Development. The maximum estimated distances where the Southall *et al.* (2019) zero-to-peak SPL thresholds for PTS and TTS onset are exceeded during piling are summarised in Table 13.8.

Table 13.8: Maximum predicted distances to zero-to-peak SPL thresholds for instantaneous PTS and TTS to marine mammals from piling

Hearing group	Species relevant to this assessment	Zero-to-peak SPL threshold (dB re 1 µPa^2)		Maximum distance to threshold (m)	
		PTS	TTS	PTS	TTS
LF cetaceans	Minke Whale	219	213	7	17
HF cetaceans	Bottlenose Dolphin, Common Dolphin and Risso's Dolphin	230	224	2	4
VHF cetaceans	Harbour Porpoise	202	196	110	270
Phocid carnivores in water	Grey Seal and Harbour Seal	218	212	8	20

Weighted cSELs received by marine mammals over 24 hours of piling have been estimated assuming that marine mammals swim away from the piling location at different swim speeds and initial starting distances (distance from the piling location at the start of piling). The estimated initial starting distances at which marine mammals must be from the piling, so they are not exposed to cSELs exceeding the Southall *et al.* (2019) thresholds for PTS and TTS from impulsive noise, are summarised in Table 13.9. The results are presented for marine mammals swimming away from the piling location at different swim speeds ranging from 1.5 – 3 m/s. The results for an assumed swim speed of 1.5 m/s are generally conservative. For example, the normal swimming speed of a minke whale is 2.1 m/s (Williams, 2009) and they have been observed swimming at much faster speeds up to 7.2 m/s (Lockyer, 1981). A harbour porpoise exposed to playback pile-driving noise was observed to swim away from the sound source at a mean swim speed of 2.0 m/s (Kastelein *et al.,* 2018). However, harbour porpoises have been recorded swimming at much faster speeds of up to 4.3 – 6.2 m/s (Culik *et al.,* 2001; Otani *et al.,* 2001). The mean swim speed of harbour seals and grey seals is about 1.8 m/s (Thompson, 2015).

All marine mammal species assessed are therefore capable of swimming away from piling activities at speeds faster than 1.5 m/s and would be expected to do so if the piling was causing harm or discomfort.

Table 13.9: Predicted distances to weighted cSEL thresholds for PTS and TTS to marine mammals from piling

Hearing group	Species relevant to this assessment	Weighted cSEL threshold (dB re 1 μPa²s)		Swim speed (m/s)	Distance to threshold (m)	
		PTS	TTS		PTS	TTS
LF cetaceans	Minke Whale	183	168	1.5	10	2,600
				2.0	10	2,000
				2.5	10	1,400
				3.0	10	780
HF cetaceans	Bottlenose Dolphin, Common Dolphin and Risso's Dolphin	185	170	1.5	Not exceeded	Not exceeded
				2.0	Not exceeded	Not exceeded
				2.5	Not exceeded	Not exceeded
				3.0	Not exceeded	Not exceeded
VHF cetaceans	Harbour Porpoise	155	140	1.5	30	2,600
				2.0	20	1,800
				2.5	10	1,300
				3.0	10	1,100
Phocid carnivores in water	Grey Seal and Harbour Seal	185	170	1.5	Not exceeded	80
				2.0	Not exceeded	40
				2.5	Not exceeded	30
				3.0	Not exceeded	20

Displacement

Displacement to marine mammals from impact piling has been assessed by comparing the estimated maximum noise levels to a single-pulse unweighted SEL threshold of 145 dB re 1 μPa²s. This threshold is mainly based on observations of harbour porpoise displacement from impulsive noise (Brandt *et al.,* 2016; Thompson *et al.*, 2013; Lucke *et al.*, 2009), which may be conservative for other species. The modelling predicts that marine mammals could be displaced from impact piling at the Proposed Development out to a maximum distance of 4.6 km from the piling location and an area of 16.3 km² will be impacted on a given day of piling (Table 13.10). The area of impact shown in Table 13.10 was calculated from the underwater noise modelling where SELs from the piling on a given day were above the threshold of 145 dB re 1 μPa²s.

Table 13.10: Maximum predicted distance from piling to the marine mammal displacement threshold and area impacted

Activity	Displacement threshold	Maximum distance (km)	Area impacted (km^2)
Piling	SEL: 145 dB re 1 μPa^2s	4.6	16.3

The predicted area of displacement from piling is considered in the context of abundance and density estimates of cetacean populations for their respective relevant Management Units in Table 13.11.

Table 13.11: Regional scale footprint of displacement from underwater noise associated with piling

Species	SCANS Density (ind./km^2)	Area of displacement (km^2)	Proportional No. of individuals impacted	MU population	% MU population impacted
Harbour Porpoise	0.2803	16.3	5	62,517	0.008%
Bottlenose Dolphin	0.2352	16.3	4	293	1.365%
Common Dolphin	0.0272	16.3	1	102,656	0.001%
Risso's Dolphin	0.0022	16.3	1	12,262	0.008%
Minke Whale	0.0137	16.3	1	20,118	0.005%

Given the highly mobile nature of these species and relatively small number of individuals and low proportion of the Management Unit populations likely to be impacted, displacement effects on cetaceans are not considered further in this assessment.

Integration of the Bunded Area as a Designed-in Feature

The influence of piling within the bund on underwater noise emitted from piling activities (see Chapter 6: Project Description of this EIAR) could not be considered in the noise modelling undertaken, as there is insufficient empirical data to establish definitive values for the noise attenuation levels provided by bunds. Additionally, the noise of piling within contained (small boat harbour) and enclosed (ORE Berths) bunded areas cannot be precisely modelled due to site-specific variables, including bund structure, water depth, and substrate composition, all of which influence noise attenuation.

Published evidence demonstrates that physical barriers of this type consistently reduce underwater noise by a material margin. NPWS (2014) reports reductions in the order of 10–30 dB using fully enclosing or confined barriers, while Stokes *et al*. (2010) modelled reductions of ~20 dB for de-watered cofferdams, and JNCC (2024) reviews found physical abatement systems to achieve up to 24 dB.

Accordingly, while the precise reduction achievable at Rosslare cannot be modelled, it can be stated with confidence that the bund will materially reduce sound input to the wider marine environment compared to unbunded piling. Its integration as a designed-in feature of the project means that the actual zones of auditory injury and disturbance for marine mammals will be significantly smaller than those predicted by the conservative noise model.

VHF Cetaceans – Harbour Porpoise

The significance of noise-related impacts depends on proximity to the piling site.

PTS

Based on the noise modelling results for impact piling undertaken without inclusion of integrated noise-reduction measures, the modelled extent of PTS for VHF cetaceans, such as harbour porpoises, extends up to 110 m from the piling source, based on predicted on zero-to-peak SPL threshold. To avoid cSEL threshold for PTS, VHF cetaceans would need to swim away from the piling activity from an initial distance of at least 30 m if swimming at a speed of 1.5 m/s.

Given that piling will only occur within contained (Small Boat Harbour) and enclosed (ORE Berths) bunded areas and the primary piling method will be rotary bored piling, the actual noise levels experienced in open water will be considerably lower than the 110 m predicted by noise modelling for conventional impact piling without integrated noise-reduction measures.

Piling for the Proposed Development is expected to use an impact hammer with an energy level of 120 kJ. Following the precautionary principle, modelling for piling used an impact hammer operating at an energy of 240 kJ to represent the worst-case scenario. Therefore, while some noise will still propagate beyond the bund, the extent of auditory injury risks is expected to be greatly reduced due to the combined effects of noise attenuation from the bund, the primary use of rotary piling, and the lower-energy hammer parameters. Given that piling will occur within a contained (Small Boat Harbour) and enclosed (ORE Berths) bunded area and the primary piling method will be rotary bored piling or impact piling with an energy level of 120 kJ, the zone of impact for VHF cetaceans from noise is expected to be lower than the 110 m predicted by noise modelling for conventional impact piling without integrated noise-reduction measures. While noise is expected to propagate beyond the bund, the extent of auditory injury risks is expected to be greatly reduced due to the combined effects of noise attenuation from the bund, the primary use of rotary piling, and the lower-energy hammer parameters.

According to NPWS (2014), studies have shown the use of fully enclosing or confined bubble curtains, encircling absorptive barriers (e.g., isolation casings, cofferdams) or other demonstrably effective noise reduction methods at the immediate works site, in order to reduce underwater sound propagation from on-site operations, can provide a significant reduction in sound input to the wider aquatic environment in the order of 10-30 dB.

As the effect of the proposed integrated noise-reduction measures on noise propagation cannot be precisely quantified at this point in time, PTS at a distance of up to 110 m during piling, as predicted by noise modelling as set out above, is considered to be significant for VHF cetaceans at both the individual and population levels. However, piling will occur within contained (Small Boat Harbour) and enclosed (ORE Berths) bunded areas, and rotary bored piling will be the primary method for bearing piles. Published studies indicate that physical noise abatement systems such as cofferdams or bunds can reduce underwater noise propagation by 10–30 dB (NPWS, 2014; Stokes *et al*., 2010) and in some cases up to 34 dB (JNCC, 2024), while rotary drilling has been measured at 142–145 dB re 1 µPa rms @ 1m (Erbe & McPherson, 2017), substantially quieter than the 210–240 dB re 1 µPa @ 1m typical of impact piling. Both measures are therefore expected to materially reduce underwater noise propagation compared to conventional impact piling in open water. Accordingly, the assessment of PTS at the distances modelled should be regarded as highly precautionary.

TTS

Based on the noise modelling results for impact piling undertaken without the inclusion of integrated noise-reduction measures, the predicted extent of TTS for VHF cetaceans extends up to 270 m from the piling source, based on the predicted zero-to-peak SPL threshold. To avoid cSEL thresholds for TTS, VHF cetaceans would need to swim away from the piling activity from an initial distance of at least 2,600 m if swimming at a speed of 1.5 m/s.

TTS, while temporary, can impair foraging efficiency and increase vulnerability, particularly if it overlaps with critical foraging areas. The significance of these effects depends on the duration of exposure and the availability of alternative habitats.

Given that piling will only occur within contained (Small Boat Harbour) and enclosed (ORE Berths) bunded areas, and that the primary piling method will be rotary bored piling, the exceedance distance based on the actual noise levels experienced in open water will be much lower than the 2,600 m predicted for conventional impact piling. Additionally, the impact hammer was modelled at a maximum energy of 240 kJ, which represents a conservative scenario exceeding what is anticipated for the Proposed Development, where an energy level closer to 120 kJ is expected to be used. While some noise will propagate beyond the bund, the extent of TTS risks is expected to be greatly reduced due to the combined effects of the bund's physical barrier, the quieter nature of rotary piling and the use of a lower-energy hammer.

Harbour porpoises are highly sensitive to impulsive noise and exhibit strong avoidance responses to piling activity. Research by Graham *et al*. (2019) found that at the start of piling activities, over 50% of individuals responded within a 7.4 km radius, but this response diminished over time, with the 50% probability of response reducing to a 1.3 km radius by the end of the piling period. This reduction in response may result from habituation, tolerance, or the displacement of more sensitive individuals by those that are less responsive. These findings suggest that harbour porpoises within the TTS zone of impact are likely to be displaced in response to piling noise, which may reduce the risk of both TTS and PTS.

Further research by Benhemma-Le Gall *et al*. (2023) highlights key behavioural responses of harbour porpoises to pre-piling activities at offshore windfarm sites. The study found that pre-piling vessel activity and installation operations - occurring 11–15 hours before pile driving - reduced harbour porpoise acoustic detections by up to 33% within 48 hours, effectively displacing porpoises before piling noise began. Increased vessel intensity, anchoring, pile loading, and installation activities further amplify this effect, suggesting that pre-piling disturbances may reduce porpoise presence before piling commences, limiting direct exposure to elevated noise levels.

