REPORT

# Millport Coastal Flood Protection Scheme: Environmental Statement

## Chapter 10 Marine Mammals and Basking Shark

Client: North Ayrshire Council

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Enhancing Society Together

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# Acronyms

| Acronym | Acronym description |
|---|---|
| **ASCOBANS** | Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas |
| **CGNS** | Celtic and Greater North Seas |
| **CI** | Confidence Interval |
| **CIA** | Cumulative Impact Assessment |
| **CIEEM** | Chartered Institute of Ecology and Environmental Management |
| **CIS** | Celtic and Irish Sea |
| **CITES** | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| **CMS** | Convention on Migratory Species |
| **CRoW** | The Countryside and Rights of Way Act |
| **cSAC** | candidate Special Area of Conservation |
| **CWSH** | Coastal West Scotland and Hebrides |
| **CV** | Coefficient of Variation |
| **dB** | Decibel |
| **DECC** | Department for Climate Change |
| **EC** | European Commission |
| **EIA** | Environmental Impact Assessment |
| **EPS** | European Protected Species |
| **ES** | Environmental Statement |
| **EU** | European Union |
| **FPS** | Flood Protection Scheme |
| **FCS** | Favourable Conservation Status |
| **GES** | Good Environmental Status |
| **HF** | High Frequency Cetaceans |
| **HWDT** | Hebridean Whale and Dolphin Trust |
| **Hz** | Hertz |
| **IAMMWG** | Inter-Agency Marine Mammal Working Group |
| **JCP** | Joint Cetacean Protocol |
| **JNCC** | Joint Nature Conservation Committee |
| **kHz** | Kilohertz |
| **km** | Kilometre |
| **km/h** | Kilometre per hour |
| **$km^2$** | Kilometre square |
| **LF** | Low Frequency Cetaceans |
| **m** | Metre |
| **m/s** | Metres per second |

| | |
|---|---|
| **$m^2$** | Metre squared |
| **$m^3$** | Metre cubed |
| **MF** | Mid Frequency Cetaceans |
| **MMO** | Marine Mammal Observer |
| **MU** | Management Unit |
| **nm** | Nautical miles |
| **NMFS** | National Marine Fisheries Service |
| **NOAA** | National Oceanic and Atmospheric Administration |
| **NPF** | National Planning Framework |
| **NPPG** | National Planning Policy Guidelines |
| **NS** | North Sea |
| **OSPAR** | Oslo and Paris Convention for the Protection of the Marine Environment 1992 |
| **PAM** | Passive Acoustic Monitoring |
| **PAN** | Planning Advice Note |
| **PMF** | Priority Marine Features |
| **pMPA** | Proposed Marine Protected Area |
| **PTS** | Permanent Threshold Shift |
| **RMS** | Root Mean Square |
| **SAC** | Special Area of Conservation |
| **SCANS** | Small Cetaceans in the European Atlantic and North Sea |
| **SCOS** | Special Committee on Seals |
| **SEL** | Sound Exposure Level |
| **$SEL_{cum}$** | Cumulative Sound Exposure Level |
| **SL** | Source Level |
| **SMRU** | Sea Mammal Research Unit |
| **SNH** | Scottish Natural Heritage |
| **SPL** | Sound Pressure Level |
| **$SPL_{peak}$** | Peak Sound Pressure Level |
| **SPP** | Scotland's Planning Policy |
| **SWS** | South West Scotland |
| **TSHD** | Trailing Suction Hopper Dredger |
| **TTS** | Temporary Threshold Shift |
| **WS** | West Scotland |

# Glossary

| Glossary Term | Glossary Text |
|---|---|
| **Environmental Impact Assessment (EIA)** | A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Statement. |
| **Environmental Statement (ES)** | A document reporting the findings of the EIA and produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations. |
| **Millport Coastal Flood Protection Scheme** | The scheme consists of offshore rock armour structures which will be built in the vicinity of the rock islets within Millport Bay. Onshore works will include flood walls, improvement works to existing coast protection structures, and works to raise the level of existing grass areas. Works on the foreshore include shore-connected rock armour breakwaters and rock armour revetments. |

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# 10 Marine Mammals and Basking Shark

## 10.1 Introduction

1. This chapter of the Environmental Statement (ES) considers the potential impacts of the proposed Millport Coastal Flood Protection Scheme (the proposed scheme) on marine megafauna (marine mammals (whales, dolphins, porpoise and seals) and basking shark *Cetorhinus maximus*.

2. This chapter provides a summary description of key aspects relating to marine mammals and basking shark followed by an assessment of the magnitude and significance of the effects upon the baseline conditions resulting from the construction, operation and decommissioning of the proposed scheme as well as those effects resulting from cumulative interactions with other existing or planned projects.

3. The potential effects on marine mammals and basking shark are assessed conservatively using realistic worst-case scenarios for the proposed scheme.

4. All figures referred to in this chapter are provided in Volume II of this ES.

5. The assessment of potential effects has been made with specific reference to Scotland's National Planning Framework and Planning Policy. These are discussed further in **Chapter 2 Policy and Legislation** and outlined below in Section 10.2. These are the principal decision-making documents for flood protection schemes.

6. This chapter has been prepared by Royal HaskoningDHV in accordance with the relevant legislation and policies, adhering to the methodology for Environmental Impact Assessment (EIA) and Cumulative Impact Assessment (CIA) as discussed in Section 10.4.

## 10.2 Policy, Legislation and Guidance

7. There are a number of pieces of legislation applicable to marine mammals and basking shark. The following key pieces of International and UK legislation which are relevant to this chapter. Further details are provided in **Chapter 2 Policy and Legislation** on the following legislation.

8. The policies and plans outlined throughout this section have also been reviewed for their relevance to marine mammals and basking shark when undertaking the EIA for the proposed scheme.

### 10.2.1 International Legislation and Policy

9. Table 10-1 below provides a brief summary of the key international legislation and policy relevant to the proposed scheme.

*Table 10-1 Summary of key international legislation and policy relevant to the proposed scheme*

| Legislation | Relevance |
|---|---|
| The Berne Convention 1979 | The Convention conveys special protection to those species that are vulnerable or endangered. Although an international convention, it is implemented within the UK through the Wildlife and Countryside Act 1981. |
| The Bonn Convention 1979 | Protects migratory wild animals across all, or part of their natural range, through international co-operation, and relates particularly to those species in danger of extinction. |

| Legislation | Relevance |
|---|---|
| Oslo and Paris Convention for the Protection of the Marine Environment 1992 | OSPAR has established a list of threatened and/or declining species in the north-east Atlantic. These species have been targeted as part of further work on the conservation and protection of marine biodiversity under Annex V of the OSPAR Convention. The list seeks to complement, but not duplicate, the work under the EC Habitats and Birds Directives and measures under the Berne Convention and the Bonn Convention. Also contained within the Convention are a series of annexes dealing with pollution from anthropogenic sources, including underwater noise pollution. |
| Convention on Biological Diversity 1993 | Requires signatories to identify processes and activities that are likely to have impacts on the conservation and sustainable use of biological diversity, inducing the introduction of appropriate procedures requiring an EIA and mitigation procedures. |
| Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas, 2008 (ASCOBANS) | ASCOBANS entered into force in 1994 under the auspices of the Convention on Migratory Species (CMS or Bonn Convention), with additional areas (the north-east Atlantic and Irish Sea) included into the convention in 2008. The aim of the convention is to promote cooperation between parties with a view to maintaining the Favourable Conservation Status (FCS) of small cetaceans throughout the agreement area. |
| International Convention for the Regulation of Whaling 1956 | This convention established the International Whaling Commission who regulate the direct exploitation and conservation of larger whales as a resource, and the impact of human activities on cetaceans. |
| Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) 1973. | Prohibits the international trade in species listed in Appendix 1 (including sperm whales, northern right whales, and baleen whales) and allows for the controlled trade of all other cetacean species. |

## 10.2.2 National Legislation and Policy

### 10.2.2.1 National Legislation

10. Table 10-2 below provides a brief summary of the key national legislation and policy relevant to the proposed scheme.

*Table 10-2 Summary of key national legislation and policy relevant to the proposed scheme*

| Legislation | Relevance |
|---|---|
| Marine (Scotland) Act 2010 | This Act provides a framework for the sustainable management of Scotland's seas and one of its key aims is to streamline and simplify the licensing and consenting process for marine projects. Under the Marine (Scotland) Act, the Conservation of Seals Act 1970 have been re-enacted, providing designation of specific seal haul-out sites for protections from intentional or reckless harassment. Under Part 6 of the new act, it is an offence to kill, injure or take a seal at any time of year, except to alleviate suffering or where a licence has been issued to do so by Marine Scotland. |
| The Marine Strategy Regulations 2010 | The Marine Strategy Framework Directive 2008 (Directive 2008/56/EC) was transposed into UK law in 2010 through the Marine Strategy Regulations. Both establish a framework for community action in the field of marine environmental policy and aims to achieve Good Environmental Status (GES) of marine waters |

| Legislation | Relevance |
|---|---|
| | by 2020 and to protect the resource base upon which marine-related economic and social activities depend. |
| The Conservation of Habitats and Species Regulations 2017<br>And<br>The Conservation of Offshore Marine Habitats and Species Regulations 2017 | 'The Habitats Regulations 2017'.<br>Provisions of The Habitats Regulations are described further above. It should be noted that the Habitats Regulations apply onshore, within the territorial seas and to marine areas within UK jurisdiction, beyond 12 nautical miles (nm). |
| Nature Conservation (Scotland) Act 2004 | The Nature Conservation (Scotland) Act 2004 sets out a series of measure designed to conserve biodiversity, and to protect and enhance the biological and geological natural heritage. This Act also provides amendments to the Wildlife and Countryside Act 1981 specifically for Scottish waters, adding that it is an offence to disturb cetacean species (either recklessly or intentionally). This Act also enacts requirements under the Bern Convention 1979. |
| Conservation of Seals Act 1970. | The Marine (Scotland) Act 2010 replaces the Conservation of Seals Act 1970 in Scottish waters. See above for further information. |
| The Wildlife and Countryside Act 1981 (as amended) | Schedule 5: all cetaceans are fully protected within UK territorial waters. This includes disturbance or harassment of a wild animal (either intentionally or recklessly). Under The Wildlife and Countryside Act (as amended) in Scotland, basking shark are a protected species of fish, and there is a requirement to apply for a basking shark licence for the disturbance or harassment, killing or injury of basking shark (either intentionally or recklessly). |
| The Countryside and Rights of Way (CroW) Act 2000 | Under the CRoW Act 2000, it is an offence to intentionally or recklessly disturb any wild animal included under Schedule 5 of the Wildlife and Countryside Act. |

### 10.2.2.2 Scotland's National Marine Plan: A Single Framework for Managing Our Seas

11. This plan covers the management of Scottish waters both inshore (less than 12nm) and offshore (between 12 and 200nm) (Scottish Government, 2015). Within Scotland's National Marine Plan are a set of Good Environmental Status (GES) indicators that must be met. Within these, of relevance to this Project, and marine mammal species and basking sharks, are;

- *"Biological diversity is maintained and recovered where appropriate. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions (GES 1);*
- *All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity (GES 4);*
- *Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment (GES 11)".*

### 10.2.2.3 Scottish Planning Policy

12. Scotland's Planning Policy (SPP) (Scottish Government, 2014) contains the following Policy Principles with regards to Valuing the Natural Environment and these have been taken into consideration when undertaking the EIA for the proposed scheme:

13. The planning system should:

- *Conserve and enhance protected sites and species, taking account of the need to maintain healthy ecosystems and work with the natural processes which provide important services to communities;*
- *Seek benefits for biodiversity from new development where possible, including the restoration of degraded habitats and the avoidance of further fragmentation or isolation of habitats; and*
- *Support opportunities for enjoying and learning about the natural environment.*
- *The planning system should support an integrated approach to coastal planning to ensure that development plans and regional marine plans are complementary.*

#### 10.2.2.4 Scottish Priority Marine Features

14. *Scottish Priority Marine Features (PMFs)* (Scottish Natural Heritage (SNH), 2014a) are habitats and species considered to be marine nature conservation priorities in Scottish waters. The aim of this work is to produce a focussed list of marine habitats and species to help target future conservation work in Scotland. The list includes 14 species of marine mammal (as listed below), listed for either offshore waters only, or in both in and offshore waters, as well as basking shark;

- Atlantic white-sided dolphin *Lagenorhynchus acutus* (offshore waters);
- Bottlenose dolphin *Tursiops truncatus* (both inshore and offshore waters);
- Fin whale *Balaenoptera physalus* (offshore waters);
- Harbour porpoise *Phoceona phoceona* (both inshore and offshore waters);
- Killer whale *Orcinus orca* (both inshore and offshore waters);
- Long-finned pilot whale *Globicephela melas* (offshore waters);
- Minke whale *Balaenoptera acutorostrata* (both inshore and offshore waters);
- Northern bottlenose whale *Hyperoodon ampullatus* (offshore waters);
- Risso's dolphin *Grampus griseus* (both inshore and offshore waters);
- Short-beaked common dolphin *Delphinus delphis* (both inshore and offshore waters);
- Sowerby's beaked whale *Mesoplodon bidens* (offshore waters);
- Sperm whale *Physeter macrocephalus* (offshore waters);
- White-beaked dolphin *Lagenorhynchus albirostris* (both inshore and offshore waters);
- Harbour seal *Phoca vitulina* (both inshore and offshore waters); and
- Grey seal *Halichoerus grypus* (both inshore and offshore waters).