Harbour porpoises are a highly mobile species with a wide distribution across coastal and shelf waters. While some individuals may be displaced due to piling noise, the bunded piling method and rotary bored piling is expected to reduce underwater noise transmission into open water, further limiting the likelihood of TTS occurrence.

TTS can temporarily reduce foraging efficiency and increase vulnerability, which may result in short-term consequences for individual animals. Individuals within the TTS zone of impact area may experience noise disturbance, displacement, or habitat degradation. If alternative foraging sites are unavailable or suboptimal, displacement may lead to localised energy deficits. However, the availability of alternative suitable habitats beyond the TTS zone of impact allows for natural redistribution of individuals, reducing the potential for long-term behavioural consequences.

Considering the integrated noise reduction measures, the high mobility of harbour porpoises, and the abundance of suitable coastal habitat in the surrounding waters, the effects of TTS from piling are considered **not significant** at both the individual and population levels.

HF Cetaceans – Dolphin Species

The significance of noise-related impacts is largely influenced by proximity to the piling site.

PTS

The risk of PTS for predicted distances to zero-to-peak SPL thresholds extends up to 2 m from the piling source for PTS in HF cetaceans, such as bottlenose dolphin, common dolphin and Risso's dolphin. This represents a very restricted range, and the likelihood of an individual marine mammal being within 2 m of the piling source is extremely low even without considering the integrated noise-reduction measures. Predicted distances to weighted cSEL thresholds for PTS are not exceeded at any of the assessed swim speeds for HF cetaceans.

The bunded piling approach and use of rotary bored piling are expected to materially reduce underwater noise propagation, thereby lowering the risk of auditory injury in HF cetaceans compared to conventional impact piling in open water. Literature indicates that bunds and other physical barriers can reduce underwater sound by 10–34 dB (Stokes *et al*., 2010; NPWS, 2014; JNCC, 2024), while rotary drilling produces sound levels several tens of decibels lower than impact piling (Erbe & McPherson, 2017). Noise modelling for conventional impact piling predicted that the zero-to-peak SPL threshold for PTS could be exceeded up to 2 m from the piling source; however, these predictions do not account for the noise-attenuating effects of the bunded environment or the quieter nature of rotary bored piling.

Additionally, piling within contained (Small Boat Harbour) and enclosed (ORE Berths) bunded areas will reduce the range of potential PTS exceedance and given that the bunded areas will be wider than 2 m, PTS will not be experienced by HF cetaceans, as the physical barrier will prevent cetaceans from being within this predicted PTS-inducing noise level range.

As a result, PTS impacts on HF cetaceans are expected to be reduced to negligible levels or eliminated altogether. Considering the substantial reduction in noise propagation from the integrated noise-reduction measures and the physical separation created by the bund, the risk of PTS is considered **not significant** at both the individual and population levels.

TTS

The risk of TTS for predicted distances to zero-to-peak SPL thresholds extends up to 4 m from the piling source for HF cetaceans. Predicted distances to weighted cSEL thresholds for TTS are not exceeded at any of the assessed swim speeds for HF cetaceans.

Based on the findings of site-specific surveys, it is considered unlikely that dolphin species will be present within 4 m of the piling source. Construction-related disturbance is expected to deter cetaceans from the immediate area.

Given that the bunded area will be wider than 4 m, it will physically cover the entire predicted TTS zone of impact, meaning it will not be possible for HF cetaceans to be within the TTS zone of impact. Furthermore, rotary bored piling, which generates much lower noise levels than conventional impact piling, will further reduce underwater noise propagation, minimising any residual risk of TTS occurrence.

As TTS is a temporary and reversible condition, it does not result in long-term auditory damage. Given that the bunded areas are expected to be wider than the predicted 4 m TTS zone of impact, it will act as a physical barrier preventing exposure, ensuring that HF cetaceans cannot be within the TTS impact range. Additionally, the noise reduction from piling within contained (Small Boat Harbour) and enclosed (ORE Berths) bunded areas, the lower energy hammer (120 kJ) expected for the Proposed Development, the primary use of rotary piling, and the low likelihood of individuals being near the piling source, further minimise the risk of auditory disturbance.

As a result, the effects of TTS at both the individual and population levels are considered **not significant**.

LF Cetaceans – Minke Whale

The significance of noise-related impacts depends on proximity to the piling site.

PTS

The modelling estimates for the potential impact of zero-to-peak SPL from piling activities indicate that LF cetaceans, such as minke whales, must be at least 7 m from the piling activity to avoid the risk of PTS. For the weighted cSELs, LF cetaceans must be at least 10 m away from the piling activity to avoid PTS, regardless of their swim speed. This indicates that the risk of PTS is highly localised and confined to a very small radius around the piling source.

The PTS zone of impact is extremely small (< 10 m radius) and confined to a very restricted zone around the piling source. At the individual level, the likelihood of a minke whale being within this range is extremely low, as they are unlikely to approach such a nearshore, shallow environment and would likely swim away from the sound source before sustaining permanent auditory injury. Field surveys recorded minke whale sightings outside the Proposed Development Boundary, suggesting limited use of the area near the piling location. This aligns with habitat preferences for depths exceeding 20 m, typically ranging from 20 to 50 m (Robinson *et al*., 2009), whereas the depth at the Proposed Development Boundary is < 10 m.

Additionally, the bunded piling method and rotary bored piling will reduce underwater noise propagation, further limiting the potential for auditory injury. The lower-energy hammer (~120 kJ) expected for the Proposed Development will also contribute to reducing noise levels compared to the 240 kJ modelled scenario. These integrated noise-reduction measures are expected to further reduce the PTS zone of impact, thereby further decreasing the already low risk of a minke whale being within the PTS zone of impact.

At a population level, given their general avoidance of high-intensity noise and activity zones, combined with the low likelihood of their presence within the small PTS range, the overall risk to the minke whale population is negligible. Furthermore, the integrated noise-reduction measures, including the bunded piling approach and use of rotary bored piling, will further reduce underwater noise propagation, thereby further limiting the potential for auditory injury.

Therefore, potential PTS effects of piling activities on minke whales are expected to be minimal and are considered **not significant** at both the individual and population levels.

TTS

The modelling estimates for the potential impact of zero-to-peak SPL from piling activities indicate that LF cetaceans must be at least 17 m from the piling activity to avoid TTS. This slightly larger radius still represents a very restricted TTS zone of impact. At the individual level, minke whales are unlikely to be present within 17 m of the piling source due to their general avoidance of such high-intensity noise and activity zones, and preferences for deeper waters (20 and 50 m; Robinson, Tetley and Mitchelson-Jacob, 2009).

The distance to avoid weighted cSELs TTS thresholds depend on the whale's swim speed. To avoid cSEL threshold for TTS, LF cetaceans would need to swim away from the piling activity from an initial distance of at least 2,600 m if swimming at a speed of 1.5 m/s. At higher swim speeds, this distance decreases considerably, ranging from 2,000 m (2.0 m/s) to 780 m (3.0 m/s).

The TTS zone of impact is predicted to range up to 2,600 m at a swim speed of 1.5 m/s, with the range decreasing as swim speed increases. Within this zone, TTS may occur, and behavioural displacement is also possible. This could disrupt essential behaviours such as foraging or transit, particularly if minke whales actively use the affected area. However, field surveys suggest that minke whales are transitory in the Proposed Development Boundary and do not rely heavily on the immediate vicinity of the piling location.

Given that piling will only occur within contained (Small Boat Harbour) and enclosed (ORE Berths) bunded areas, and that the primary piling method will be rotary bored piling or impact piling with a lower energy level of 120 kJ (half of the 240 kJ modelled scenario), the actual TTS zone of impact for LF cetaceans is expected to be considerably reduced compared to the 2,600 m TTS zone of impact predicted by noise modelling for conventional impact piling conducted in open water without integrated noise-reduction measures.

Furthermore, minke whales are highly mobile and exhibit a wide range of swimming speeds depending on context. While speeds of 1.5 m/s were used in the modelling as a conservative measure, minke whales typically swim at 2.5–7.0 m/s and can reach speeds of up to 8.3 m/s when fleeing disturbances or predators (Helble *et al.*, 2023). At these faster speeds, they can rapidly leave the potential TTS zone of impact, further reducing the likelihood of temporary auditory effects.

At the population level, the availability of alternative habitats beyond the TTS zone of impact, coupled with the wider regional distribution of minke whales and their limited use of the area near the Proposed Development, reduces the likelihood of any measurable impact on the overall population.

Considering these factors, along with the integrated noise reduction measures built into the project design, piling within the bunded areas are expected to reduce noise levels by at least 10 dB (DAHG, 2014). As a result, the effects of TTS on LF cetaceans are considered **not significant** at both the individual and population levels.

Phocid Carnivores in Water – Harbour and Grey Seal

The significance of noise-related impacts is largely influenced by proximity to the piling site.

PTS

The cSEL thresholds for phocid carnivores in water (e.g., grey and harbour seals) are 185 dB re 1 $\mu Pa^2 s$ for PTS and 170 dB re 1 $\mu Pa^2 s$ for TTS. These thresholds are higher than those for species like harbour porpoise, reflecting the lower sensitivity of seals to high-frequency noise.

Based on the site-specific noise modelling of impact piling with an energy hammer of 240 kJ in open water, it is predicted that the zero-to-peak SPL thresholds for PTS in phocid carnivores in water could be exceeded within a radius of up to 8 m. However, predicted distances to weighted cSEL thresholds for PTS are not exceeded at any of the assessed swim speeds for seals.

At the individual level, while the likelihood of a seal being within 8 m of the piling source is extremely low, PTS represents a permanent and irreversible auditory injury that can impair seals' hearing capabilities for communication and foraging.

At the population level, field surveys recorded grey seals within the Proposed Reclamation Area, where piling activities will take place, and grey and harbour seal vocalisations, including pups, were recorded within the harbour area. While seals are highly mobile and capable of detecting and avoiding underwater disturbances, the presence of individuals in the area, including pup vocalisations, suggests that the habitat holds functional importance.

However, the risk of auditory injury is expected to be substantially reduced due to the integrated noise-reduction measures built into the project design. The bunded piling environment will provide a physical barrier, reducing the propagation of underwater noise, while the primary use of rotary bored piling - substantially quieter than conventional impact piling – or impact piling with a lower energy level of 120 kJ (half of the 240 kJ modelled scenario), will further limit the extent of noise impacts in open water outside the bund.

Considering these factors, piling within contained (Small Boat Harbour) and enclosed (ORE Berths) bunded areas, is expected to reduce noise levels by at least 10 dB (DAHG, 2014). Therefore, the actual PTS zone of impact is anticipated to be much shorter than initially predicted, and the likelihood of exposure is further reduced to negligible levels.

Given the very restricted PTS impact range (8 m), the presence of contained and enclosed bunded piling areas and the primary use of quieter rotary piling methods for the ORE Berths, the risk of PTS is further reduced to a negligible level. As a result, the effects of PTS from piling are considered **not significant** at both the individual and population levels.

TTS

Noise modelling predicts that the zero-to-peak SPL thresholds for phocid carnivores could be exceeded for TTS within a radius of up to 20 m from the piling source. To avoid predicted cSEL thresholds for TTS, phocids would need to swim away from the piling activity from an initial distance of at least 80 m if swimming at a speed of 1.5 m/s, 40 m at 2.0 m/s, 30 m at 2.5 m/s, and 20 m at 3.0 m/s, indicating that TTS is a potential concern only in close proximity to the piling source, particularly at higher swim speeds.

At the individual level, seals are expected to avoid the immediate vicinity of construction activities and vessels, reducing the likelihood of exposure to noise levels capable of inducing TTS. Research on pile-driving effects on seals has shown that they tend to maintain distance from such noise sources, thereby reducing the risk for auditory damage (Whyte *et al*., 2020). Furthermore, the study indicates that seal densities return to pre-piling levels within two hours after piling ceases, suggesting that while temporary avoidance occurs, seals rapidly resume habitat use, limiting any prolonged impact.

The predicted TTS impact range was based on impact piling, whereas the actual noise levels are expected to be considerably lower due to the integrated noise-reduction measures built into the project design. These measures will reduce the extent of noise propagation, minimising the distance at which seals may experience TTS.

Given that TTS is a temporary and reversible condition, does not result in long-term auditory impairment, and has a highly restricted impact range (maximum 80 m), the short recovery time observed in seals, and the integrated noise-reduction measures, the likelihood of sustained auditory impairment or displacement is minimal.

As a result, the effects of TTS from piling are considered **not significant** at both the individual and population levels.

Displacement

Noise modelling based on harbour porpoise predicts displacement effects due to noise levels exceeding the SPL displacement threshold of 145 dB re 1 μPa^2. The same displacement threshold applies to seals, meaning that similar displacement effects are expected in response to these noise levels from impact piling (Tougaard, 2016).

The original noise modelling, which was based on impact piling with a hammer energy of 240 kJ in open water, predicted avoidance behaviours extending up to 4.6 km from the piling activity. This has potential to disrupt key breeding-related activities such as communication, territorial defence, and social interactions.

However, the actual displacement zone of impact is expected to be considerably smaller due to the integrated noise-reduction measures built into the project design. Piling within contained (Small Boat Harbour) and enclosed (ORE Berths) bunded areas is expected to reduce noise levels by at least

10 dB (DAHG, 2014), further reducing the extent of noise propagation, greatly reducing the distance at which seals may experience displacement.

While individual grey seals may be deterred from the displacement zone of impact, the availability of alternative habitats within the broader Regional Marine Mammal Study Area reduces the risk of long-term population-level effects. Consequently, for grey seals, the potential effects of behavioural disturbance over the duration of the piling works are considered **not significant** at both the individual and population levels.

The Slaney River Valley SAC is located approximately 6.6 km northwest of the Proposed Development, and supports known haul-out, breeding, and moulting sites for harbour seals. Under the initial noise modelling scenario - which did not account for integrated noise-reduction measures - the displacement zone of impact was estimated up to 4.6 km. This suggested that foraging harbour seals within this range may experience temporary disruptions, particularly during the breeding season (May to July).

However, piling will occur entirely within contained (Small Boat Harbour) and enclosed (ORE Berths) bunded areas, rotary piling is the primary method of piling employed for the ORE Berths. Due to these primary mitigations, the actual displacement zone of impact is expected to be much smaller than the originally predicted 4.6 km. While the noise modelling outputs have not been revised to reflect this reduction, the bunded piling approach and primary use of rotary bored piling will substantially reduce underwater noise transmission into open water. As a result, while temporary displacement of some individuals may still occur, the extent of displacement is expected to be lower than initially predicted under a conventional impact piling scenario.

Displacement will not prevent harbour seals from accessing the Slaney River Valley SAC or its important haul-out, breeding, and moulting sites. While some temporary avoidance of the displacement zone may occur, the availability of alternative suitable foraging and transit habitat in the surrounding waters ensures that seals will be able to move freely between foraging areas and the SAC.

Considering the anticipated reduction in displacement due to integrated noise-reduction measures, the overall effect of piling-related displacement on harbour seals is considered **not significant** both during and outside the harbour seal breeding season.

13.5.5.2 ROCK BLASTING

Rock blasting may be required along the quay face to facilitate installation of infill sheet piles between the main bearing piles, as described in Chapter 6: Project Description of this EIAR. The final requirement for blasting will depend on ground conditions encountered during construction, and it is therefore assessed here as a precautionary worst-case scenario.

The principal impact pathway from rock blasting on marine mammals considered in this assessment is underwater noise. Noise modelling has been undertaken using a semi-empirical blasting model to estimate potential noise levels and associated impact ranges.

There is inherent uncertainty in the predictions, as the characteristics of underwater noise generated by confined explosives (such as those used for rock blasting within boreholes) have been less widely studied than open-water detonations. Limited available measurements from comparable coastal or harbour blasting activities indicate substantial variability: Nedwell and Thandavamoorthy (1992) recorded zero-to-peak pressures as low as 6% of equivalent open-water conditions, while Hempen *et al*. (2007) reported values ranging from 19–41% during blasting at the Miami Harbour Deepening Project. On this basis, the zero-to-peak sound pressure from confined blasting is expected to fall within the range of 6–41% of that from equivalent open-water detonations.

To account for this variability, the present assessment has applied a mid-range value of 23.5% to estimate likely sound pressure levels, with the lower and upper bounds (6–41%) used to provide precautionary ranges for potential impact distances. This approach ensures that the modelling results capture the uncertainty and reflect a conservative assessment of potential effects on marine mammals. It is also noted that the weight of explosive relevant to these calculations is that contained in a single drill hole, as short delays between detonations prevent pressures from overlapping constructively.

Auditory Injury

The zero-to-peak SPL during rock blasting at the Proposed Development have been estimated and compared to the Southall *et al.* (2019) thresholds for PTS and TTS from impulsive noise. The estimated range of distances where the PTS and TTS thresholds are exceeded are summarised in Table 13.12. The bold highlighted numbers in Table 13.12 indicate the average estimated distances to threshold exceedances, whilst the bracketed numbers indicate lower and upper bounds (see EIAR Technical Appendix 13: Marine Mammals for details).

Table 13.12: Maximum predicted distances to zero-to-peak SPL thresholds for PTS and TTS to marine mammals from rock blasting

Hearing group	Species relevant to this assessment	Zero-to-peak SPL threshold (dB re 1 µPa^2)		Maximum distance to threshold (m) [1]	
		PTS	TTS	PTS	TTS
LF cetaceans	Minke Whale	219	213	**290** (85 - 470)	**520** (160 - 870)
HF cetaceans	Bottlenose Dolphin, Common Dolphin and Risso's Dolphin	230	224	**95** (30 - 155)	**170** (50 - 285)
VHF cetaceans	Harbour Porpoise	202	196	**1,630** (490 – 2,670)	**3,000** (900 – 4,920)
Phocid carnivores in water	Grey Seal and Harbour Seal	218	212	**320** (95 - 525)	**590** (175 - 965)

[1] **Bold** highlighted numbers indicate the predicted distances to threshold exceedance whilst the numbers in brackets indicate predicted lower and upper bounds.

Displacement

If rock blasting is required, only a single blasting event will be conducted on any given day at the Proposed Development. Furthermore, it is expected that there will be at least 2 – 3 weeks between each blasting event. A short-term startle response is considered more likely than any long-term displacement with animals expected to return to original locations. As such, long-term displacement of marine mammals from the area is not considered further in this chapter.

VHF Cetaceans – Harbour Porpoise

The significance of noise-related impacts depends on proximity to the blasting site.

The zero-to-peak SPL modelling predicts that the threshold for PTS in VHF cetaceans could be exceeded at distances up to 1,630 m, with a range of 490 – 2,670 m representing the lower and upper bounds of this prediction. This indicates a significant risk of permanent auditory injury within these distances if harbour porpoises are present during blasting. PTS results in permanent auditory damage, directly impairing porpoises' ability to echolocate and forage.

Baseline survey data confirm that porpoises are regularly present within the Proposed Dredge Area, with detections recorded on a high percentage of survey days (see Section 13.4.3.1 above and EIAR Technical Appendix 13: Marine Mammals). Given the permanent nature of PTS, the effects of PTS up to 1,630 m from the blasting source are considered **significant** at both the individual and population levels.

The TTS threshold is predicted to be exceeded at distances up to 3,000 m, with a range of 900 – 4,920 m representing the uncertainty in the model. This suggests a considerable area where temporary auditory effects may occur, particularly for individuals closer to the blasting source. TTS, while temporary, can momentarily reduce foraging efficiency and increase vulnerability during its duration.

Given that TTS may affect multiple individuals within a large zone of impact (i.e., 3,000 m radius of the blast source), the potential cumulative effects on multiple individuals could equate to a population-level impact at a localised scale, particularly if the affected area holds functional importance for foraging, commuting, or social interactions. While suitable foraging and commuting grounds exist beyond the TTS zone of impact, the potential for repeated exposure and temporary sensory impairment could still disrupt critical behaviours within this zone.

Therefore, the effects of TTS up to 3,000 m from the blasting source are not limited to individual-level impacts but are also considered **significant** at a localised population level due to the potential cumulative effects on multiple individuals recorded within the Study Area.

HF Cetaceans – Dolphin Species

For HF cetaceans (e.g., bottlenose dolphins, common dolphins, and Risso's dolphins), the zero-to-peak SPL threshold for PTS is predicted to be exceeded at distances up to 95 m, with a range of 30 – 155 m representing the uncertainty in the model. This indicates a very small area of potential PTS to HF cetaceans if individuals are present during blasting. Given the permanent nature of PTS and the inability of individuals to avoid exposure prior to blasting due to the lack of warning or ramp-up, the effects of PTS up to 95 m from the blasting source are considered **significant** at both the individual and local population levels.

The TTS threshold for HF cetaceans is predicted to be exceeded at distances up to 170 m, with a range of 50 – 285 m representing the uncertainty in the model. This suggests a relatively small area where TTS may occur, particularly for individuals closer to the blasting source.

TTS, while temporary, can reduce foraging efficiency and increase vulnerability during its duration. The spatial extent of TTS impacts for HF cetaceans is small relative to the blasting operation, however, TTS risks extend over a larger area than PTS. These risks therefore have the potential to result in a significant effect where exposure overlaps with important foraging areas.

Given that rock blasting will occur as discrete, single events without any warning, HF cetaceans will not have the opportunity to leave the TTS zone of impact before exposure. The potential for multiple individuals to be exposed within this small spatial area suggests that, although the effects of TTS are temporary, they may still be significant at an individual level.

Survey data confirms that bottlenose dolphins were observed within the Proposed Dredge Area, over multiple months across both survey years, with individuals recorded as close as 100 m north of the existing harbour breakwater, well within the TTS zone of impact. Acoustic monitoring also detected dolphins at both survey sites, with dolphins recorded on 81% of survey days at Site 2, located off the breakwater, and 51% of survey days at Site 1. These detections indicate consistent dolphin presence in the wider Regional Marine Mammal Study Area and suggest that individuals may be exposed to blasting noise at distances where TTS is predicted to occur.

While visual survey sightings for common dolphins and Risso's dolphins were recorded outside the Proposed Development Boundary, the presence of bottlenose dolphins within the zone of impact confirms that HF cetaceans actively use the Study Area. Given the recorded occurrence of HF cetaceans in proximity to the Proposed Development, there is potential for localised population-level impacts, as repeated or widespread exposure to TTS could temporarily disrupt foraging, communication, or other critical behaviours.

Although the TTS zone of impact for HF cetaceans is spatially limited relative to the blasting operation, the presence of HF cetaceans in the Regional Marine Mammal Study Area and their potential exposure to TTS effects suggests that the impact cannot be dismissed at the population level. Therefore, the effects of TTS up to 170 m from the blasting source are considered **significant** at both the individual and local population levels due to documented dolphin presence within the Regional Marine Mammal Study Area and potential disruption to critical behaviours.

LF Cetaceans – Minke Whale

The PTS threshold for LF cetaceans (e.g., minke whales) is predicted to be exceeded at distances up to 290 m, with a range of 85 – 470 m representing the uncertainty in the model. This indicates a moderate spatial extent where permanent auditory injury could occur if minke whales are present during blasting activities.

Survey data confirms that minke whales are present in the wider Study Area. While all confirmed sightings were recorded outside the Proposed Development Boundary, their documented presence in the broader area suggests occasional use of the region, meaning individuals could enter the PTS zone of impact during blasting events.