### 10.2.3 Regional Legislation and Policy

#### 10.2.3.1 Clyde Regional Marine Plan

15. A pre-consultation on the draft Clyde Regional Marine Plan took place between 18th March and 27th May 2019. The first version of the SPP for the Clyde Regional Marine Plan was given Ministerial approval in December 2017. This version has since been updated to reflect changes in the pre-consultation draft phase. The most recent version was given Ministerial Approval in December 2018.

16. The Plan will create a framework for integrated, sustainable and co-ordinated planning and management of the Clyde Marine Region's environmental, economic and community resource.

### 10.2.4 Local Planning Policy

17. The proposed scheme falls within the North Ayrshire Council local authority boundaries.

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18. The proposed scheme falls within the North Ayrshire Council local authority boundaries. North Ayrshire adopted its new Local Development Plan 2 in November 2019 (North Ayrshire Council, 2019), which is considered below. Millport Conservation Area Regeneration Scheme (CARS) and Flood Defence Scheme is listed as a strategic project for North Ayrshire within the North Ayrshire Local Development Plan: Action and delivery Programme – March 2018 – this document acts as the implementation mechanism for the plan.

19. For the purpose of the Local Plan, Millport and the footprint of the proposed scheme is categorised to be within 'Developed Coast'.

20. The Ayrshire Joint Structure Plan '*Growing A Sustainable Ayrshire*' (North Ayrshire Council, East Ayrshire Council and South Ayrshire Council, 2007) establishes a framework that brings together the aspirations of communities with those of business and industry, and the area's many supporting agencies and organisations, to provide a strategic land use context to the year 2025. The Plan classes Great Cumbrae as a 'potential area' for a woodland strategy.

21. Table 10-2Table 10-3 provides details of the local planning policy documents and the relevant policies in respect to marine mammals and basking shark. Designated areas which these policies may refer to are shown on Figure 10-3. These policy document have been considered when undertaking the EIA for the proposed scheme.

*Table 10-3 Relevant local planning policies*

| Document | Policy / Guidance | Policy / Guidance purpose | ES Reference |
|---|---|---|---|
| North Ayrshire Local Development Plan 2 (North Ayrshire Council, 2019) | Policy 14 | Green and Blue Infrastructure.<br>All proposals should seek to protect, create, enhance and/or enlarge our natural features and habitats which make up our green and blue infrastructure (including open space), ensuring no unacceptable adverse environmental impacts occur. | A full assessment of all impacts are assessed within this section. |
| | Policy 16 | Protection of our Designated Sites.<br>We will support development which would not have an unacceptable adverse effect on our valuable natural environment as defined by the following legislative and planning designations;<br>Nature Conservation Sites of International Importance<br>Nature Conservation Sites of National Importance<br>Nature Conservation Sites of Local Importance<br>Marine Protected Areas<br>Development likely to have an adverse effect on the protected features of South Arran MPA will not be supported. Proposals are also required to consult with the Clyde Marine Planning Partnership (CMPP).<br>Biodiversity Action Plan Habitats and Species<br>Protected Species<br>Development likely to have an unacceptable adverse effect on; European Protected Species (see Schedules 2 & 4 of the Habitats Regulations 1994 (as amended) for definition); Birds, Animals and Plants listed on Schedules 1, 5 and 8 (respectively) of the Wildlife and Countryside Act 1981 (as amended); or badgers, will only be | A full assessment of all impacts are assessed, including on protected sites and species, within this section. |

| Document | Policy / Guidance | Policy / Guidance purpose | ES Reference |
|---|---|---|---|
| | | permitted where the applicant can demonstrate that a species licence is likely to be granted.<br>ii) The Scottish Biodiversity List (SBL) of animals, plants and habitats that Scottish Ministers considered to be of principle importance for biodiversity conservation in Scotland. | |

### 10.2.5 Best Practice and Guidance

22. The impact assessment has been based upon the following guidance and standards:

- The Protection of Marine European Protected Species (EPS) from Injury and Disturbance: Draft Guidance for the Marine Area in England and Wales and the UK Offshore Marine Area (Joint Nature Conservation Committee (JNCC) *et al.,* 2010).

23. Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (Chartered Institute of Ecology and Environmental Management (CIEEM), 2016).

## 10.3 Consultation

24. To inform the ES, North Ayrshire Council has undertaken a thorough pre-application consultation process, which has included the following key stages:

- Scoping Reports submitted to statutory stakeholders (Royal HaskoningDHV, 2017); and
- Scoping Opinion received from Marine Scotland and North Ayrshire Council (2017).

25. Full details of the proposed scheme consultation process to date is presented within **Chapter 3 EIA Methodology and Consultation.**

26. A summary of the consultation carried out at key stages throughout the proposed scheme with the Marine Management Organisation (MMO), JNCC and Scottish Natural Heritage (SNH), of particular relevance to marine mammals and basking shark, is presented in Table 10-4.

*Table 10-4 Consultation responses*

| Consultee | Date/ Document | Comment | Response / Where addressed in the ES |
|---|---|---|---|
| MMO | Response to Scoping Report consultation request. | As works are within Scottish waters, the MMO would defer to Marine Scotland and will not have a response to give. | Not applicable. |
| JNCC | Response to Scoping Report consultation request. | This development proposal is not located within the offshore area, does not have any potential offshore nature conservation issues and is not concerned with nature conservation at a UK level. JNCC therefore does not have any comments to add to this consultation. | Not applicable. |

| Consultee | Date/ Document | Comment | Response / Where addressed in the ES |
|---|---|---|---|
| SNH | Response to Scoping Report consultation request. | The report correctly identifies the key areas of concern to this organisation and these issues have been adequately described. The proposed measures for baseline surveys and completing the assessment of the potential impacts on the natural heritage should lead to a fair assessment of the project. | |

## 10.4 Methodology

27. This section describes the methodology used to obtain baseline data, characterise marine mammals and basking shark in the area and undertake the EIA. The primary study area is the Firth of Clyde, with a further area to include the Management Unit (MU) of each species to ensure the potential connectivity with designated sites is considered.

### 10.4.1 Baseline Data Sources and Study Area

28. Baseline data was obtained through a number of sources.

#### 10.4.1.1 Data Sources – Desk Study

29. A number of publicly available datasets and information on marine mammal and basking shark in the area were used. It is considered that these are sufficient to assess the impact of the proposed scheme and therefore no further marine mammal or basking shark surveys were undertaken. The data sources included, but were not limited to:

30. Small Cetaceans of the Atlantic and North Sea Surveys (SCANS-III) (Hammond *et al.,*2017);

- Management Units (MUs) for cetaceans in UK waters (Inter-Agency Marine Mammal Working Group (IAMMWG), 2015);
- Revised Phase III data analysis of Joint Cetacean Protocol (JCP) data resources (Paxton *et al*., 2016)
- The identification of discrete and persistent areas of relatively high harbour porpoise density in the wider UK marine area (Heinänen and Skov, 2015);
- Department of Energy and Climate Change (DECC) (now the Department for Business, Energy and Industrial Strategy (BEIS)) Offshore Energy Strategic Environmental Appraisal (OESEA) 3rd Report (DECC, 2016);
- JNCC Cetacean Atlas (Reid *et al*.,2003);
- Sea Watch Foundation sightings (Sea Watch Foundation, 2018);

31. Special Committee on Seals (SCOS) reports (SCOS, 2018);

- Sea Mammal Research Unit reports (SMRU);
- At-sea usage maps for harbour and grey seals (Russell *et al.,*2017);

32. Hebridean Whale and Dolphin Trust (HWDT) surveys;

- Hebridean Marine Mammal Atlas (HWDT, 2018); and

33. The Clyde Marine Mammal Project data (CMMP, 2017).

34. The Clyde Marine Mammal Project (CMMP, 2017) documents recordings of marine mammals and basking sharks in the Clyde and are undertaking visual and acoustic surveys of the Clyde waters.

**Study Areas**

35. Marine mammals and basking shark are highly mobile and transitory in nature; therefore, it is necessary to consider species occurrence not only within the immediate area of the proposed scheme, but also over the wider region.

36. For each species of marine mammal, the following study areas have been defined based on the relevant Management Units (MUs), current knowledge and understanding of the biology of each species:

- Harbour porpoise: West Scotland (WS) MU;
- Bottlenose dolphin: Coastal West Scotland and the Hebrides (CWSH) MU;
- Common dolphin: Celtic and Greater North Seas (CGNS) MU;
- Minke whale: CGNS MU;
- Grey seal: West Scotland and Southwest Scotland MUs; and
- Harbour seal: West Scotland and Southwest Scotland MUs.

37. MUs provide an indication of the spatial scales at which effects of plans and projects alone, and in-combination, need to be assessed for the key cetacean species in UK waters, with consistency across the UK (Inter-Agency Marine Mammal Working Group (IAMMWG), 2015). The study areas, MUs and reference populations used in the assessment have been determined based on the most relevant information and scale at which potential impacts from the proposed Project alone and cumulatively with other plans and projects.

38. There are currently no MUs for killer whale and humpback whale *Megaptera novaeangliae*, therefore the study area is based on information from the west coast of Scotland and wider area. For basking shark, the study has been based on the west coast of Scotland.

39. The status and activity of marine mammals and basking shark known to occur within or adjacent to the proposed scheme is considered in the context of regional population dynamics at the relevant scale, depending on the data available for each species and the extent of the MU.

### 10.4.2 Impact Assessment Methodology

40. General methods for EIA are discussed in **Chapter 3 EIA Methodology and Consultation.** The following sections describe the methodology used to assess the potential impacts of the proposed scheme on marine mammals and basking shark in more detail.

41. The approach to determining the significance of an impact follows a systematic process for all impacts. This involves identifying, qualifying and, where possible, quantifying the sensitivity, value and magnitude of all ecological receptors which have been scoped into this assessment. Using this information, a significance of each potential impact has been determined. Each of these steps is set out in the following sections.

42. In principle, a matrix approach has been used to assess impacts following best practice, EIA guidance and the approach outlined in the Scoping Report (Royal HaskoningDHV, 2017). Each potential impact has been identified using expert judgement and through consultation via the Scoping Process.

### 10.4.2.1 Sensitivity

43. The sensitivity of a receptor is determined through its ability to accommodate change and on its ability to recover if it is negatively affected. The sensitivity level of marine mammals or basking shark to each type of impact is justified within the impact assessment and is dependent on the following factors:

- Adaptability – The degree to which a receptor can avoid or adapt to an effect;
- Tolerance – The ability of a receptor to accommodate temporary or permanent change without a significant adverse effect;
- Recoverability – The temporal scale over and extent to which a receptor will recover following an effect; and
- Value – A measure of the receptors importance and rarity (as reflected in the species conservation status and legislative importance, see Section 10.4.2.2).

44. Table 10-5 defines the levels of sensitivity and what they mean for the receptor. The sensitivity to potential impacts of lethality, physical injury, auditory injury or hearing impairment, as well as behavioural disturbance or auditory masking are considered for each species, using available evidence including published data sources.

*Table 10-5 Definitions of sensitivity levels for marine mammals*

| Sensitivity | Definition |
|---|---|
| High | Individual receptor has very limited capacity to avoid, adapt to, accommodate or recover from the anticipated impact. |
| Medium | Individual receptor has limited capacity to avoid, adapt to, accommodate or recover from the anticipated impact. |
| Low | Individual receptor has some tolerance to avoid, adapt to, accommodate or recover from the anticipated impact. |
| Negligible | Individual receptor is generally tolerant to and can accommodate or recover from the anticipated impact. |

### 10.4.2.2 Value

45. In addition, the 'value' of the receptor forms an important element within the assessment, for instance, if the receptor is a protected species. It is important to understand that high value and high sensitivity are not necessarily linked. A receptor could be of high value (e.g. an Annex II species) but have a low or negligible physical/ecological sensitivity to an effect. Similarly, low value does not equate to low sensitivity and is judged on a receptor by receptor basis.