Given the permanent nature of PTS, PTS effects up to 290 m from the blasting source are considered **significant** at both the individual and population level due to the risk of irreversible auditory damage.

The TTS threshold for LF cetaceans is predicted to be exceeded at distances up to 520 m, with a range of 160 – 870 m representing the uncertainty in the model. This presents a larger area of potential temporary auditory effects compared to PTS, though it remains relatively limited in spatial extent. TTS, while temporary, can reduce foraging efficiency and increase vulnerability for its duration. The significance of TTS depends on the overlap with critical foraging areas and the duration of exposure. However, given the relatively small spatial extent of TTS thresholds for LF cetaceans, the temporary nature of TTS, the availability of alternative habitats and the transitory presence of minke whales, as indicated by field surveys, risk of TTS is considered negligible. Survey results confirm that minke whales do not appear to rely heavily on the immediate vicinity of the Proposed Development Boundary. As such, the effects of TTS for LF cetaceans from blasting are considered **not significant** at both an individual and population level.

Phocid Carnivores in Water – Harbour and Grey Seals

The significance of noise-related impacts depends on proximity to the blasting site.

For phocid carnivores in water (e.g., grey seals and harbour seals) the PTS threshold for blasting is predicted to be exceeded at distances up to 320 m, with an upper and lower range of 95 – 525 m representing the uncertainty in the model. This indicates a moderate spatial extent where PTS could occur if seals are present during blasting activities.

Survey data confirms that grey seals were consistently recorded within the Proposed Development Boundary, including the Proposed Dredge Area, with harbour seal vocalisations, including pups, recorded within the harbour area. Given the permanent nature of PTS and the lack of any warning or ramp-up before blasting occurs, individuals within this range would have no opportunity to leave before exposure. PTS results in permanent auditory damage, directly impairing seals' ability to navigate, forage, and communicate.

Therefore, the effects of PTS up to 320 m from the blasting source are considered **significant** at both the individual and local population levels due to the potential for multiple individuals to be affected within a known area of seal activity.

The TTS threshold for phocid carnivores in water is predicted to be exceeded at distances up to 590 m, with a range of 175 – 965 m representing the model uncertainty. This presents a broader spatial extent of potential TTS effects compared to PTS, though it remains spatially limited in the context of the wider Study Area.

TTS, while temporary, can impair seals' ability to detect predators and prey, potentially reducing foraging efficiency and increasing vulnerability during its duration. TTS may also disrupt critical behaviours such as communication and social interactions, particularly during sensitive periods such as the breeding season.

Survey data confirms that both grey and harbour seals, including harbour seal pups, were recorded in the harbour area, suggesting that the site holds functional importance. Given the potential for multiple individuals to be affected within the TTS zone of impact, the effects of TTS up to 590 m from the blasting source are considered **significant** at both the individual and local population levels.

Displacement effects from rock blasting (i.e., beyond 590 m from the noise source) are expected to be limited in duration and spatial extent. Only a single blasting event will be conducted per day, with at least 2–3 weeks between each event, greatly reducing the likelihood of long-term displacement.

A short-term startle response is considered more likely than prolonged displacement, with seals expected to return to their original locations shortly after the event. Survey data confirms that seals use multiple areas within the Study Area, indicating flexibility in habitat use, which reduces the potential for sustained displacement impacts.

Given the intermittent nature of blasting, the availability of alternative habitats in the broader area, and the species' expected ability to return post-disturbance, long-term displacement of seals is considered **not significant** at either the individual or population level.

13.5.5.3 DREDGING

The impact on marine mammals from dredging considered in this assessment is underwater noise.

Dredging operations involve two key phases:

1) Perimeter Bund Construction: approximately 1,000 m of bunds, made from 400,000 m³ of imported rockfill, will define the Reclamation Area over 6 – 8 weeks using construction barges.
2) Dredging and Reclamation:
    a) Soft Sediments: 550,000 m³ will be removed by a TSHD in 12 weeks, completing six loads daily.
    b) Remaining Material: 850,000 m³ will be dredged by a backhoe dredger over 33 weeks, operating for 20 hours daily.

These activities will generate underwater noise over extended durations.

Noise modelling has been conducted to estimate potential impacts to marine mammals from dredging at the Proposed Development. The modelling estimated noise levels from a TSHD operating continuously over a 24-hour period at the Proposed Development location (this is conservative for the anticipated 20 hours of dredging in a day).

Auditory Injury

The zero-to-peak SPL values during dredging at the Proposed Development have been estimated and compared to the Southall *et al.* (2019) thresholds for PTS and TTS from non-impulsive noise. The modelling predicted that the zero-to-peak SPL during dredging operations would not exceed the thresholds for PTS and TTS to marine mammals (Table 13.13).

Table 13.13: Maximum predicted distances to zero-to-peak SPL thresholds for PTS and TTS to marine mammals from dredging

Hearing group	Species relevant to this assessment	Zero-to-peak SPL threshold (dB re 1 µPa²)		Maximum distance to threshold (m)	
		PTS	TTS	PTS	TTS
LF cetaceans	Minke Whale	219	213	Not exceeded	Not exceeded
HF cetaceans	Bottlenose Dolphin,	230	224	Not	Not

Hearing group	Species relevant to this assessment	Zero-to-peak SPL threshold (dB re 1 µPa²)		Maximum distance to threshold (m)	
		PTS	TTS	PTS	TTS
	Common Dolphin and Risso's Dolphin			exceeded	exceeded
VHF cetaceans	Harbour Porpoise	202	196	Not exceeded	Not exceeded
Phocid carnivores in water	Grey Seal and Harbour Seal	218	212	Not exceeded	Not exceeded

Weighted cSELs received by marine mammals over 24 hours of continuous dredging at the Proposed Development have been estimated assuming that marine mammals swim away from the dredging at different swim speeds and initial starting distances (distance from the dredging location at the start of dredging). The estimated initial starting distances marine mammals must be from the dredging, so they are not exposed to cSELs exceeding the Southall *et al.* (2019) thresholds for PTS and TTS from non-impulsive noise are summarised in Table 13.14.

Table 13.14: Predicted distances to weighted cSEL thresholds for PTS and TTS to marine mammals from dredging

Hearing group	Species relevant to this assessment	Weighted cSEL threshold (dB re 1 µPa²s)		Swim speed (m/s)	Distance to threshold (m)	
		PTS	TTS		PTS	TTS
LF cetaceans	Minke Whale	199	179	1.5	Not exceeded	10
				2.0	Not exceeded	10
				2.5	Not exceeded	Not exceeded
				3.0	Not exceeded	Not exceeded
HF cetaceans	Bottlenose Dolphin, Common Dolphin and Risso's Dolphin	198	178	1.5	Not exceeded	Not exceeded
				2.0	Not exceeded	Not exceeded
				2.5	Not exceeded	Not exceeded
				3.0	Not exceeded	Not exceeded
VHF cetaceans	Harbour Porpoise	173	153	1.5	Not exceeded	410
				2.0	Not exceeded	320
				2.5	Not exceeded	250
				3.0	Not exceeded	210
Phocid carnivores in water	Grey Seal and Harbour Seal	201	181	1.5	Not exceeded	Not exceeded
				2.0	Not exceeded	Not exceeded
				2.5	Not exceeded	Not exceeded
				3.0	Not exceeded	Not exceeded

Displacement

Displacement to marine mammals from dredging at the Proposed Development has been assessed by comparing the estimated noise levels to an SPL threshold of 140 dB re 1 µPa². This threshold is based on observations of disturbance to marine mammals from non-impulsive noise sources (by Southall *et al.*, 2008). The studies reviewed by Southall *et al.* (2008) indicate an increasing likelihood of displacement at SPLs above this threshold.

Noise modelling predicts that marine mammals could be displaced by dredging up to a maximum distance of 1.3 km from the dredging area, equating to an area of 2.7 km^2 on a given day (Table 13.15). The area of impact has been calculated form the modelled sound field, measured from the centre of the dredging footprint as the area where sound levels exceed the 140 dB re 1 μPa^2 threshold.

Table 13.15: Maximum predicted distance from dredging to the marine mammal displacement threshold and area impacted

Activity	Displacement threshold	Maximum distance (km)	Area impacted (km^2)
Dredging	SPL: 140 dB re 1 μPa^2	1.3	2.7

The predicted area of displacement from dredging is considered in the context of abundance and density estimates of cetacean populations for their respective relevant Management Units in Table 13.16.

Table 13.16 Regional scale footprint of displacement from underwater noise associated with dredging

Species	SCANS Density (ind./km^2)	Area of displacement (km^2)	No. of individuals impacted	MU population	% MU population impacted
Harbour Porpoise	0.2803	2.7	1	62,517	0.002%
Bottlenose Dolphin	0.2352	2.7	1	293	0.341%
Common Dolphin	0.0272	2.7	1	102,656	0.001%
Risso's Dolphin	0.0022	2.7	1	12,262	0.008%
Minke Whale	0.0137	2.7	1	20,118	0.005%

Given the highly mobile nature of these species and relatively small proportion of their Management Unit impacted, small numbers of individuals and low proportion of the Management Unit populations likely to be impacted, displacement effects on cetaceans from dredging are not considered further in this assessment.

VHF Cetaceans – Harbour Porpoise

Predicted distances to zero-to-peak SPL thresholds and weighted cSELs at any swim speed in VHF cetacean, such as harbour porpoise, do not exceed thresholds for PTS at any distance during dredging operations. This indicates that the risk of permanent auditory injury from noise events during dredging is negligible for VHF cetaceans and is therefore considered **not significant**.

Predicted distances to zero-to-peak SPL thresholds for TTS in VHF cetaceans do not exceed thresholds for TTS at any distance during dredging operations. However, the modelling indicates that the risk of weighted cSELs TTS thresholds may be exceeded for VHF. To avoid cSEL thresholds for TTS, VHF cetaceans would need to swim away from the piling activity from an initial distance of at least 410 m from the dredging source if swimming at a speed of 1.5 m/s. This distance reduces to 320 m at 2.0 m/s, 250 m at 2.5 m/s, and 210 m at 3.0 m/s. TTS, while temporary, can notably reduce foraging efficiency and increase vulnerability during its duration.

However, given the current population size and the highly mobile nature of harbour porpoise individuals, which enables them to leave the TTS zone of impact, and their likelihood of avoiding the zone of impact during dredging activities, population-level risk is considered negligible. Therefore, the effects of TTS at this range are considered **not significant.**

HF Cetaceans – Dolphin Species

Predicted distances to zero-to-peak SPL and weighted cSELs thresholds for PTS and TTS in HF cetaceans do not exceed thresholds at any distance during dredging operations. This indicates that the risk of both TTS and PTS during dredging is negligible for HF cetaceans, such as bottlenose dolphins, common dolphins, and Risso's dolphins.

Given that both zero-to-peak SPL and cSEL thresholds are not exceeded, there is no anticipated risk at either the individual or population level of HF cetaceans from dredging activities. Therefore, the effects of noise exposure from dredging on HF cetaceans are considered **not significant** at both the individual and population levels.

LF Cetaceans – Minke Whale

Predicted distances to zero-to-peak SPL thresholds for PTS in LF cetaceans, such as minke whales, do not exceed the thresholds at any distance during dredging operations. This indicates that the risk of auditory injury from single peak noise events during dredging is negligible for LF cetaceans. Additionally, the modelling predicts that LF cetaceans are not at risk of PTS from weighted cSELs at any swim speed. This suggests that the risk of PTS is negligible and is therefore considered **not significant**.

Predicted distances to zero-to-peak SPL thresholds for TTS in LF cetaceans, such as minke whales, do not exceed the thresholds at any distance during dredging operations. This indicates that the risk of TTS from single peak noise events during dredging is negligible for LF cetaceans. For weighted cSEL thresholds for TTS in LF cetaceans, the threshold is exceeded only within 10 m of the dredging source for slower-swimming individuals at 1.5 m/s and 2.0 m/s, with no exceedance at higher swim speeds. This suggests that the risk of TTS is negligible at all but the closest ranges (i.e. 10 m).

The results of the noise modelling indicate that the combination of minke whales' ability to avoid close proximity to the dredging source and the limited range of potential impacts minimises the likelihood of significant auditory effects. Given that zero-to-peak SPL thresholds and most cSEL thresholds are not exceeded, the risk to LF cetaceans from dredging activities is very low.

Minke whales are unlikely to be within 10 m of the shore or at depths shallower than 20 m. Considering the current population size, the availability of alternative habitats and the transitory presence of minke whales, as indicated by field surveys, the limited range of potential impacts minimises the likelihood of significant auditory effects. Given that zero-to-peak SPL thresholds and most cSEL thresholds are not exceeded, the risk to LF cetaceans from dredging activities is very low, and the effects of noise exposure from dredging on LF cetaceans are considered **not significant** at both the individual and population levels.

Phocid Carnivores in Water – Harbour and Grey Seals

Predicted distances to zero-to-peak SPL thresholds and weighted cSELs at any swim speed in phocid carnivores, such as grey seals and harbour seals, do not exceed the thresholds for PTS at any distance during dredging operations. This indicates that the risk of PTS from noise during dredging is negligible for these species.

Predicted distances to zero-to-peak SPL thresholds and weighted cSELs at any swim speed in phocid carnivores do not exceed the thresholds for TTS at any distance during dredging operations. This indicates that the risk of TTS from noise during dredging is negligible for these species.

The results of the noise modelling indicate that the relatively high thresholds for auditory injury in phocid carnivores, combined with their ability to avoid areas of disturbance, minimise the likelihood of significant auditory impacts. Given that neither zero-to-peak SPL nor cSEL thresholds are exceeded, the risk to phocid carnivores from dredging activities is very low. Therefore, the effects of noise-induced PTS/TTS from dredging on phocid carnivores in water are considered **not significant** at both the individual and population levels.

Noise modelling based on harbour porpoise predicts avoidance behaviours due to levels exceeding the SPL displacement threshold of 140 dB re 1 μPa^2 up to 1.3 km from the dredging activity. This has potential to disrupt breeding-related activities such as communication, territorial defence, and social interactions. However, the availability of alternative habitats within the broader Regional Marine Mammal Study Area reduces the risk of long-term population-level effects. Consequently, for grey seals, the potential effects of behavioural disturbance at this range over the duration of the piling works are considered **not significant**.

The Slaney River Valley SAC is located approximately 6.6 km northwest of the Proposed Development, entering the sea via Wexford Harbour, where known haul-out, breeding, and moulting sites for harbour seals are located. While these sites are outside the predicted range of displacement from dredging activities (up to 1.3 km), field surveys recorded adult and pup harbour seals in two distinct contexts: emitting typical mother-attraction calls and in aggressive contexts, producing aggressive vocalisations within and surrounding the Proposed Development. Mother-pup communication is critical for pup survival, further underscoring the importance of considering potential impacts during sensitive periods for the species.

Both harbour and grey seals are central place foragers, typically spending the majority of their foraging time within 50 km of the coast (Jones *et al*., 2015). However, much longer distances have been observed, with harbour seal pups travelling up to 300 km (Bonner & Whitthames, 1974). Foraging seals within the displacement range of the Proposed Development may face temporary disruptions, potentially increasing energy expenditure and reducing foraging efficiency.

Additionally, if dredging noise masks critical mother-pup communication cues, this could disrupt bonding, nursing, and pup survival, particularly given that adult and pup harbour seals have been recorded within the Marine Mammal Survey Area. As a result, the effects of dredging-related disturbance could have an impact on the localised harbour seal population by interfering with essential vocal communication during the breeding season.

Furthermore, seals are known to approach active dredgers to exploit foraging opportunities associated with the disturbance of the seabed. Given this behaviour, there is a possibility that seals may enter the area where dredging operations are occurring.

Therefore, for harbour seals, considering that field surveys recorded both adults and pups within the Proposed Development Area, and given the potential for noise to interfere with mother-pup communication, the effects of displacement from dredging up to 1.3 km are considered significant for the local haul-out population within Wexford Harbour during the harbour seal breeding season (May to July). This effect is not significant outside of this period and does extend to the wider regional population.

13.5.5.4 INCREASED VESSEL TRAFFIC

During reclamation activities, including dredging and infilling, vessel frequency/movement within Rosslare Harbour will increase slightly. However, the addition of one to two dredging vessels is not expected to substantially raise activity levels in this already busy harbour.

Collisions with dredgers have the potential to cause physical injury to marine mammals. A global review of dredging effects by Todd *et al*. (2015) suggests that the risk of collision between dredges and marine mammals will be minimal if the activity avoids critical habitats and seasons when the species of concern may be distracted (e.g. feeding or resting) or have calves/pups present. Additionally, dredgers generally operate at slow speeds of 1–3 knots during active dredging, further reducing the likelihood of collision. However, risks increase when vessels travel at higher speeds, particularly during transit, with Todd *et al*. (2015) highlighting that collision risks rise substantially when speeds exceed 10–14 knots.

Pirotta *et al*. (2013) investigated the response of bottlenose dolphins to dredging in Aberdeen Harbour and found a marked initial absence of dolphins during the first phase of dredging, with the dolphins being completely absent for c. five (5) weeks, despite their regular exposure to high levels of boat traffic. This study reported that some re-use of the area resumed later. This avoidance behaviour was attributed to the intermittent nature of dredging noise and associated sediment disturbance, which interferes with dolphin communication and foraging.

Similarly, Diederichs *et al*. (2010), as cited in Todd *et al*. (2015), found that harbour porpoises exhibited short-term avoidance behaviour at distances up to 600 m from a trailing suction hopper dredger (TSHD). These findings suggest that both bottlenose dolphins and harbour porpoises are likely to temporarily avoid dredging areas, reducing collision risk during construction.

At Rosslare, dredging and reclamation will take place at two adjacent locations within the harbour, limiting vessel transit distances. Construction vessels will operate under existing port speed restrictions, ensuring slow movement. These factors further reduce the likelihood of vessel strikes.

Importantly, the risk of vessel-on-vessel collision during construction was assessed as and found not to lead to significant effects in EIA terms in Chapter 20: Shipping and Navigation. While an increase in vessel traffic is expected, the Navigation Risk Assessment (NRA) found that Rosslare Europort has adequate capacity to manage this increase without impacting port operations. For example, during off-peak times (09:00–15:00 and 22:00–02:00), only 5–6% of available time is occupied by existing commercial traffic, providing ample capacity for construction vessels.

Movements of dredgers, barges, and support vessels will be controlled through embedded measures such as the Local Port Services (LPS), Clear Channel Policy, and the Construction Method Statement. These measures are designed to reduce navigational conflict and avoid collision scenarios.

Rosslare Harbour is already a busy commercial port, and marine mammals in the area are likely habituated to high levels of vessel activity. Given the low number of construction vessel transits, slow vessel speeds, and robust coordination protocols, the risk of marine mammal collision during construction is considered to be low.

In summary, the minor increase in vessel activity associated with construction is not expected to significantly alter existing conditions for marine mammals. With embedded mitigation measures—including harbourmaster oversight of ship movements—collision risk is minimal.

impact of collisions associated with construction vessel movements on marine mammals is assessed as **not significant**.

13.5.6 OPERATIONAL PHASE IMPACTS

13.5.6.1 INCREASED VESSEL TRAFFIC

As discussed in Chapter 20: Shipping & Navigation and EIAR Technical Appendix 20: Navigation Risk Assessment, vessel activity associated with the Proposed Development is expected to include both large and small project vessels. Large vessels, such as cable-laying vessels (CLVs), wind turbine installation vessels (WTIVs), and offshore construction vessels (OCVs), are anticipated to arrive at a frequency of one per week during off-peak periods and one every two days during peak ORE activity. Smaller vessels, including crew transfer vessels (CTVs), service operation vessels (SOVs), and survey vessels, are expected to make multiple arrivals daily depending on the volume of ORE operations. This projected increase in vessel movements will vary seasonally, with peak activity likely coinciding with key phases of offshore construction and maintenance. Historical trends and future case modelling show a steady projected increase in vessel movements. In 2023, commercial vessel arrivals reached 2,000 in a year and are projected to increase steadily over the next decade.

Physical Injury – Vessel Collision

While there may be an increase in vessel traffic during the operational phase of the Proposed Development, vessels will be moving at low speeds typical of port operations, reducing the likelihood of collisions. Furthermore, Rosslare Harbour is already a busy port, and marine mammals in the area are likely habituated to existing vessel movements.

As a result, the risk of collisions with marine mammals during the operational phase is assessed as low. The potential for physical injury is assessed as not significant.

Given this, impact of collisions associated with operational vessel movements on marine mammals is assessed as **not significant**.

Underwater noise

While vessel activity is expected to increase gradually, underwater noise emitted by these movements are unlikely to result in significant disturbance. Marine mammals in the area are habituated to existing port activities, and the additional vessel movements are anticipated to occur incrementally, without causing a substantial change in underwater noise levels.

Given this, underwater noise impacts on marine mammals are assessed as **not significant**.

13.5.7 SIGNIFICANCE OF EFFECTS

Table 13.17 gives the analysis of the significance of effects during the construction and operational phases of the Proposed Development based on the magnitude of the likely effect and sensitivities of receptors within the ZoI.

Table 13.17: Significance of effects for marine mammals during the construction and operational phase

KER	Significance of effect	Spatial extent of significant effect	Mitigation required
Construction Phase – Piling (underwater noise)			
Harbour Porpoise	Significant	110 m (PTS)	Yes
Bottlenose Dolphin	Not Significant	N/A	No
Common Dolphin	Not Significant	N/A	No
Risso’s Dolphin	Not Significant	N/A	No
Minke Whale	Not Significant	N/A	No
Harbour Seal	Not Significant	N/A	No
Grey Seal	Not Significant	N/A	No
Construction Phase – Blasting (underwater noise)			
Harbour Porpoise	Significant	1,630 m (PTS)	Yes
Bottlenose Dolphin	Significant	95 m	Yes
Common Dolphin	Significant	95 m	Yes
Risso’s Dolphin	Significant	95 m	Yes
Minke Whale	Significant	290 m	Yes
Harbour Seal	Significant	590 m	Yes

KER	Significance of effect	Spatial extent of significant effect	Mitigation required
Grey Seal	Significant	590 m	Yes
Construction Phase – Dredging (underwater noise)			
Harbour Porpoise	Not Significant	N/A	No
Bottlenose Dolphin	Not Significant	N/A	No
Common Dolphin	Not Significant	N/A	No
Risso's Dolphin	Not Significant	N/A	No
Minke Whale	Not Significant	N/A	No
Harbour Seal	Significant during breeding season, not significant outside breeding season	1,300 m during breeding season, n/a outside breeding season	Yes, during breeding season (May to July)
Grey Seal	Not Significant	N/A	No
Operational Phase -			
Physical Injury – Vessel Collision	Not Significant	N/A	No
Underwater noise	Not Significant	N/A	No

13.6 SECONDARY MITIGATION

While a number of integrated noise-reduction measures have been incorporated into the design of the Proposed Development as primary mitigation (see Section 13.5.2), and broader statutory or regulatory measures (e.g. compliance with MARPOL and existing codes of practice) function as tertiary mitigation (see Section 13.5.3), further secondary mitigation is required where significant impacts are predicted to remain following the implementation of these measures.