46. In the case of marine mammals, a large number of species fall within legislative policy; all cetaceans in UK waters are EPS and, therefore, are internationally important. Harbour porpoise, bottlenose dolphin, grey seal and harbour seals are Annex II species and also afforded international protection through the designation of Natura 2000 sites. As such, all species of marine mammal and basking shark can be considered to be of high value.

47. The value will be considered, where relevant, as a modifier for the sensitivity assigned to the receptor, based on expert judgement. Table 10-6 provides definitions for the value afforded to a receptor based on its legislative importance.

*Table 10-6 Definitions of value levels for marine mammals*

| Value | Definition |
|---|---|
| **High** | Internationally or nationally important<br>Internationally protected species that are listed as a qualifying interest feature of an internationally protected site (i.e. Annex II protected species designated feature of a European designated site) and protected species (including EPS) that are not qualifying features of a European designated site. |
| **Medium** | Regionally important or internationally rare<br>Protected species that are not qualifying features of a European designated site, but are recognised as a Biodiversity Action Plan (BAP) priority species either alone or under a grouped action plan, and are listed on the local action plan relating to the marine mammal study area. |
| **Low** | Locally important or nationally rare<br>Protected species that are not qualifying features of a European designated site and are occasionally recorded within the study area in low numbers compared to other regions. |
| **Negligible** | Not considered to be or particular important or rare<br>Species that are not qualifying features of a European designated site and are never or infrequently recorded within the study area in very low numbers compared to other regions. |

### 10.4.2.3 Magnitude

48. The significance of the potential impacts is also based on the intensity or degree of impact to the baseline conditions and is categorised into four levels of magnitude: high; medium; low; or negligible, as defined in Table 10-7.

49. The thresholds defining each level of magnitude of effect for each impact have been determined using expert judgement, current scientific understanding of marine mammal population biology and JNCC *et al*. (2010) draft guidance on disturbance to EPS species. The magnitude of each effect is calculated or described in a quantitative or qualitative way within the assessment.

*50.* The number of animals that can be 'removed' from a population through injury or disturbance varies between species but is largely dependent on the growth rate of the population; populations with low growth rates can sustain the removal of a smaller proportion of the population than one with a larger growth rate. The JNCC *et al*. (2010) draft guidance provides some indication on how many animals may be removed from a population without causing detrimental effects to the population at FCS. The JNCC *et al*. (2010) draft guidance also provides consideration of permanent displacement and limited consideration of temporary effects. As such this guidance has been considered in defining the thresholds for magnitude of effects.

51. Temporary effects are considered to be of medium magnitude at greater than 5% of the reference population being affected within one year. JNCC *et al*. (2010) draft guidance considered 4% as the maximum potential growth rate in harbour porpoise, and the 'default' rate for cetaceans. Therefore, beyond natural mortality, up to 4% of the population could theoretically be permanently removed before population growth would be halted. In assigning 5% to a temporary impact in this assessment, consideration is given to uncertainty of the individual consequences of temporary disturbance.

52. Permanent effects to greater than 1% of the reference population being affected within a single year are considered to be high magnitude in this assessment. This is based on Agreement on the

Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS) and Defra advice (Defra, 2003; ASCOBANS, 2015) relating to impacts from fisheries by-catch (i.e. a permanent effect) on harbour porpoise. A threshold of 1.7% of the relevant harbour porpoise population above which a population decline is inevitable has been agreed with Parties to ASCOBANS, with an intermediate precautionary objective of reducing the impact to less than 1% of the population (Defra, 2003; ASCOBANS, 2015).

*Table 10-7 Definitions of magnitude levels for marine mammals*

| Magnitude | Definition |
|---|---|
| High | Permanent irreversible change to exposed receptors or feature(s) of the habitat which are of particular importance to the receptor.<br>Assessment indicates that more than 1% of the reference population are anticipated to be exposed to the effect.<br>OR<br>Temporary effect (limited to phase of development or proposed scheme timeframe) to the exposed receptors or feature(s) of the habitat which are of particular importance to the receptor.<br>Assessment indicates that more than 10% of the reference population are anticipated to be exposed to the effect. |
| Medium | Permanent irreversible change to exposed receptors or feature(s) of the habitat of particular importance to the receptor.<br>Assessment indicates that between 0.01% and 1% of the reference population anticipated to be exposed to effect.<br>OR<br>Temporary effect (limited to phase of development or proposed scheme timeframe) to the exposed receptors or feature(s) of the habitat which are of particular importance to the receptor.<br>Assessment indicates that between 5% and 10% of the reference population anticipated to be exposed to effect. |
| Low | Permanent irreversible change to exposed receptors or feature(s) of the habitat of particular importance to the receptor.<br>Assessment indicates that between 0.001% and 0.01% of the reference population anticipated to be exposed to effect.<br>OR<br>Intermittent and temporary effect (limited to phase of development or proposed scheme timeframe) to the exposed receptors or feature(s) of the habitat which are of particular importance to the receptor.<br>Assessment indicates that between 1% and 5% of the reference population anticipated to be exposed to effect. |
| Negligible / No Impact | Permanent irreversible change to exposed receptors or feature(s) of the habitat of particular importance to the receptor.<br>Assessment indicates that less than 0.001% of the reference population anticipated to be exposed to effect.<br>OR<br>Intermittent and temporary effect (limited to phase of development or proposed scheme timeframe) to the exposed receptors or feature(s) of the habitat which are of particular importance to the receptor.<br>Assessment indicates that less than 1% of the reference population anticipated to be exposed to effect. |

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#### 10.4.2.4 Duration

53. The definitions of duration used within this EIA are dependent on the individual ecological receptor, and how sensitive it is to effects over different timescales. However, in general terms the following definitions have been used:

- **Short term**: effects which at most occur over a part of, or over a part of a key period of, a species' active season or a habitat's growing season, i.e. typically effects which occur over a matter of days or weeks;
- **Medium term**: effects which occur over the full duration of a species' active season or a habitat's growing season, i.e. typically effects which occur over a matter of months or one year; and
- **Long term**: effects which occur over the multiple active or growing seasons, i.e. typically effects which occur over more than one year.

54. Where deviations from these definitions are used within the impact assessment for marine mammals and basking shark, this is explained within the text.

#### 10.4.2.5 Impact Significance

55. Following the identification of receptor importance and magnitude of the effect, it is possible to determine the significance of the impact. The matrix (provided in Table 10-8) will be used as a framework to aid determination of the impact assessment. Definitions of impact significance are provided in Table 10-9.

56. For the purposes of this assessment and specifically the marine mammal assessment, major and moderate impacts are considered to be significant. However, whilst minor impacts would not be considered significant in their own right, they may contribute to significant impacts cumulatively or through inter-relationships.

57. The probability of the impact occurring is also considered in the assessment process. If doubt exists concerning the likelihood of occurrence or the prediction of an impact, a precautionary approach is taken to assign a higher level of probability to adverse effects.

58. Embedded mitigation and commitments for the proposed scheme, if relevant, has been referred to and included in the initial assessment of impacts. An assessment of residual impacts has then been made, after assuming implementation of additional mitigation measures where required, i.e. the significance of the effects that are predicted after the implementation of all committed mitigation measures. If, the impact does not require mitigation (or none is possible) the residual impact remains the same. However, if mitigation is required, an assessment of the post-mitigation residual impact is provided.

*Table 10-8 Impact significance matrix*

| | | Negative Magnitude | | | | Beneficial Magnitude | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | High | Medium | Low | Negligible | Negligible | Low | Medium | High |
| Sensitivity | High | Major | Major | Moderate | Minor | Minor | Moderate | Major | Major |
| | Medium | Major | Moderate | Minor | Minor | Minor | Minor | Moderate | Major |
| | Low | Moderate | Minor | Minor | Negligible | Negligible | Minor | Minor | Moderate |
| | Negligible | Minor | Minor | Negligible | Negligible | Negligible | Negligible | Minor | Minor |

*Table 10-9 Impact significance definitions*

| Impact Significance | Definition |
|---|---|
| Major | Very large or large change to a receptor (or receptor group) either adverse or beneficial, which are likely to be important considerations at a population (national or international) level because of the contribution to achieving national, regional or local objectives, or, could result in exceedance of statutory objectives and / or breaches of legislation. |
| Moderate | Intermediate change, either adverse of beneficial) to a receptor (or receptor group), which may be an important consideration at national or regional population level. Potential to result in exceedance of statutory objectives and / or breaches of legislation. |
| Minor | Small change (either adverse or beneficial) to a receptor (or receptor group), which may be raised as local issues but is unlikely to be important at a regional population level.. |
| Negligible | No discernible change in receptor. |

### 10.4.2.6 Cumulative Impact Assessment

59. **Chapter 3 EIA Methodology and Consultation** provides an introduction to the methodology used for the CIA. This chapter includes those cumulative impacts that are specific to marine mammals and basking shark.

60. The CIA involves consideration of whether impacts on a receptor can occur on a cumulative basis between the proposed scheme and other activities, projects and plans for which sufficient information regarding location and scale exist.

61. The potential for cumulative effects has been considered for the construction, operation and decommissioning of the proposed scheme cumulatively with other projects.

62. It is assumed that any consented development would be subject to mitigation and management measures which would reduce impacts to non-significant unless there were exceptional circumstances, however, it is accepted that such projects or schemes may contribute to a wider cumulative impact.

63. Finally, in cases where this proposed scheme has negligible or no impact on a receptor (through for example avoidance of impact through routeing or construction methodology) it is considered that there is no pathway for a cumulative impact.

64. The plans and projects considered in to the CIA are (i) located in the marine mammal MU population reference area (defined for individual species in the assessment sections); and (ii) have the potential

for cumulative impacts with the proposed scheme, taking into account location, timing and areas of potential impact.

65. The CIA considered projects, plans and activities which have sufficient information available in order to undertake the assessment. Insufficient information will preclude a meaningful quantitative assessment, and it is not appropriate to make assumptions about the detail of future projects in such circumstances.

## 10.5 Existing Environment

### 10.5.1 Overview

66. The island of Great Cumbrae is located in the Firth of Clyde about 1.5km from the mainland. The majority of the coast of the island is characterised by an emergent rock platform, with isolated pocket bays containing beaches. The rock foreshore is currently stable with low rates of change. Millport Bay is the part of the island coast that contains larger lengths of mobile beach sediment. The bay can be divided into three parts:

- Kames Bay located in the northeast corner of Millport which contains a 150m-wide sandy beach;
- A sandy beach (about 50m wide) on rock platform at Newtown Bay; and
- The rest of the Millport shore, which has a sand and gravel veneer overlying rock platform.

67. Millport Bay faces south, with Kames Bay (at the eastern end) aligned to the south-southwest. Within the bay, there are large rock outcrops, known as the Eileans, the Leug and the Spoig, which provide shelter to the central section of Millport Bay against waves from the south. The shelter provided by these outcrops has led to the deposition of sand in their lee along the Newtown Bay shoreline (i.e. forming a small salient).

68. The SCANS-III survey was undertaken in the summer of 2016, and covered all European Atlantic waters from the Strait of Gibraltar in the south to 62°N in the north and extending west to the 200nm limits of all EU Member States (Hammond *et al.,* 2017). The proposed scheme is located in SCANS-III survey block G, which only recorded harbour porpoise, bottlenose dolphin, and minke whale within that block. The Phase III Joint Cetacean Protocol (JCP) report shows a similar presence of species within the area, with harbour porpoise, minke whale and bottlenose dolphin being shown to be the only species present in the Firth of Clyde (Paxton *et al.*, 2016).

69. Several species of marine mammal have been recorded in and around the Firth of Clyde. Species that have recently been reported to SeaWatch Foundation being in the Forth of Clyde and surrounding area between August and October 2019 include northern bottlenose whale, killer whale, Risso's dolphin, minke whale and harbour porpoise, although it should be noted that all were reported in relatively low numbers (SeaWatch Foundation, 2020).

70. The Clyde Marine Mammal Project also reports public sightings data as well as recording marine mammal specific surveys within the Clyde. The most recent reports available are from January 2016 to July 2017, with a total of 1,729 marine mammals (and basking shark) sightings being recorded. Harbour porpoise were by far the most common species (with 1,127 sightings; 65% of the total), bottlenose dolphin (with 152 sightings; 9% of the total), common dolphin (135 sightings; 8% of the total), and harbour seal (with 93 sightings; 5% of the total), suggesting they are the most common species in the area (Clyde Porpoise Community Interest Company (C.I.C), 2018). Other species that were recorded in lower numbers include minke whale (38 sightings; 2% of the total sightings),

humpback whale (27 sightings; 2% of the total sightings), grey seal (26 sightings; 2% of the total sightings), basking shark (13 sightings; 1% of the sightings), and killer whale (3 sightings). A total of 90 unidentified dolphin species (5% of the total sightings), 7 unidentified baleen whale, 2 unidentified seals and 1 unidentified cetacean were also reported in this period.

71. Based on the above, the species most likely to be present in the area are listed below. The following assessment of impacts is based upon this list, with all other species considered to be too rare within the Firth of Clyde to be impacted;

- Harbour porpoise;
- Bottlenose dolphin;
- Common dolphin;
- Killer whale;
- Minke whale;
- Humpback whale;
- Grey seal;
- Harbour seal; and
- Basking shark.

#### 10.5.1.1 Conservation Importance

72. All cetaceans in UK waters are classed as EPS under Annex IV of the Habitats Directive (European Union (EU) Directive 92/43/EEC) and therefore internationally important (see Section 10.2). Bottlenose dolphin and harbour porpoise are also listed under Annex II of the Habitats Directive and are afforded protection through the designation of Natura 2000 sites.

73. Seal species within the UK are listed under a number of international and national legislations for their protection (see Section 10.2). Both grey seal and harbour seal are listed under Annex II and Annex V of the Habitats Directive. Annex V requires that their exploitation or removal from the wild may be subject to management measures, and under Annex II of the Habitats Directive are afforded protection through the designation of Natura 2000 sites. The Offshore Marine Regulations provide the same level of protection for more than 12nm offshore. Both grey and harbour seals are also listed under Appendix III of the Bern Convention, requiring appropriate and necessary legislative and administrative measures to ensure the protection of seal species. The Marine Scotland Act 2010 provides protection for seals within Scotland, where it is an offence to injure, take or kill any seal except under licence.

74. Basking sharks are listed on schedule 5 of the Wildlife and Countryside Act 1981, CITES Appendix II, and are listed on the Bonn Convention on Migratory Species, and the Common Fisheries Policy. Basking shark are protected from disturbance up to 12nm offshore from the Nature Conservation (Scotland) Act (2004).

#### 10.5.1.2 Conservation Status

75. When assessing potential impacts consideration is given to the definition of the Conservation Status of a species. There are three parameters that determine when the Conservation Status of a species can be taken as Favourable:

- Population(s) of the species is maintained on a long-term basis;
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and

- The habitat on which the species depends (for feeding, breeding, rearing etc.) is maintained in sufficient size to maintain the population(s) over a period of years/decades.

76. Member states report back to the EU every six years on the Conservation Status of marine EPS. In the UK, of the common or newly arriving marine mammal species, 11 out of 12 cetacean species have been assessed as having an 'unknown' Conservation Status, and one has not been assessed (based on the 2013-2018 reporting (JNCC, 2019). Some of these species were given a Favourable Conservation Status (FCS) in previous reporting periods, however, the implementation of more robust FCS assessment methodology requires a higher number of UK population estimates over time than are currently available. Table 10-10 presents the Conservation Status of commonly occurring marine mammal species within UK waters that are of relevance for the proposed scheme (JNCC, 2019).

77. There are two species of seals common to UK waters, the grey seal and harbour seal. Approximately 38% of the worlds grey seals breed in the UK, of which 88% are from sites in Scotland, with the main colonies being in the Inner and Outer Hebrides and Orkney (SCOS, 2018). Approximately 30% of the European harbour seal population are found in the UK, which has declined from approximately 40% in 2002 (SCOS, 2018). The current conservation status, as assessed in the 4th UK report on implementation of the Habitats Directive (submitted to the European Commission in 2019), of the grey seal is 'favourable' (JNCC, 2019). The current conservation status, as assessed in the 4th UK report on implementation of the Habitats Directive (submitted to the European Commission in 2012), of the harbour seal is 'unfavourable' for the overall assessment (JNCC, 2019).

*Table 10-10: FCS assessment of cetacean species occurring in UK waters that are of relevance for the proposed scheme (JNCC, 2019)*

| Species | FCS assessment |
|---|---|
| **Harbour porpoise** | **Unknown** |
| **Bottlenose dolphin** | **Unknown** |
| **Common dolphin** | **Unknown** |
| **Killer whale** | **Unknown** |
| **Minke whale** | **Unknown** |
| **Humpback whale** | **Not assessed** |
| **Grey seal** | **Favourable** |
| **Harbour seal** | **Unfavourable** |

## 10.5.2 Harbour Porpoise

### 10.5.2.1 Distributions and Abundance

78. Harbour porpoise within the eastern North Atlantic are generally considered to be part of a continuous biological population that extends from the French coastline of the Bay of Biscay to northern Norway and Iceland (Tolley and Rosel, 2006; Fontaine *et al.*, 2007, 2014; IAMMWG, 2015). However, for conservation and management purposes, it is necessary to consider this population as smaller MUs. MUs provide an indication of the spatial scales at which effects of plans and projects alone, and in-combination, need to be assessed for the key cetacean species in UK waters, with consistency across the UK (IAMMWG, 2015).

79. The IAMMWG defined three MUs for harbour porpoise: North Sea (NS); West Scotland (WS); and the Celtic and Irish Sea (CIS). The proposed scheme is located within the West Scotland MU, which

has an estimated harbour porpoise abundance of 21,462 (95% Confidence Interval (CI) = 9,740-47,289; IAMMWG, 2015).

80. A series of large scale surveys for cetaceans in European Atlantic waters was initiated in summer 1994 in the North Sea and adjacent waters (SCANS, 1995; Hammond *et al.*, 2002) and continued in summer 2005 and summer 2016 in all shelf waters (SCANS-II, 2008; SCANS-III, 2017). SCANS-III in the summer of 2016 surveyed all European Atlantic waters from the Strait of Gibraltar in the south to 62°N in the north and extending west to the 200nm limits of all EU Member States (Hammond *et al.*, 2017). For the entire SCANS-III survey area, harbour porpoise abundance in the summer of 2016 was estimated to be 466,569 with an overall estimated density of 0.381/km$^2$ (Coefficient of Variation (CV) = 0.154; 95% CI = 345,306-630,417; Hammond *et al.*, 2017). The SCANS-III estimate of harbour porpoise abundance in the West Scotland MU was 24,370 (CV = 0.23; 95% CI = 15,074-37,858) with a density estimate of 0.21/km$^2$ (Hammond *et al.*, 2017).

81. The proposed scheme is located in SCANS-III survey block G, which was completed by aerial surveys and had an area of 15,122km$^2$ and 958km of effort. The estimated abundance of harbour porpoise in SCANS-III survey block G is 5,087 harbour porpoise (CV=0.43; 95% CI = 1,701-10,386), with an estimated density of 0.336 harbour porpoise/km$^2$ (Hammond *et al.*, 2017).

82. Heinänen and Skov (2015) provide the results of detailed analyses of 18 years of JCP survey data. The model results for the North West Scottish Wates MU indicate that most important factors for probability of presence of harbour porpoise in this MU during summer is the particle size of surface sediments, with sediments of 2.5 – 3Ø, i.e. coarse sands and gravels (Heinänen and Skov, 2015). Surface salinity is also a factor in harbour porpoise abundance in the area, with lower abundancies salinity of over 35psu, while water depth and the number of ships had no significant effect on their distribution and abundance. Modelled areas of persistent high densities within the North West Scottish MU shows areas of high harbour porpoise densities through the summer periods along much of the west coast of Scotland, including for the area around Great Cumbrae and Millport (Heinänen and Skov, 2015, Plate 10-1).

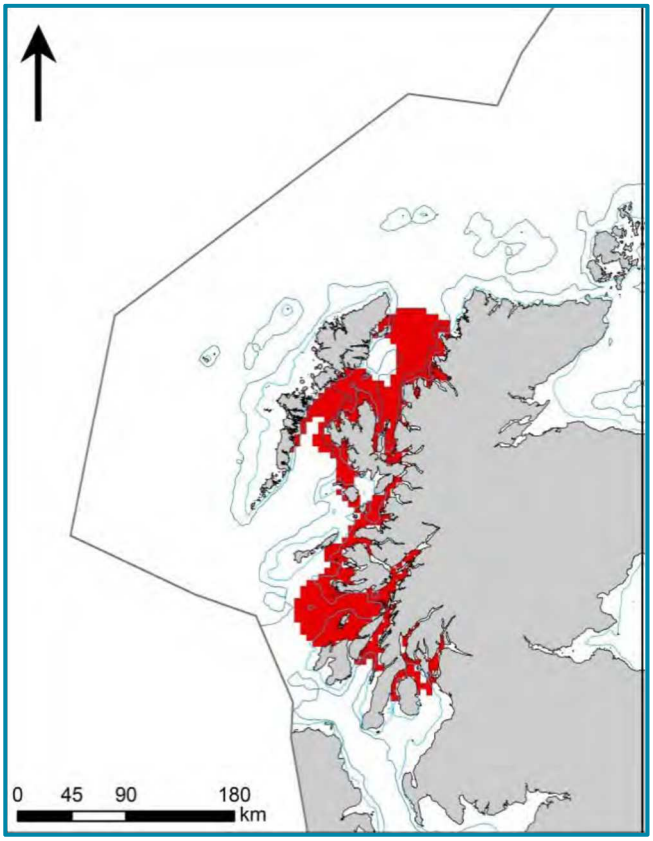


*Plate 10-1 Persistent high-density areas identified and selected in North West Scottish Waters MU during the summer months. The red colours mark areas with where persistent high densities as defined by the upper 90th percentile have been identified (Heinänen and Skov, 2015).*

83. The HWDT conduct yearly marine mammal, basking shark and sunfish surveys. During 2014, 11 monitoring trips were conducted from May to mid-October, each lasting between 7 and 12 days, totalling 750 hours of effort and covering 4,500nm, with the purpose of collecting sightings data of marine mammals and to use that data to build up an understanding of key habitats for marine mammals off the west coast of Scotland. Plate 10-2 shows the survey effort (both for visual and acoustic surveys) that was undertaken in 2014 by the HWDT. Effort was concentrated within the Inner Hebrides and through the Sea of the Hebrides and the Minches, however survey effort did reach as far south as the Isle of Arran and Bute.

84. A total of 1,089 harbour porpoise individuals were sighted in 2014, with a sighting rate of 7.84 per 100km covered (HWDT, 2014). Harbour porpoise were common throughout the survey area, including around Millport.

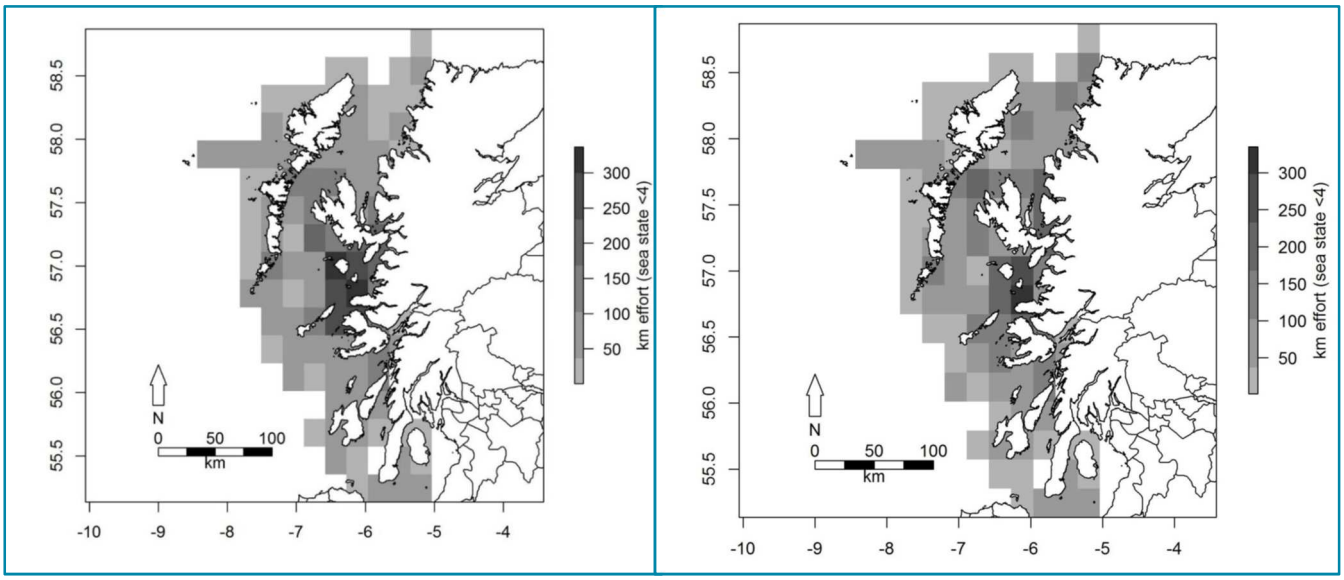


*Plate 10-2 Visual and acoustic survey effort for 2014 undertaken by the HWDT (HWDT, 2014)*

85. The Clyde Marine Mammal Project undertake marine mammal surveys, lasting between 3 – 5 days within the Clyde. The area covered includes the entire of the Firth of Clyde, up to Loch Long and Gare Loch in the north and to Loch Ryan at North Cairn in the south, with the western edge of the area being south-east offshore of the mainland at Southend.