Secondary mitigation comprises project-specific actions designed to further reduce the scale, intensity, or likelihood of effects on marine mammals, particularly in relation to underwater noise during construction. These measures go beyond the inherent project design features and existing legislative controls and are informed by the impact assessment set out in Section 13.5.

The proposed secondary mitigation measures will be supported by monitoring, as set out below, to ensure effective implementation and determine any unforeseen effects. This adaptive management approach will allow for modifications to the activity generating the impact or to the mitigation measures themselves, should monitoring indicate that this is required.

13.6.1 GENERAL MITIGATION MEASURES

Measures described below will be implemented during piling, blasting and dredging (including perimeter bund installation and reclamation area infilling) works:

- A trained and experienced Marine Mammal Observer (MMO) or MMOs shall be appointed to monitor for marine mammals. The MMO(s) will scan the surrounding area to ensure no marine mammals are in the pre-determined exclusion zone in the 30-minute period prior to operations. The activity-specific Monitored Zone (MZ), as recommended by NPWS (DAHG, 2014), will be implemented during these activities.
- For dredging activities (including perimeter bund installation and reclamation area infilling), MMOs will ensure no marine mammals are present within the bunded areas by conducting a 30-minute pre-watch prior to any materials placement activities. The 30-minute pre-watch is only required if the MMO has not been continuously present leading up to the materials placement activities. For example, if the MMO is already conducting a pre-watch during dredging operations, this monitoring will continue through the dredging activities and the transit from the Dredging Area to the Reclamation Area, covering the requirements for materials placement. If materials placement occurs prior to or following dredging activities, the pre-watch can be coordinated to include all activities within a single continuous monitoring period.
- MMOs must be located on an appropriate elevated platform from which the entire MZ can be effectively covered without any obstruction of view. MMOs will be positioned as near to the centre of the MZ as is practicable, i.e., adjacent to the sound source.
- Noise-producing activities will only commence in daylight hours where effective visual monitoring, as performed and determined by the MMO, has been achieved. Where effective visual monitoring is not possible, the sound-producing activities will be postponed until effective visual monitoring is possible. Visual scanning for marine mammals will only be effective during daylight hours and if the sea state is World Meteorological Organisation (WMO) Sea State 4 (≈Beaufort Force 4 conditions) or less.
- A clear communication protocol, agreed on-site, will be established between the MMO and the Works Superintendent to confirm whether the relevant activity may proceed or resume following a break. Activities shall only commence or resume upon positive confirmation from the MMO.
- All marine mammal detections will be systematically recorded, encompassing both sightings observed during formal monitoring watches and incidental observations made outside of these designated periods, including observations made by additional personnel on board. Detailed records of all marine mammal sightings documented will be reported to the NPWS.
- Any approach by marine mammals into the immediate (<50m) works area will be reported to NPWS.

- The MMO will keep a record of the monitoring and log all relevant events using standardised data forms available from NPWS and submit to the NPWS on completion of the works.

13.6.2 CONSTRUCTION PHASE MITIGATION MEASURES FOR MARINE MAMMALS

The following mitigation measures will be implemented during the construction phase of the Proposed Development to minimise the risk of injury or disturbance to marine mammals in the area of operations, in accordance with the NPWS "*Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters"* (DAHG, 2014). Proposed mitigation, through the implementation of NPWS (DAHG, 2014) Guidelines and the implementation of an appropriate Monitored Zone (MZ) will reduce potential impacts. Should updated statutory guidelines be issued before or during the construction phase that supersede the 2014 guidance, the updated guidelines will be fully adhered to. Measures described below will be implemented during piling, blasting (if required) and dredging (including dumping of sediment).

- A trained and experienced Marine Mammal Observer (MMO) or MMOs shall be appointed to monitor for marine mammals during piling, dredging, dumping of sediment, rock placement and blasting operations. The MMO(s) will scan the surrounding area to ensure no marine mammals are in the pre-determined exclusion zone in the 30-minute period prior to operations. The appropriate MZ recommended by NPWS (DAHG, 2014) will be implemented for dredging works, including dumping, piling and blasting activities.
- For rock placement within the bunds, MMOs will ensure no marine mammals are present within contained (Small Boat Harbour) and enclosed (ORE Berths) bunded areas by conducting a 30-minute pre-watch prior to any rock placement activities. The 30-minute pre-watch is only required if the MMO has not been continuously present leading up to the rock placement activities. For example, if the MMO is already conducting a pre-watch during dredging operations, this monitoring will continue through the dredging activities and the transit from the Dredging Area to the Reclamation Area, covering the requirements for rock placement. If rock placement occurs prior to or following dredging activities, the pre-watch can be coordinated to include all activities within a single continuous monitoring period.
- MMOs must be located on an appropriate elevated platform from which the entire MZ can be effectively covered without any obstruction of view. MMOs will be positioned as near to the centre of the MZ as is practicable, i.e., adjacent to the sound source.
- Noise-producing activities will only commence in daylight hours where effective visual monitoring, as performed and determined by the MMO, has been achieved. Where effective visual monitoring is not possible, the sound-producing activities will be postponed until effective visual monitoring is possible. Visual scanning for marine mammals will only be effective during daylight hours and if the sea state is World Meteorological Organisation (WMO) Sea State 4 (≈Beaufort Force 4 conditions) or less.
- A clear communication protocol, agreed on-site, will be established between the MMO and the Works Superintendent to confirm whether the relevant activity may proceed or resume following a break, refer to the oCEMP. Activities shall only commence or resume upon positive confirmation from the MMO.

- All marine mammal detections will be systematically recorded, encompassing both sightings observed during formal monitoring watches and incidental observations made outside of these designated periods, including observations made by additional personnel on board. Detailed records of all marine mammal sightings documented will be reported to the NPWS.
- Any approach by marine mammals into the immediate (<50m) works will be reported to NPWS.

The MMO will keep a record of the monitoring and log all relevant events using standardised data forms available from NPWS and submit to the NPWS on completion of the works.

13.6.2.1 PILING SPECIFIC REMEDIAL AND MITIGATION MEASURES

Note: As piling will be conducted within contained (new small boat harbour) and enclosed (ORE Berths) bunded areas, with impact piling with a lower energy level of 120 kJ (new small boat harbour) and rotary piling (ORE Berths) as the primary methods of piling employed, the PTS and TTS zones of impact are expected to reduce considerably in distance to negligible levels.

The following mitigation measures will also be implemented during piling activities, in accordance with the NPWS "*Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters*" (DAHG, 2014):

- 1,000 m Monitored Zone (MZ): A 30-minute pre-watch will be conducted by a suitably qualified MMO prior to commencing piling, blasting, dredging, or dumping. No marine mammals may be observed within the defined MZ of 1,000 m during this period (DAGH, 2014).
    - Once operations are underway with appropriate ramp-up, activities will continue regardless of night-time conditions, reduced visibility, or the presence of marine mammals within the MZ.
- Bunded Area Checks: For works within the enclosed Small Boat Harbour or bunded areas at the ORE Berths, MMOs will confirm the absence of marine mammals within the enclosed areas before works commence.
- Ramp-Up Procedures: A ramp-up or soft-start will be used for piling where practicable, increasing noise levels gradually over 20–40 minutes after the pre-watch. The protocol will be repeated after any break of more than 30 minutes.
- Real-Time Acoustic Monitoring (SAM): During the harbour seal breeding season (May–July), real-time underwater noise monitoring will be used. A precautionary displacement threshold 140 dB re 1 μPa^2 will be applied, consistent with dredging assessment criteria (Southall et al., 2008) and suitably conservative for piling. This ensures that noise levels do not exceed this threshold beyond the 1,000 m MZ. If SAM detects exceedance of this threshold outside the MZ, works will cease. Appropriate adjustments will then be implemented to ensure that displacement thresholds remain below this level outside the MZ before piling can resume. As per NPWS guidance (DAHG, 2014), once piling operations are underway following the 30-minute pre-watch by the MMO and an appropriate ramp-up procedure, activities will continue regardless of the presence of a marine mammal within the MZ. By ensuring that any displacement impact zones are restricted to the MZ, displacement of harbour seals during the breeding season will be

reduced to negligible levels, further decreasing the likelihood of impacts on breeding populations.

- Piling works for the Proposed Development and not to occur simultaneously to the piling works associated with the Berth 3 extension, avoiding potential environmental impacts from associated elevated levels of underwater noise being introduced into the marine environment.
- Reporting Requirements: All sightings will be logged and reported to NPWS.

These mitigation measures, which incorporate both visual observation and acoustic monitoring, will ensure that underwater noise from piling activities associated with the Proposed Development does not result in any adverse effects on marine mammals.

13.6.2.2 BLASTING SPECIFIC REMEDIAL AND MITIGATION MEASURES

The JNCC (2025) guidelines highlight that ADDs are required for predicted injury ranges exceeding 1 km (i.e., the MZ), with the objective of encouraging marine mammals to vacate the area before detonation. While specific guidance on ADD use is not provided by NPWS (DAHG, 2014), reference has been made to the JNCC (2025) guidelines, which outline the most recent best practice in mitigating injury to marine mammals from underwater explosions.

The following mitigation measures will also be implemented during blasting activities, in accordance with the NPWS "*Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters*" (DAHG, 2014) and the JNCC "Guidelines on the use of underwater explosives near marine mammals" (JNCC, 2025).

The JNCC (2025) guidelines recommend that ADDs are used for predicted injury ranges exceeding 1 km (i.e. the MZ), with the objective of encouraging marine mammals to vacate the area before detonation.

The following will be applied in all blasting operations:

- 1,000 m MZ: A 1,000 m exclusion zone (as per DAHG, 2014) will be established around the blasting location. A 30-minute pre-blast watch will be conducted by a qualified MMO to confirm that no marine mammals are present within the MZ. If any are observed, detonation will be postponed until the zone is clear.
- Acoustic Deterrent Device (ADD) Use:
    - An ADD(s) will be deployed prior to detonation to encourage marine mammals, particularly harbour porpoise, to vacate the 1,000 m MZ. ADDs will be deployed as follows:
        i) Positioned as close to the detonation site as safely possible.
        ii) Activated only after a 30-minute visual check confirms no marine mammals within 100 m of the device(s).
        iii) Remain active during any delay due to mammal presence; if delays are prolonged, the ADD may be paused to avoid habituation and restarted after 20 minutes to reinitiate deterrence.

iv) ADD duration and configuration will be agreed with the statutory authority and tailored to ensure effective deterrence from the full PTS zone.

- Species-Specific ADD Configuration:
  - To avoid unnecessary auditory impacts, an ADD specifically designed for harbour porpoise (e.g. FaunaGuard Porpoise Module) will be used. These devices emit high-frequency signals (60–150 kHz) at lower sound pressure levels, aligned with the species' auditory range. They also include:

    i) Ramp-up features to gradually increase signal strength.

    ii) Variable signal sequences to minimise habituation. This approach reduces the risk of TTS while ensuring porpoises vacate the area prior to detonation (Schaffeld *et al*., 2019).

- Daylight-Only Blasting: All blasting will be conducted during daylight hours to ensure effective visual monitoring. Early-day scheduling will allow flexibility for postponement in case of marine mammal presence or poor conditions.
- Fixed MMO Location and Continuous Monitoring: MMOs will maintain a fixed observation point throughout the 30-minute pre-watch and up to the point of detonation. If any marine mammal enters the MZ during this period, the blast will be cancelled or delayed until the zone is clear.
- Blast Delay Protocol: If harbour porpoise or other QI species remain within the MZ, blasting will not proceed until clearance is confirmed through visual observation and/or ADD effectiveness.
- Data Recording and Reporting: All sightings and mitigation actions will be recorded using NPWS standardised forms and submitted post-works.

The above approach follows the precautionary principle while balancing the minimisation of potential disturbance from ADDs with the necessity of ensuring harbour porpoise are not within the PTS zone of impact for VHF cetaceans before detonation. These mitigation measures, which incorporate both visual observation and acoustic deterrents, will ensure that underwater noise from blasting activities associated with the Proposed Development does not result in any adverse effects on marine mammals.