86. The Clyde Marine Mammal Project are also responsible for collating community sightings in the area. From January 2016 to July 2017, there were 1,127 confirmed sightings of harbour porpoise, making this species the most commonly sighted within the area (Clyde Porpoise c.i.c, 2018). Plate 10-3 shows the number of sightings per month, identifying a seasonal trend with the highest sightings through spring and early summer (March-May) and a peak in April. However, it should be noted that this could reflect the increased chance of sighting harbour porpoise with good sea conditions (Clyde Porpoise c.i.c, 2018).

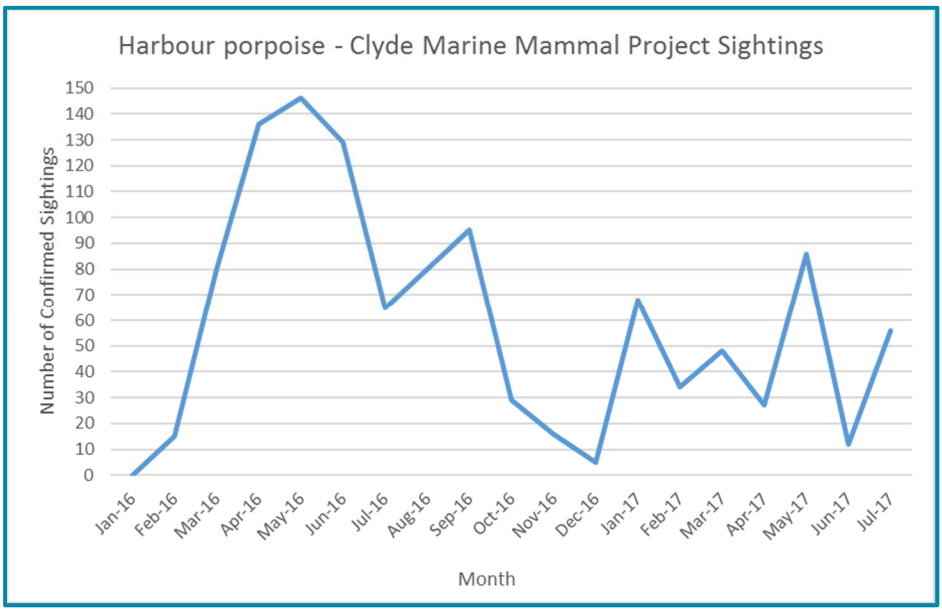


*Plate 10-3 Clyde Marine Mammal Project sightings data for harbour porpoise January 2016 to July 2017 (data taken from Clyde Porpoise c.i.c, 2018)*

87. Brown (2018) conducted analysis of 25 Passive Acoustic Monitoring (PAM) surveys covering a small focal area in the north of the Firth of Clyde, this was undertaken as part of larger survey network in the wider Clyde area. The Clyde Porpoise c.i.c collected data between the 4th October 2016 and the 9th November 2017, covering this localised 'focal area' in the North of the Firth of Clyde which were analysed to predict harbour porpoise distribution over different size grids and predicted a group of small hotspots either side of the Cumbraes (little and great), a large hotspot north of Great Cumbrae, a large group of small hotspots to the north of the survey area and a few small hotspots around the island of Bute (the large island to the left of the Cumbraes) (Plate 10-4). The hotspots identified are likely to represent the areas within the Firth of Clyde with the highest productivity. Two of the areas identified (the areas around the Cumbraes and the area in the north of the survey area) corroborate with biodiversity hotspots previously identified in the Firth of Clyde (Langmead *et al.,* 2008).

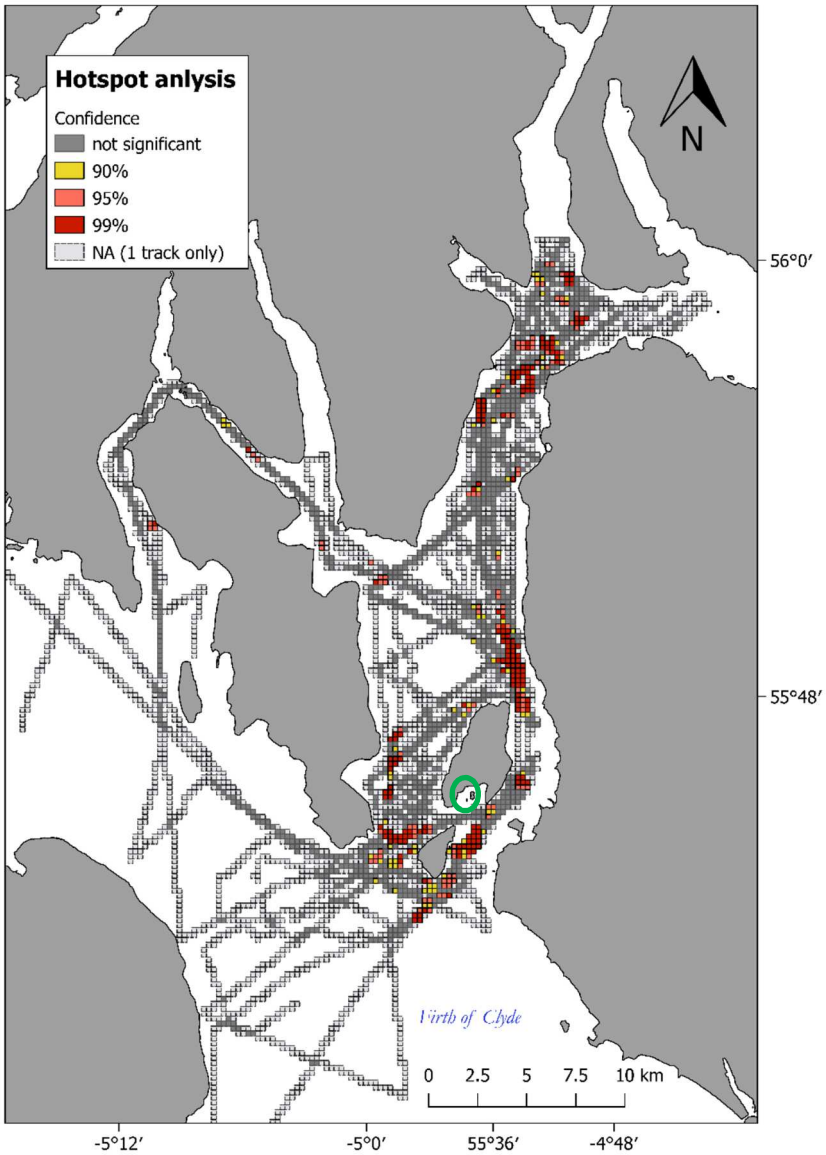


*Plate 10-4 Predicted distribution of harbour porpoise hotspots in the Firth of Clyde from hot spot analysis (Brown, 2018) . Grid cells containing only one track (NA) were excluded from predictions [the approximate location of the proposed scheme is shown by the green circle]*

### 10.5.2.2 Life History and Ecology

88. Within coastal waters, distributions of harbour porpoise are often associated with strong tidal features, including headlands, sounds between islands, areas with tidal upwelling, races and rips and are often found near reefs and small islands where prey are more likely to be concentrated in patches, providing optimum foraging conditions (Read and Westgate, 1997; Pierpoint, 2008; Marubini *et al.*, 2009). The conditions off the west coast of Scotland provides ideal habitat for the harbour porpoise.

89. Harbour porpoise are highly mobile, and within the western North Atlantic, individuals are known to range over large areas, covering as much as 11,289km$^2$ in a single month (Johnston *et al.*, 2005). Seasonal movements and migratory patterns of harbour porpoise are not well understood, while they may reside within a particular area for an extended period of time, there is also evidence to suggest that they may make seasonal movements (Northridge *et al.*, 1995; Bjorge and Tolley, 2002). Although

harbour porpoise are highly mobile, they tend to occupy small core areas or regions for short periods of time and make rapid movements over hours or days across larger areas (Johnston *et al*., 2005; Fontaine *et al*., 2007) which often corresponds to good foraging opportunities (Marubini *et al*., 2009).

90. The calving period for harbour porpoise is primarily in the summer months between May and July, when sea temperatures are increasing (Read, 1990; Sorensen and Kinze, 1994; Lockyer, 1995; Learmonth *et al*., 2014). At present, there is not enough evidence to determine whether some parts of the harbour porpoise range are more important than others for breeding and calving, there is currently no evidence for specific habitat requirements for mating and calving within UK waters (JNCC, 2002; 2016).

#### 10.5.2.3 Prey Species

91. The distribution and occurrence of harbour porpoise and other marine mammals is most likely to be related the availability and distribution of their prey species. For example, sandeels *Ammodytidae*, which are known prey for harbour porpoise, exhibit a strong association with particular surface sediments (Clark *et al*., 1998).

92. The diet of the harbour porpoise consists of a wide variety of fish, including pelagic schooling fish, as well as demersal and benthic species, especially Gadoids, Clupeids and *Ammodytes* spp. Other prey species such as cephalopods, other molluscs, crustaceans and polychaetes have also been recorded. The diet varies geographically, seasonally and annually, reflecting changes in available food resources and differences in diet between sexes or age classes may also exist (Berrow and Rogan, 1995; Kastelein *et al*., 1997; Börjesson *et al*. 2003; Santos and Pierce, 2003; Santos *et al*., 2004; Pierce *et al*., 2007).

### 10.5.3 Bottlenose Dolphin

#### 10.5.3.1 Distributions and Abundance

93. The bottlenose dolphin has a worldwide distribution across tropical and temperate seas of both hemispheres and can be found in coastal and continental shelf waters (Reid *et al*., 2003; DECC, 2016). In most regions, including the UKCS, inshore and offshore 'sub-populations' of bottlenose dolphins tend to be distinct (DECC, 2016; Oudejans *et al*., 2015). In UK waters, inshore individuals are frequently reported off north-east and south-west Scotland, in the Irish Sea, and in the western English Channel (DECC, 2016; IAMMWG, 2015).

94. Bottlenose dolphin within the eastern North Atlantic are generally considered to be part of a continuous biological population that extends from the French coastline of the Bay of Biscay to northern Norway and Iceland (Tolley and Rosel, 2006; Fontaine *et al*., 2007, 2014; IAMMWG, 2015). As outlined above, for conservation and management purposes, it is necessary to consider this population as smaller MUs.

95. The IAMMWG defined seven MUs for bottlenose dolphin, the proposed Millport FPS is located within the CWSH MU, which has an estimated bottlenose dolphin abundance of 45 (95% CI = 33-66; IAMMWG, 2015).

96. For the entire SCANS-III survey area, bottlenose dolphin abundance in the summer of 2016 was estimated to be 27,697 with an overall estimated density of 0.015/km$^2$ (CV = 0.233; 95% CI = 17,662-43,432; Hammond *et al*., 2017). The proposed Millport FPS is located in SCANS-III survey block G, which was completed by aerial surveys and had an area of 15,122km$^2$ and 958km of effort. The

estimated abundance bottlenose dolphin in SCANS-III survey block G is 1,824 (CV=0.68; 95% CI = 0-4,474), with an estimated density of 0.121 individuals/km$^2$ (Hammond *et al*., 2017).

97. Bottlenose dolphins off the west coast of Scotland are at the northern most extreme of the species range, and are common throughout the Hebrides and off the mainland coastlines. Bottlenose dolphins are most commonly sighted in inshore waters and close to the coastline, particularly around headlands and bays. Photo-ID studies completed by the HWDT have revealed a population of 30-40 bottlenose dolphin inhabit the inner-Hebrides (from Kintyre to Skye), with a separate group of 12 individuals within the Sound of Barra (HWDT, 2018a). Plate 10-5 shows bottlenose dolphin hotspot areas within the Hebrides and off the west coast of Scotland, as identified through 11 years of survey data collected by the HWDT. Millport is located within the bottlenose dolphin range but not within an identified hotspot for the species. In the HWDT 2014 surveys, a total of 10 bottlenose dolphin individuals were sighted in 2014, with a sighting rate of 0.01 per 100km covered (HWDT, 2014).

98. The Clyde Marine Mammal Project identified a total of 152 confirmed bottlenose dolphin sightings from January 2016 to July 2017 (Clyde Porpoise c.i.c, 2018). Plate 10-6 shows the number of sightings per month, identifying a clear seasonal trend with peak sightings in the summer months (June to August) for both years, with very low sightings for the rest of the year (Clyde Porpoise c.i.c, 2018).

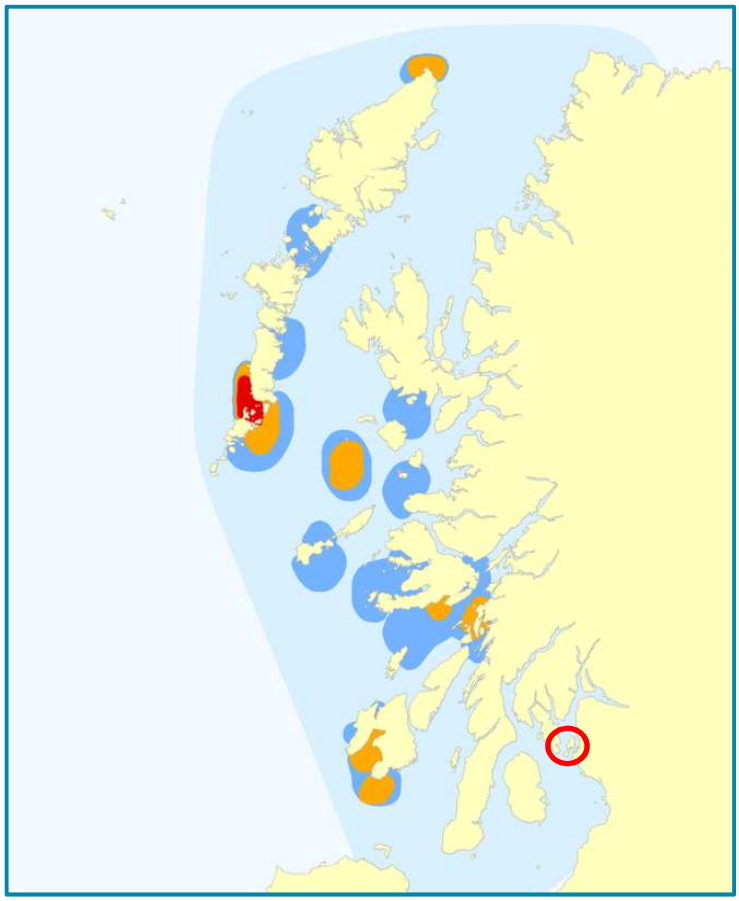

*Plate 10-5 Bottlenose Dolphin Hotspot Map, the approximate Millport site location is shown by the red circle. (HWDT , 2018a)*

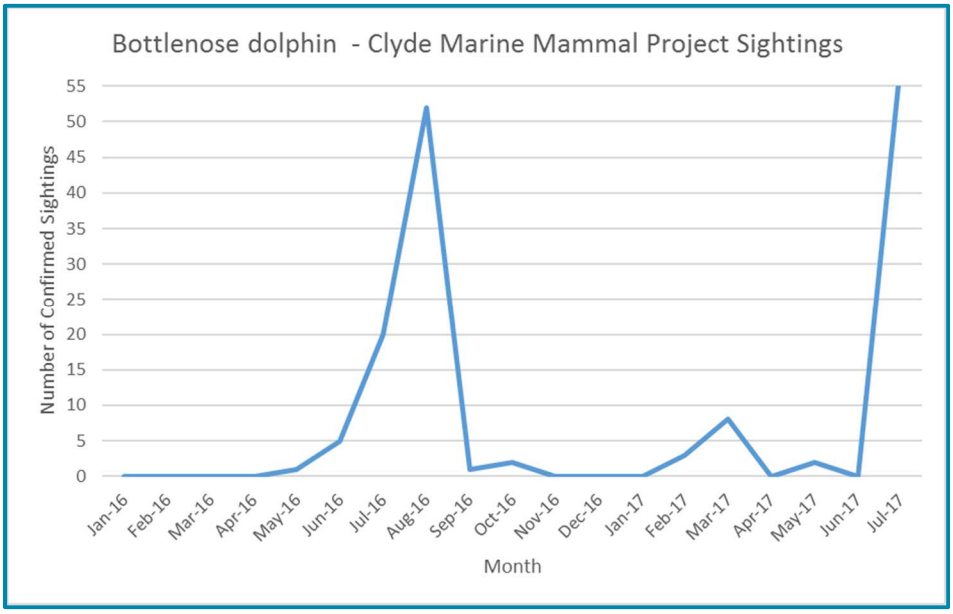


*Plate 10-6 Clyde Marine Mammal Project sightings data for bottlenose dolphin January 2016 to July 2017 (data taken from Clyde Porpoise c.i.c, 2018)*

### 10.5.3.2 Life History and Ecology

99. Bottlenose dolphins occur in UK waters in the greatest numbers between July and October, with a second highest peak in some areas from March to April (Reid *et al.*, 2003; Evans *et al.*, 2003). Evidence suggest that bottlenose dolphins in UK waters may have two calving peaks in the year (Evans, 1980) or an extended breeding season, meaning that calves can often be observed throughout the year. Calves stay with their mothers for at least four years (Smolker *et al.*, 1992), but have been reported to stay together until the calf is eight years old (Grellier *et al.*, 2003).

### 10.5.3.3 Prey Species

100. Bottlenose dolphins are opportunistic feeders and take a wide variety of fish and invertebrate species. Diet analysis of bottlenose dolphins has revealed a wide variety of prey, including benthic and pelagic fish (both solitary and schooling species) such as haddock *Melanogrammus aeglefinus*, saithe *Pollachius virens*, pollock, cod *Gadus morhua*, whiting *Merlangius merlangus*, hake *Merluccius Merluccius*, blue whiting *Micromesistius poutassou*, bass *Dicentrarchus labrax*, mullet *Mugilidae*, mackerel *Scombridae*, salmon *Salmo salar*, sea trout *Salmo trutta trutta*, flounders *Pleuronectidae,* sprat *Sprattus sp.* and sandeels, as well as cephalopods including octopus (Santos *et al.*, 2001; Reid *et al.,* 2003).

## 10.5.4 Common Dolphin

### 10.5.4.1 Distributions and Abundance

101. The common dolphin is the most numerous offshore cetacean species in the north east Atlantic, most often sighted off the western coast of the UK, in the Celtic Sea, and western approaches to the Channel, it is only occasionally sighted in the North Sea during the summer months (Reid *et al.*, 2003). Analysis of summer sightings data for UK waters revealed that that majority of common dolphin sightings are made in waters of 14°C or higher (MacLeod *et al.*, 2008; Canadas *et al.,* 2009). During the summer months and the common dolphin calving period (of May to September), the majority of common dolphin sightings are more widely spread along and off the continental shelf slope and in

deep waters off the south-west of England, west coast of Ireland and west and north-west coast of Scotland (Murphy *et al*., 2005; Murphy and Rogan, 2006).

102. For the entire SCANS-III survey area, common dolphin abundance in the summer of 2016 was estimated to be 467,673 with an overall estimated density of 0.261/km$^2$ (CV = 0.264; 95% CI = 281,129-777,998; Hammond *et al*., 2017). There was no estimate made for common dolphin with in Area G, where Millport is located. The next nearest SCANS-III block with a common dolphin density estimate is survey block J, with an estimated density of 0.133/km$^2$ (CV = 0.95; 95% CI = 0-16,108).

103. The IAMMWG defined just one MU for common dolphin, the Celtic and Greater North Seas MU, which has an estimated common dolphin abundance of 56,556 (95% CI = 33,014-96,920; IAMMWG, 2015).

104. In the 2014 HWDT surveys, a total of 649 common dolphin individuals were sighted in 2014, with a sighting rate of 0.51 per 100km covered (HWDT, 2014). No sightings were recorded near the Millport area, or south of the Isle of Mull, but were common in the Minches and Inner Hebrides and north of the Isle of Mull (HWDT, 2014).

105. The Clyde Marine Mammal Project identified a total of 135 confirmed common dolphin sightings from January 2016 to July 2017 (Clyde Porpoise c.i.c, 2018). Plate 10-7 shows the number of sightings per month, identifying a seasonal trend with lower sightings within the winter months, and higher sightings in the Spring and Summer for 2016 and the Spring in 2017 (Clyde Porpoise c.i.c, 2018).

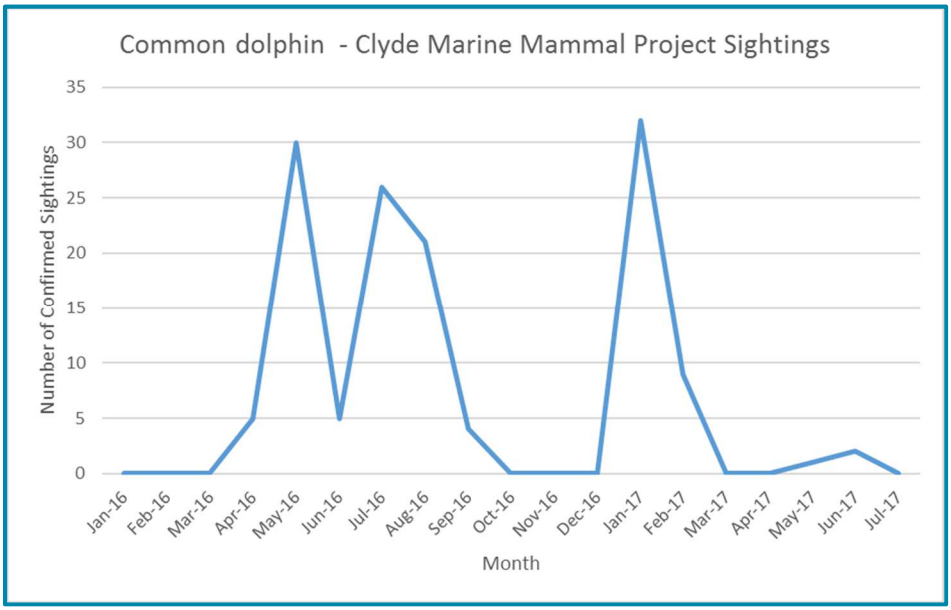


*Plate 10-7 Clyde Marine Mammal Project sightings data for common dolphin January 2016 to July 2017 (data taken from Clyde Porpoise c.i.c, 2018)*

### 10.5.4.2 Life History and Ecology

106. There is little information on the social structure of common dolphins, they are often seen in groups of six to ten in north-west European waters, although pods of hundreds have frequently been recorded (Reid *et al*., 2003). A study of stranded and by-caught common dolphins along the Irish coastline was undertaken from 1990-2003 (Murphy & Rogan, 2006). For each individual, measurements of their body size was taken to determine their age, with ages determined for 183 of the individuals (Murphy & Rogan, 2006). Males were reported to be between 105 and 231cm, and females 93 to 230cm, with a maximum age of 25 for both male and female. Maturity was estimated to be at 11 years

for males and 9 years for females, and the gestation period was again estimated to be 11.5 months (Murphy & Rogan, 2006).

#### 10.5.4.3 Prey Species

107. The diet of common dolphins includes a variety of fish and cephalopods such as squid, with the main dominant species varying with season and region (Hammond *et al*., 2008; Murphy *et al*., 2013). Studies have defined common dolphin opportunistic feeders, while others have described them as specialist feeders with a preference for energy-rich species. The most recent large-scale analysis was unable to determine which type of feeder common dolphin are (Santos *et al*., 2013).