13.6.2.3 DREDGING SPECIFIC REMEDIAL AND MITIGATION MEASURES

The following mitigation measures will be implemented during dredging activities, in accordance with the NPWS "*Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters*" (DAHG, 2014):

- 500 m MZ: A 30-minute pre-watch will be undertaken by a qualified MMO before the onset of any dredging or sediment disposal activity. No dredging will commence unless the MMO confirms that no marine mammals have been observed within a 500 m MZ during this period.
- No Requirement to Halt Once Active: In line with NPWS guidance, once dredging has commenced (following the pre-watch and a soft start or ramp-up where appropriate), operations may continue regardless of visibility, weather conditions, or marine mammal presence within the MZ.

- Best Practice During Operations: MMOs will remain present during active dredging and, where feasible, may recommend brief pauses or adjustments to the works to allow nearby animals to move away from the source.
- Seasonal Real-Time Monitoring: During the harbour seal breeding season (May to July), real-time SAM will be deployed to measure received underwater noise levels. A displacement threshold of 140 dB re 1 µPa² will be used to manage the spatial extent of potential disturbance.
    - If SAM detects that this threshold is exceeded beyond 1,000 m, dredging will be paused and adjustments made before recommencing.

These mitigation measures, which incorporate both visual observation and acoustic monitoring, will ensure that underwater noise from dredging activities associated with the Proposed Development does not result in any adverse effects on marine mammals.

13.7 CUMULATIVE AND RESIDUAL EFFECTS

13.7.1 CUMULATIVE EFFECTS AND OTHER INTERACTIONS

13.7.1.1 METHODOLOGY

While a single development may not in itself cause a significant impact on the local ecosystem, a combination of projects within a localised area may cause a negative impact. Therefore, the cumulative impacts of a project or plan in association with other projects and plans must be taken into consideration when assessing the possible impacts of a development.

Transboundary effects refer to significant effects that a proposed development in one country may have on the environment of another. Ireland is a signatory of the United Nations Economic Commission for Europe (UNECE) Convention on Environmental Impact Assessment in a Transboundary Context, referred to as the 'Espoo Convention'. The Espoo Convention was adopted in 1991 and entered into force with respect to Ireland in 2002. The Espoo Convention establishes the requirement to consider transboundary impacts. The Espoo Convention requires that assessments are extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts.

Chapter 25: Interactions of this EIAR has considered and assessed cumulative and transboundary effects that may occur as a result of the Proposed Development. Potential impacts relevant to marine mammal ecology receptors are documented in Table 13.18 below. Additional projects identified as having potential to act in-combination with the Proposed Development are those most likely to contribute to, or generate, the same or similar pressures as those identified in this assessment.

Further details of these projects and the assessment method are provided in Chapter 25: Interactions.

13.7.1.2 ASSESSMENT OF CUMULATIVE IMPACTS

The Cumulative Effects Assessment (CEA) for marine mammals has not identified any significant cumulative effects resulting from the Proposed Development alongside other developments during either the construction or operational phases.

The following impacts were assessed in the cumulative assessment:

- Disturbance from construction activities such as piling, dredging and blasting
- Disturbance from vessel activities

Refer to Chapter 25: Interactions for the CEA.

The overall significance of the cumulative effect is considered **not significant** at both the individual and population levels for all KERs.

Table 13.18: Projects considered for cumulative effects on marine mammals in conjunction with the Proposed Development

Project	During the Construction Phase	During the Operational Phase	Assessment outcome of cumulative effect on marine mammals
Phase 1 OWF projects: • Arklow Bank Wind Park 2 • Codling Wind Park (CWP) Project • Dublin Array	No	Yes	Construction of the Phase 1 OWF projects will temporally overlap while Rosslare Europort ORE Hub will be in operation. **Arklow Bank Wind Park 2** This proposed offshore windfarm is situated on and around Arklow Bank, approximately 6 to 15 km east of Arklow, and comprises of 56 or 47 turbines (SSE Renewables EIAR NTS 2024). The Proposed Development is situated approximately 52 km from Arklow Bank Wind Park 2. Given this separation distance and the limited zone of impact associated with the operational and construction phases of the Proposed Development, no cumulative impacts on marine mammal receptors are anticipated. **CWP Project** This project is a proposed offshore windfarm located in the Irish Sea approximately 13–22 km off the east coast of Ireland, at County Wicklow. The Proposed Development is situated approximately 89 km from CWP Project. Given this separation distance and the limited zone of impact associated with the operational and construction phases of the Proposed Development, no cumulative impacts on marine mammal receptors are anticipated. **Dublin Array** Dublin Array is located approximately 10 km off the coast of Dublin and Wicklow counties in the Irish Sea. The project will have an installed capacity of up to 834 MW. The Proposed Development is situated approximately 103 km from Dublin Array. Given this separation distance and the limited zone of impact associated with the operational and construction phases of the Proposed Development, no cumulative impacts on marine mammal receptors are anticipated.
Extension of existing linkspan at Berth 3 and the demolition and	Yes	Yes	Iarnród Éireann – Irish Rail is responsible for the Berth 3 project at Rosslare Harbour, a project which is independent of the Proposed Development.

Project	During the Construction Phase	During the Operational Phase	Assessment outcome of cumulative effect on marine mammals
removal of the existing Berth 4 linkspan within Rosslare Europort.			Iarnród Éireann – Irish Rail will schedule works such that piling activities fore the Berth 3 extension do not occur simultaneously with the piling required for the Proposed Development. This approach will avoid cumulative effects from separate piling operations being undertaken in close proximity to each other and at the same time, avoiding potential environmental impacts from associated elevated levels of underwater noise being introduced into the marine environment.
Maintenance dredging at Rosslare Europort and Ballygeary Harbour, Co. Wexford	Yes	Yes	Iarnród Éireann is responsible for maintenance dredging at Rosslare Harbour, a routine activity independent of the Proposed Development. To minimise cumulative impacts, Iarnród Éireann will ensure maintenance dredging activities do not occur simultaneously with the capital dredging required for the Proposed Development. This approach will avoid cumulative effects from separate dredging operations being undertaken in close proximity to each other and at the same time, avoiding potential environmental impacts from associated elevated levels of turbidity and underwater noise being introduced into the marine environment.
South Coast Designated Maritime Area Plan (DMAP)	No	Yes	The South Coast Designated Maritime Area Plan (SC-DMAP), adopted by the Oireachtas in October 2024, identifies four maritime areas within a broader geographical region that is the subject of the draft Plan. These areas are where future deployments of ORE projects may proceed, subject to further project-level assessment, in alignment with the plan-led approach outlined in the EU Maritime Spatial Planning (MSP) Directive and required by the draft Plan. An objective of the SC-DMAP is to avoid potential adverse impacts on biodiversity, including EU-protected sites and future national protected site designations. In

Project	During the Construction Phase	During the Operational Phase	Assessment outcome of cumulative effect on marine mammals
			addition to identifying the four maritime areas, the draft SC-DMAP includes a suite of policy objectives and associated measures designed to inform the scale, precise location, and timing of future ORE developments within the SC-DMAP area. At present, no specific ORE projects are planned within these maritime areas, and therefore a cumulative assessment of effects cannot be conducted. Potential for cumulative effects on marine mammal receptors may arise during the operational phase of the Proposed Development. However, as the Proposed Development is a coastal project with limited impacts during its operational phase, the potential for cumulative effects with future ORE projects within the SC-DMAP is not predicted to be significant. It will be the responsibility of future ORE developers to undertake a cumulative effects assessment at the appropriate stage, taking into account operational activities at Rosslare where relevant.

13.7.1.3 ASSESSMENT OF TRANSBOUNDARY IMPACTS

The magnitude of all identified construction and operational phase impacts of the Proposed Development are documented above. Underwater noise modelling predicts that the maximum distance of impact for all sources is 4.6 km (predicted noise modelling for displacement during piling activities). Therefore, marine mammals will only be affected if they are within this modelled distance to the sound source.

As there is no international border within this distance, there will be no direct transboundary auditory injury or behavioural displacement. Transboundary effects may occur if impacts from a development in one country affect the marine environment or species in another country or state. For marine mammals, transboundary impacts are possible due to their wide-ranging movements and the transboundary nature of the Management Units of the Irish Sea and adjacent Celtic Sea.

While the disturbance itself occurs locally, individuals that normally feed, breed, or migrate elsewhere may happen to be within the zone of impact at the time of construction activities and be affected by underwater noise.

Marine mammals such as harbour porpoise and grey seals regularly move across boundaries between Irish and UK waters; however, the spatial extent of underwater noise impacts from construction activities, including piling and blasting, remains localised. Measures to mitigate these impacts, such as pre-activity monitoring, exclusion zones, the use of ADDs (rock blasting), soft-start procedures, SAM to ensure levels remain within defined thresholds, and conducting piling within contained (new small boat harbour) and enclosed (ORE Berths) bunded areas, with impact piling with a lower energy level of 120 kJ (new small boat harbour) than modelled and rotary piling (ORE Berths) as the primary methods of piling employed, will substantially reduce the likelihood of auditory injury or behavioural displacement to animals within the zone of impact.

Although the disturbance will occur within Irish waters, the affected individuals may belong to transboundary populations. While the impact of the Proposed Development on these populations will remain limited due to the temporary nature of construction activities, the potential for individual animals from transboundary populations to be affected within Irish waters is acknowledged.

Marine mammals from transboundary populations are most likely to avoid the zone of impact of the Proposed Development. Given the availability of suitable habitat beyond the zone of impact, these populations will most likely utilise these areas instead, reducing the likelihood of any long-term displacement or disruption at an individual or population level. As a result, the overall transboundary effect is considered not significant.

Additionally, the Proposed Development is located along the coast and does not introduce any new offshore infrastructure that could create a physical or acoustic barrier to marine mammal movements. Therefore, the nature and position of the Proposed Development do not present a significant obstacle to transboundary populations.

Overall, transboundary impacts on marine mammals from the Proposed Development are considered **not significant**. This finding is supported by the localised scale of potential impacts, the temporary duration of construction activities and the absence of any direct transboundary displacement or injury within the predicted impact range.

13.7.2 RESIDUAL EFFECTS

This section presents the residual effects of the Proposed Development once the mitigation in Section 13.6 has been applied. Where the mitigation presented in Section 13.6 has changed the significance determination, this has been detailed.

The residual effects of the project options once mitigation has been applied are summarised in Table 13.20.

13.7.2.1 CONSTRUCTION PHASE

Following the implementation of the mitigation measures outlined in Section 13.6, the Proposed Development is not expected to result in any significant residual effects above the local scale on marine mammals, either individually or cumulatively with other proposed developments during the construction phase.

13.7.2.2 OPERATIONAL PHASE

With the implementation of the mitigation measures outlined in Section 13.6, the Proposed Development is not anticipated to result in any significant residual effects above the local scale on marine mammals, either individually or cumulatively with other proposed developments during the operational phase.