108. From stranded common dolphins, it is possible to determine their prey species. Fish species identified through these studies in UK and Irish waters revealed horse mackerel *Trachurus trachurus*, mackerel, Norway pout *Trisopterus esmarkii* and sardines to be the dominate species, with other Trisopterus spp., whiting, herring *Clupeidae sp*., sprat and sandeel also being present. Cephalopod prey species mainly included Loligo spp., *Alloteuthis subulata*, A*ncistroteuthis lichtensteini*, *Todarodes sagittatus*, *T. eblane* and *Sepiola atlantica*, but various other species of squid, octopus and cuttlefish (*Sepiida*) were also consumed. Within Scottish waters, whiting was dominant (DECC, 2016).

### 10.5.5 Killer Whale

#### 10.5.5.1 Distributions and Abundance

109. The killer whale has a worldwide distribution in tropical, temporal and polar seas in both the north and south Hemispheres, with greater abundancies at higher latitudes. Killer whales are widely distributed throughout the Atlantic seaboard of northern Europe, around Iceland, Norway and northern Scotland, the Firth of Forth and as far down as Farne Islands. Sightings are common around Orkney and Shetland, and around the Hebrides (DECC, 2016).

110. Within the Hebrides is a small pod of resident killer whales, known as the West Coast Community. They are the only resident pod within UK waters, with just eight individuals within the pod comprised of four males and four females which can all be identified by name through distinguishing marks on their dorsal fins and saddle patches. Photo-ID studies of this pod have been undertaken by the HWDT for a number of years which has created an in-depth knowledge of their core habitat and movements. Non-resident groups of killer whales from Shetland, Orkney, Iceland and Norway have also been sighted off the west coast of Scotland (HWDT, 2018b). Plate 10-8 shows the hotspots of killer whale sightings, as identified through 11 years of survey data collected by the HWDT. Millport lies within the range of the resident pod of killer whales, but is not within or near a known hot-spot ((HWDT, 2018b).

111. Within the 2014 HDWT surveys, a total of 7 killer whale individuals were sighted in 2014, with a sighting rate of 0.04 per 100km covered (HWDT, 2014). No sightings were made south of the Isle of Barra or Rum, and were made normally through The Little Minch and The Sea of the Hebrides.

112. The Clyde Marine Mammal Project identified just three killer whale sightings from January 2016 to July 2017, with sightings in July (n=2) and November (n=1) 2016. There is not enough data for killer whale in order to identify any seasonal trends in their movements (Clyde Porpoise c.i.c, 2018).

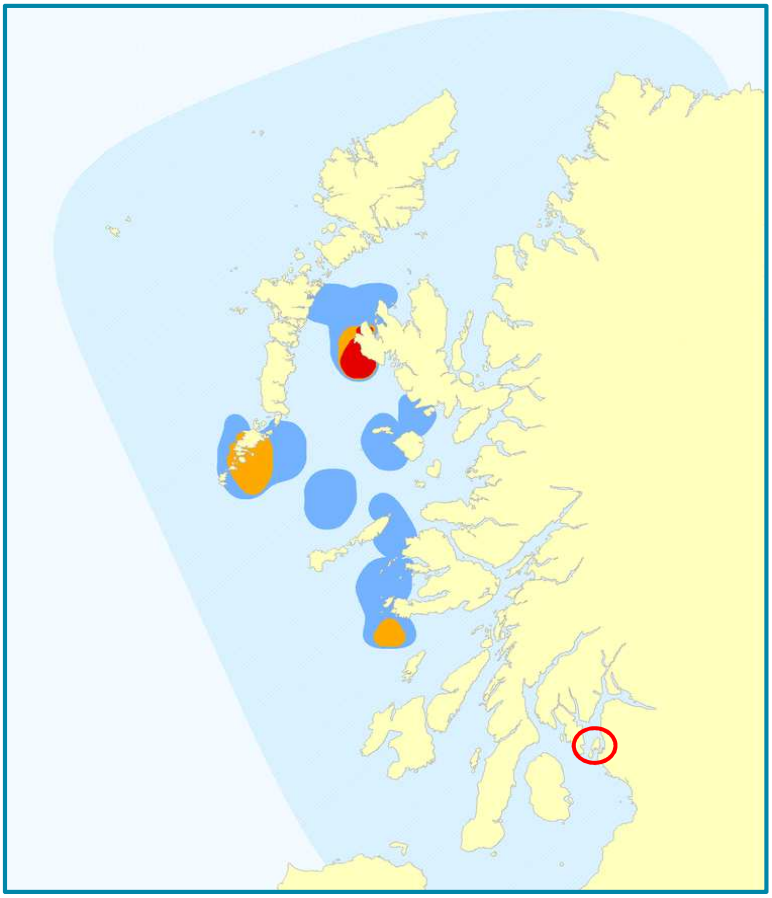

*Plate 10-8 Killer Whale Hotspot Map, the approximate Millport site location is shown by the red circle. (HWDT, 2018b)*

### 10.5.5.2 Life History and Ecology

113. Killer whales are normally found in close-knit social groups, although are sometimes sighted as solitary individuals. Pods of killer whales normally contain five to twenty individuals, with occasional meetings of two or more pods to form super pods with up to 150 individuals. Individuals of a pod normally stay together for life, with both males and females staying within their natal groups through adulthood (SWF, 2012).

114. Female killer whales become mature at seven years and males at ten to twelve, either mating normally occurring within the norther hemisphere between October to December. Gestation is 13-16 months and lactation lasts for 12 months. Calf dependency is prolonged for killer whales, with calves remaining with their mothers for as long as 10 years. The normal calving interval is between three and three and a half years within the North Atlantic, and life expectancy for females for an average of 90 years and for males 60 years (SWF, 2012).

### 10.5.5.3 Prey Species

115. There has been limited study of killer whale diet within UK waters. However, killer whales are known to have one of the most diverse diets among marine predator species (Heyning and Dahlheim, 1988). Within the Northeast Atlantic, herring is considered the key prey species for killer whale (Similä *et al.*, 1996). In Scottish waters, the killer whale has occasionally been recorded feeding near pelagic

vessels targeting herring and mackerel (Luque *et al*., 2006) and they have also been reported predating on seals around major colonies, particularly in Orkney and Shetland (Bolt et *al*., 2009, Samarra and Foote, 2015).

### 10.5.6 Minke Whale

#### 10.5.6.1 Distributions and Abundance

116. Minke whales are one of the most widely distributed baleen whale within the Northern Hemisphere, being found from the tropics to the ice-edges. They are most abundant in cool waters and on continental shelf in water of over 200m in depth. Within UK waters, minke whale are most commonly sighted in the western central North Sea and the west of Scotland around the Hebrides (DECC, 2016). Minke whale are predominantly a seasonal visitor to UK waters, with sightings increasing from May to October, with sightings rare outside of this period. However, there are some individuals that are known to be resident in UK waters year-round (Evans, 2008).

117. For the entire SCANS-III survey area, minke whale abundance in the summer of 2016 was estimated to be 14,759 with an overall estimated density of 0.008/km$^2$ (CV = 0.327; 95% CI = 7,908-27,544; Hammond *et al*., 2017). The proposed Millport FPS is located in SCANS-III survey block G, which was completed by aerial surveys and had an area of 15,122km$^2$ and 958km of effort. The estimated abundance minke whale in SCANS-III survey block G is 410 (CV=0.70; 95% CI = 0-1,295), with an estimated density of 0.027 individuals/km$^2$ (Hammond *et al*., 2017).

118. The IAMMWG defined just one MU for minke whale, the CGNS

MU, which has an estimated abundance of 23,528 (95% CI = 13,989-39,572; IAMMWG, 2015).

119. Within the Hebrides and off the west coast of Scotland, minke whale are frequently seen in coastal and inshore waters between April and October. Plate 10-9 shows the known hotspots of minke whale sightings, as identified through 11 years of survey data collected by the HWDT. Millport lies within the range of the minke whale, with the closest hotspot being south of the Isle of Arran, approximately 20km from Millport (HWDT, 2018c).

120. Within the 2014 HDWT surveys, a total of 76 minke whale individuals were sighted in 2014, with a sighting rate of 0.86 per 100km covered (HWDT, 2014). No sightings of minke whale were made south of the Isle of Mull, but were common through The Minches and The Sea of the Hebrides.

121. The Clyde Marine Mammal Project identified a total of 38 confirmed minke whale sightings from January 2016 to July 2017 (Clyde Porpoise c.i.c, 2018). Plate 10-10 shows the number of sightings per month, identifying a seasonal trend with higher sightings in the autumn months, where minke whale are known to be actively lunge feeding (Clyde Porpoise c.i.c, 2018).

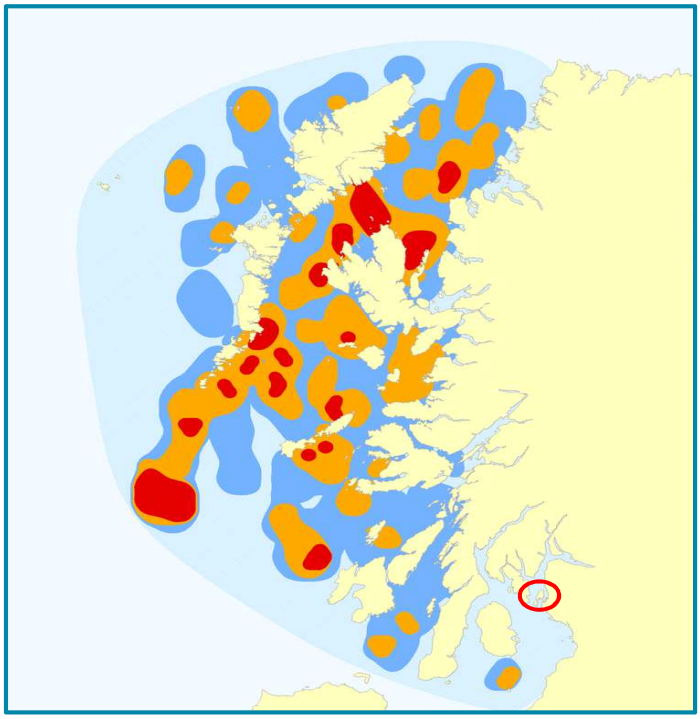

*Plate 10-9 Minke Whale Hotspot Map, the approximate Millport site location is shown by the red circle. (HWDT,2018c)*

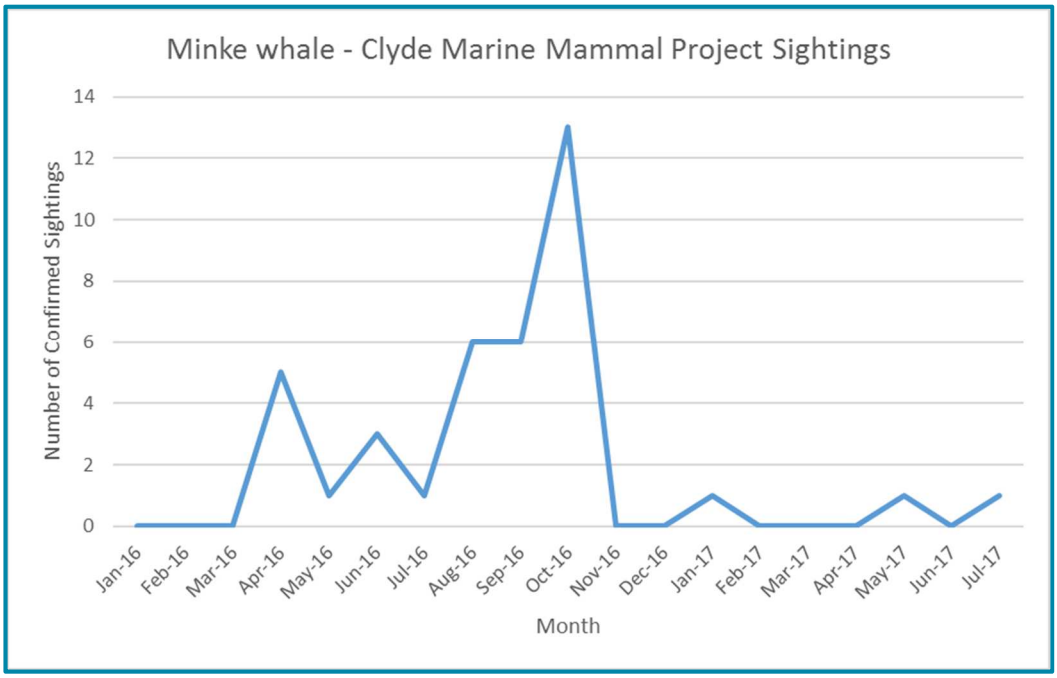


*Plate 10-10 Clyde Marine Mammal Project sightings data for minke whale January 2016 to July 2017 (data taken from Clyde Porpoise c.i.c, 2018)*

Royal HaskoningDHV

#### 10.5.6.2 Life History and Ecology

122. The annual movement patterns and migrations of minke whale are not well understood, but it is thought that they make a migration between tropical breeding grounds in the winter to colder feeding grounds in the summer (HWDT, 2018c). The summer and autumn periods are where minke whale can be seen with the highest abundance within the Hebrides and off the west coast of Scotland, with lunge-feeding behaviours commonly seen in Autumn ((HWDT, 2018c).