Table 13.19: Residual effects relating to marine mammals

Potential Impact	Species	Sensitivity	Initial Distance (m) from Activity	Significance Determination	Monitoring and Mitigation Measures (Secondary)	Residual Effects (post mitigation)
Auditory injury (PTS) from Piling	Harbour Porpoise	High	110 m *	Significant	MMO pre-watch within 1,000 m MZ including a ramp-up procedure	Not Significant
	Bottlenose Dolphin	Negligible	N/A	Not Significant		Not Significant
	Common Dolphin	Negligible	N/A	Not Significant		Not Significant
	Risso's Dolphin	Negligible	N/A	Not Significant		Not Significant
	Minke Whale	Negligible	N/A	Not Significant		Not Significant
	Grey Seal	Negligible	N/A	Not Significant		Not Significant
	Harbour Seal	Negligible	N/A	Not Significant		Not Significant
Auditory impairment (TTS) from Piling	Harbour Porpoise	Medium	2,600 m (@ swim speed of 1.5 m/s) *	Not Significant	MMO pre-watch within 1,000 m MZ including a ramp-up procedure	Not Significant
	Bottlenose Dolphin	Negligible	N/A	Not Significant		Not Significant

Potential Impact	Species	Sensitivity	Initial Distance (m) from Activity	Significance Determination	Monitoring and Mitigation Measures (Secondary)	Residual Effects (post mitigation)
	Common Dolphin	Negligible	N/A	Not Significant		Not Significant
	Risso's Dolphin	Negligible	N/A	Not Significant		Not Significant
	Minke Whale	Low	2,600 m (@ swim speed of 1.5 m/s) *	Not Significant		Not Significant
	Grey Seal	Low	80 m (@ swim speed of 1.5 m/s) *	Not Significant		Not Significant
	Harbour Seal	Low	80 m (@ swim speed of 1.5 m/s) *	Not Significant		Not Significant
Displacement from underwater noise during Piling	Grey Seal	Negligible	N/A	Not Significant	MMO pre-watch within 1,000m MZ including a ramp-up procedure.	Not Significant
	Harbour Seal	High**	4.6 km *	Not Significant	MMO pre-watch within 1,000 m MZ including a ramp-up procedure. Real-time SAM (May–July) ensures piling noise stays below 140 dB re 1 μPa^2 outside 1,000 m MZ.	Not Significant

Potential Impact	Species	Sensitivity	Initial Distance (m) from Activity	Significance Determination	Monitoring and Mitigation Measures (Secondary)	Residual Effects (post mitigation)
					If exceeded, MMO is alerted, and piling stops immediately.	
Auditory injury (PTS) from Blasting	Harbour Porpoise	High	1,630 m	Significant	MMO pre-watch within 1,000 m MZ. Use only necessary quantities; favour smaller, sequential blasts to reduce peak noise. Daytime Scheduling. Place explosives in boreholes/depressions with stemming material to limit noise spread. MMO remains in a fixed position for uninterrupted pre-watch; blasting halted if a marine mammal enters the MZ. Use of ADDs: Deployed pre-blast to deter	Not Significant

Potential Impact	Species	Sensitivity	Initial Distance (m) from Activity	Significance Determination	Monitoring and Mitigation Measures (Secondary)	Residual Effects (post mitigation)
					harbour porpoises from the 1,630 m PTS zone.	
	Bottlenose Dolphin	High	95 m	Significant	MMO pre-watch within 1,000 m MZ. Use only necessary quantities; favour smaller, sequential blasts to reduce peak noise. Daytime Scheduling. Place explosives in boreholes/depressions with stemming material to limit noise spread. MMO remains in a fixed position for uninterrupted pre-watch; blasting halted if a marine mammal enters the MZ.	Not Significant
	Common Dolphin	High	95 m	Significant		Not Significant
	Risso's Dolphin	High	95 m	Significant		Not Significant
	Minke Whale	High	290 m	Significant		Not Significant
	Grey Seal	High	320 m	Significant		Not Significant
	Harbour Seal	High	320 m	Significant		Not Significant
Auditory impairment (TTS) from Blasting	Harbour Porpoise	High	3,000 m	Significant	MMO pre-watch within 1,000 m MZ. Use only necessary quantities; favour smaller,	Not Significant
	Bottlenose Dolphin	Low	170 m	Significant		Not Significant

Potential Impact	Species	Sensitivity	Initial Distance (m) from Activity	Significance Determination	Monitoring and Mitigation Measures (Secondary)	Residual Effects (post mitigation)
	Common Dolphin	Low	170 m	Significant	sequential blasts to reduce peak noise. Daytime Scheduling. Place explosives in boreholes/depressions with stemming material to limit noise spread. MMO remains in a fixed position for uninterrupted pre-watch; blasting halted if a marine mammal enters the MZ.	Not Significant
	Risso's Dolphin	Low	170 m	Significant		Not Significant
	Minke Whale	Medium	520 m	Not Significant		Not Significant
	Grey Seal	Medium	590 m	Not Significant		Not Significant
	Harbour Seal	Medium	590 m	Significant **		Not Significant
Auditory injury (PTS) from Dredging	Harbour Porpoise	Negligible	N/A	Not Significant	MMO pre-watch within 500 m MZ including a ramp-up procedure.	Not Significant
	Bottlenose Dolphin	Negligible	N/A	Not Significant		Not Significant
	Common Dolphin	Negligible	N/A	Not Significant		Not Significant
	Risso's Dolphin	Negligible	N/A	Not Significant		Not Significant

Potential Impact	Species	Sensitivity	Initial Distance (m) from Activity	Significance Determination	Monitoring and Mitigation Measures (Secondary)	Residual Effects (post mitigation)
	Minke Whale	Negligible	N/A	Not Significant		Not Significant
	Grey Seal	Negligible	N/A	Not Significant		Not Significant
	Harbour Seal	Negligible	N/A	Not Significant	MMO pre-watch within 500 m MZ including a ramp-up procedure.	Not Significant
Auditory impairment (TTS) from Dredging	Harbour Porpoise	Low	410 m @1.5 m/s	Not Significant	MMO pre-watch within 500 m MZ including a ramp-up procedure.	Not Significant
	Bottlenose Dolphin	Negligible	N/A	Not Significant		Not Significant
	Common Dolphin	Negligible	N/A	Not Significant		Not Significant
	Risso's Dolphin	Negligible	N/A	Not Significant		Not Significant
	Minke Whale	Negligible	N/A	Not Significant		Not Significant
	Grey Seal	Negligible	N/A	Not Significant		Not Significant

Potential Impact	Species	Sensitivity	Initial Distance (m) from Activity	Significance Determination	Monitoring and Mitigation Measures (Secondary)	Residual Effects (post mitigation)
	Harbour Seal	Negligible	N/A	Not Significant		Not Significant
Displacement from underwater noise during Dredging	Grey Seal	Low	1,300 m	Not Significant		Not Significant
	Harbour Seal	Medium **	1,300 m	Significant **	MMO pre-watch within 500 m MZ including a ramp-up procedure. Real-time SAM will monitor dredging noise to ensure displacement thresholds (140 dB re 1 μPa^2) are not exceeded beyond 1,000 m. If exceeded, the MMO will be alerted, dredging will stop, and adjustments will be made before resuming.	Not Significant
Increased Vessel traffic – Physical	All KERs	Low	N/A	Not Significant	N/A	Not Significant

Potential Impact	Species	Sensitivity	Initial Distance (m) from Activity	Significance Determination	Monitoring and Mitigation Measures (Secondary)	Residual Effects (post mitigation)
Injury due to vessel collision						
Increased Vessel traffic – Underwater noise	All KERs	Negligible	N/A	Not Significant	N/A	Not Significant

13.8 MONITORING

During the piling, blasting and dredging activities in the construction phase, the MMO will keep a record of the monitoring and log all relevant events using standardised data forms available from NPWS and submit to the NPWS on completion of the works.

No marine mammal monitoring is considered necessary during the operational phase.

13.9 SUMMARY

Chapter 13: Marine Mammals has assessed the potential impacts of the Proposed Development on marine mammal species, with a focus on those observed within the Regional Marine Mammal Study Area. These include harbour porpoise, bottlenose dolphin, Risso's dolphin, common dolphin, minke whale, harbour seal, and grey seal. The primary impacts identified are underwater noise from piling, blasting, and dredging during construction. Noise modelling indicates that without mitigation, there is potential for auditory injury (PTS), temporary hearing loss (TTS), and displacement. However, the project design incorporates primary noise-reduction measures such as use of a bunded piling area, soft-start procedures, and real-time acoustic monitoring. Further, secondary mitigation in line with NPWS guidelines will be implemented, including MMO oversight, exclusion zones, and use of ADDs during blasting. These measures are expected to reduce all residual impacts to not significant. Indirect effects on prey species have been assessed in related EIAR chapters (Chapters 8, 9, 11, 12, and 15). No significant cumulative effects are predicted with other projects during either the construction or operational phases.

Table 13.20: Assessment Summary

Potential Effect	Construction/ Operation	Beneficial / Adverse/ Neutral	Extent (Site/Local/National/ Transboundary)	Short term/ Long term	Direct/ Indirect	Permanent / Temporary	Reversible / Irreversible	Significance of Effect (according to defined criteria)	Proposed mitigation	Residual Effects (according to defined criteria)
Underwater noise (Piling) – Almost all KERs	Construction	Adverse	Site	Short term	Direct	Temporary	Reversible	Not Significant	n/a	Not Significant
Underwater noise (Piling) – Harbour Porpoise	Construction	Adverse	Site	Short term	Direct	Temporary	Reversible	Significant	The following mitigation measures will be implemented during the construction phase of the Proposed Development to minimise the risk of injury or disturbance to marine mammals in the area of operations, in accordance with the NPWS "*Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters*" (DAHG, 2014). Proposed mitigation, through the implementation of NPWS (DAHG, 2014) Guidelines and the implementation of an appropriate Monitored Zone (MZ) will reduce potential impacts. Should updated statutory guidelines be issued before or during the construction phase that supersede the 2014 guidance, the updated guidelines will be fully adhered to.	Not Significant
Underwater noise (Blasting) – All KERs	Construction	Adverse	Site	Short term	Direct	Temporary	Reversible	Significant	The following mitigation measures will be implemented during the construction phase of the Proposed Development to minimise the risk of injury	Not Significant

Potential Effect	Construction/ Operation	Beneficial / Adverse/ Neutral	Extent (Site/Local/National/ Transboundary)	Short term/ Long term	Direct/ Indirect	Permanent / Temporary	Reversible / Irreversible	Significance of Effect (according to defined criteria)	Proposed mitigation	Residual Effects (according to defined criteria)
									or disturbance to marine mammals in the area of operations, in accordance with the NPWS "*Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters*" (DAHG, 2014). Proposed mitigation, through the implementation of NPWS (DAHG, 2014) Guidelines and the implementation of an appropriate Monitored Zone (MZ) will reduce potential impacts. Should updated statutory guidelines be issued before or during the construction phase that supersede the 2014 guidance, the updated guidelines will be fully adhered to.	
Underwater noise (Dredging) – Most KERs	Construction	Adverse	Site	Short term	Direct	Temporary	Reversible	Not Significant	n/a	Not Significant
Underwater noise (Dredging) – Harbour Seal breeding season	Construction	Adverse	Site	Short term	Direct	Temporary	Reversible	Significant	The following mitigation measures will be implemented during the construction phase of the Proposed Development to minimise the risk of injury or disturbance to marine mammals in the area of operations, in accordance with the NPWS "*Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources*	Not Significant

Potential Effect	Construction/ Operation	Beneficial / Adverse/ Neutral	Extent (Site/Local/National/ Transboundary)	Short term/ Long term	Direct/ Indirect	Permanent / Temporary	Reversible / Irreversible	Significance of Effect (according to defined criteria)	Proposed mitigation	Residual Effects (according to defined criteria)
									in Irish Waters" (DAHG, 2014). Proposed mitigation, through the implementation of NPWS (DAHG, 2014) Guidelines and the implementation of an appropriate Monitored Zone (MZ) will reduce potential impacts. Should updated statutory guidelines be issued before or during the construction phase that supersede the 2014 guidance, the updated guidelines will be fully adhered to.	
Physical Injury – Vessel collision	Operation	Adverse	Site/local	Long term	Direct	Temporary	Reversible	Not Significant	n/a	Not Significant
Underwater noise	Operation	Adverse	Site	Long term	Direct	Temporary	Reversible	Not Significant	n/a	Not Significant

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