#### 10.5.6.3 Prey Species

123. Minke whales feed on a variety of fish species, including herring, cod and haddock. Minke whale feed by engulfing large volumes of prey and water, which they then 'sieve' out of through their baleen plates and swallow their prey whole. Lunge feeding is commonly seen within the Hebrides, and minke whale are commonly seen feeding is association with seabirds (in particular kittiwake, Manx shearwaters *Puffinus puffinus* and young gulls) (HWDT, 2018c).

124. A study on the stomach contents of 10 stranded minke whales in Scotland from 1992-2002 revealed sandeels to be the dominant prey species, with sprat, herring, mackerel and Norway pout to also be key prey species (Pierce *et al*., 2004). Minke whales around the Hebrides, and particularly off the Isle of Mull have been shown to be foraging specifically around sandeel habitat in spring and early summer, and shifting to pre-spawning herring habitat and areas with high sprat abundancies in the later summer (MacLeod *et al*., 2004; Anderwald *et al*., 2012).

### 10.5.7 Humpback Whale

#### 10.5.7.1 Distributions and Abundance

125. Humpback whales are widely distributed globally, but historically have not been common within UK waters. Within Europe, humpback whales generally occur on or near the continental shelf from Iceland and Norway, to south and South-west Ireland and the Bay of Biscay. Sightings of minke whale in UK waters have increased in recent years. The North-west Atlantic humpback whale population has been estimated using photo-ID studies at 10,600 individuals (Smith *et al.,* 1999). Humpback whale sightings occur in three main areas around the UK, the Northern Isles, northern Irish Sea to south-west Scotland and the Celtic Sea. Sightings are more common from May to September, with some extending into the winter months of November to March (Evans, 2003).

126. The Clyde Marine Mammal Project identified a total of 27 confirmed humpback whale sightings from January 2016 to July 2017 (Clyde Porpoise c.i.c, 2018). Plate 10-11 shows the number of sightings per month, identifying a seasonal trend with higher sightings in the spring months, particularly in 2016 where 20 sightings of humpback whale were confirmed in the area (Clyde Porpoise c.i.c, 2018).

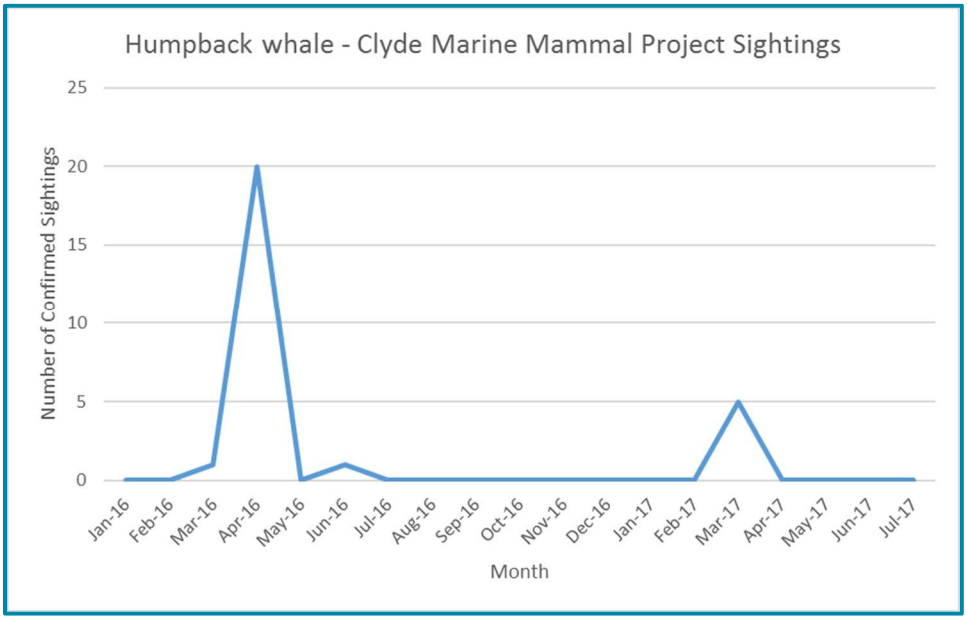


*Plate 10-11 Clyde Marine Mammal Project sightings data for humpback whale January 2016 to July 2017 (data taken from Clyde Porpoise c.i.c, 2018)*

### 10.5.7.2 Life History and Ecology

127. Humpback whales are usually seen alone or in small groups, but large groups can be present in feeding and breeding areas. The only stable grouping of humpback whales tends to be with mother and calf pairs (Clapham, 1996). It is common for 'escort' whales, normally male, to accompany mother and calf pairs to protect them from rival males. Humpback whales undertake long migrations from summer feeding grounds to tropical mating and calving areas in winter. Mixing between the western and eastern Atlantic populations is known to occur, with calving occurring in the Caribbean (Sea Watch Foundation, 2012). Humpback whales are a very active species, and can often be seen to be breaching, spy hopping, lobtailing and tail slapping (Reid *et al.*, 2003).

128. Humpback whale females will usually give birth every two to three years but can birth young every year. The gestation period is 11 months, and calves normally remain with their mothers after weaning, even if a new calf is born (Sea Watch Foundation, 2012).

### 10.5.7.3 Prey Species

129. Humpback whale diet can consist of schooling fish, such as sandeels, herring, mackerel, capeline, pollack, cod and anchovy, as well as large zooplankton (Winn and Reichley, 1985), although the prey consumed depends greatly on the region. Within UK waters, humpback whales consume krill and fish, such as herring and cod (Sea Watch Foundation, 2012).

## 10.5.8 Grey Seal

### 10.5.8.1 Distributions and Abundance

130. The most recent counts available are from the 2016 surveys, that were released in 2018. These surveys were from both aerial and ground surveys, undertaken during the autumn breeding season. For 2016, the total grey seal pup count in the UK was 65,000, taking into account areas less frequently surveyed, the estimate totalled 6,00 pups. The total grey seal pup count for Scotland in 2016 was 54,750 (SCOS, 2018).

131. The pup counts can be used to determine actual population size through a mathematical model and have been projected forward to 2018. This model provides an estimated UK population for 2017 of 150,000 (approximate 95% CI 131,000-171,600; SCOS, 2018). The Inner Hebrides region has an estimate of 4,500 (95% CI 3,900-5,200 and the estimates for the Outer Hebrides was 23,800 (95% CI 20,700-27,550) (SCOS, 2018).

132. The most recent August counts (2008-2017) of grey seal at haul-out sites were 5,267 for the West of Scotland (1,170 in the central and 479 in the north of the region), with a total of 27,526 grey seal in Scotland (SCOS, 2018). For the Southwest Scotland MU, there are an estimated 374 grey seals (SCOS, 2018).Plate 10-12 Plate 10-12 shows the august distributions of grey seals in Scotland, estimate from survey data collected from 2011 to 2017 (SCOS, 2018). There are relatively low numbers present within the south-west Scotland area, with the largest site having 50 individuals present located off the coast by Southend. This location is over 75km from the proposed Millport FPS site location. There is also a known colony of grey seals on Great Cumbrae, located at the Eileans.

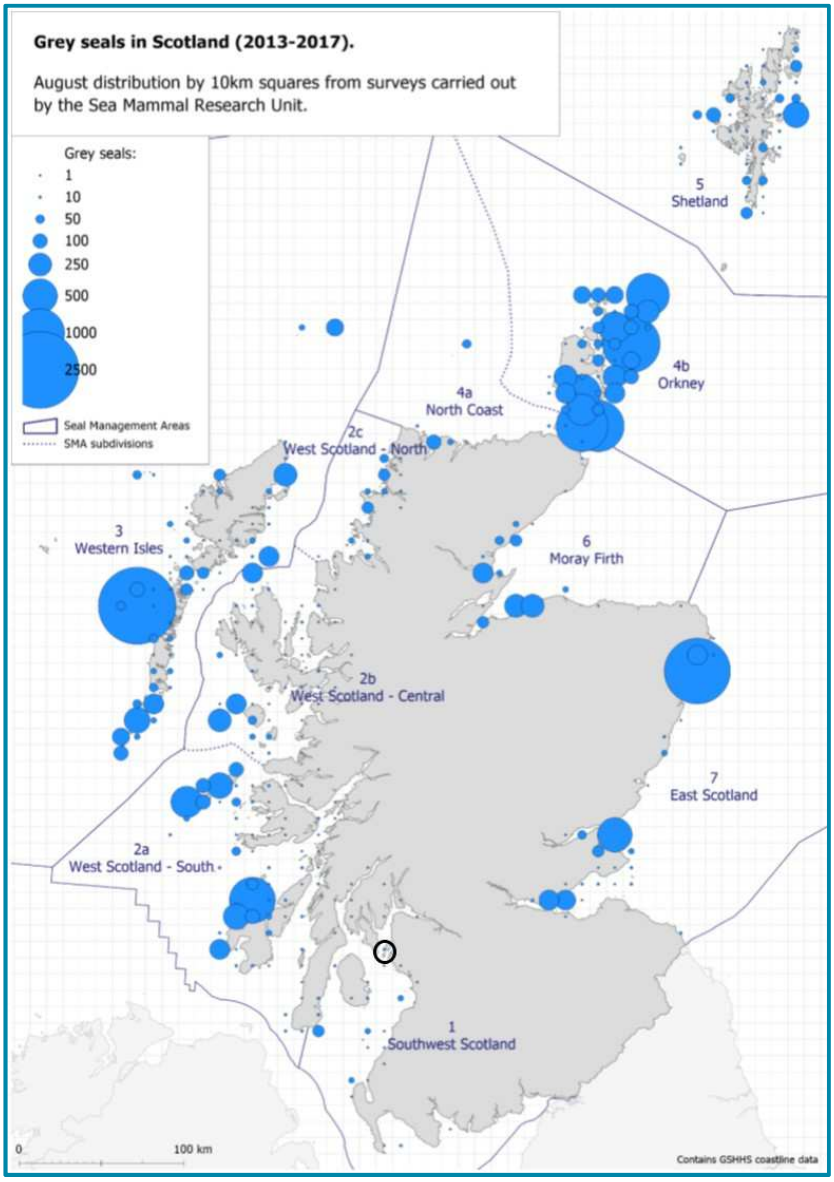


*Plate 10-12 The August distribution of grey seals in Scotland. All areas were surveyed by helicopter using a thermal imaging camera, except for the Moray Firth area between Helmsdale and Findhorn, which was surveyed by fixed-wing aircraft without a thermal imager (SCOS, 2018). The approximate Millport site location is shown by the black circle.*

133. Tracking of individual seals has shown that most foraging probably occurs within 100km of a haul-out site, with ranges of approximately 145km (Thompson *et al.,* 1996), although they can feed up to several hundred kilometres offshore, with ranges of 1,088 to 6,400km recorded (Dietz *et al.,* 2003). Individual grey seals based at a specific haul-out site often make repeated trips to the same region offshore, but will occasionally move to a new haul-out site and begin foraging in a new region (SCOS, 2016). Studies of regular foraging and dispersal between winter breeding sites, and summer foraging and haul out sites indicates ranges of 1,000km (e.g. McConnell *et al.,* 1992).

134. For the HWDT 2014 surveys, a total of 419 grey seal individuals were sighted in 2014, with a sighting rate of 4.78 per 100km covered (HWDT, 2014). Sightings of grey seal are common through the Hebrides and west coast of Scotland, including near the Millport area and around the eastern and southern coasts of the Isle of Arran (HWDT, 2014).

135. The Clyde Marine Mammal Project identified a total of 26 confirmed grey seal sightings from January 2016 to July 2017 (Clyde Porpoise c.i.c, 2018). Plate 10-13 shows the number of sightings per month, identifying a seasonal trend with higher sightings in the spring and early summer, particularly in 2016 where 12 sightings of grey seal were confirmed in the area (Clyde Porpoise c.i.c, 2018).

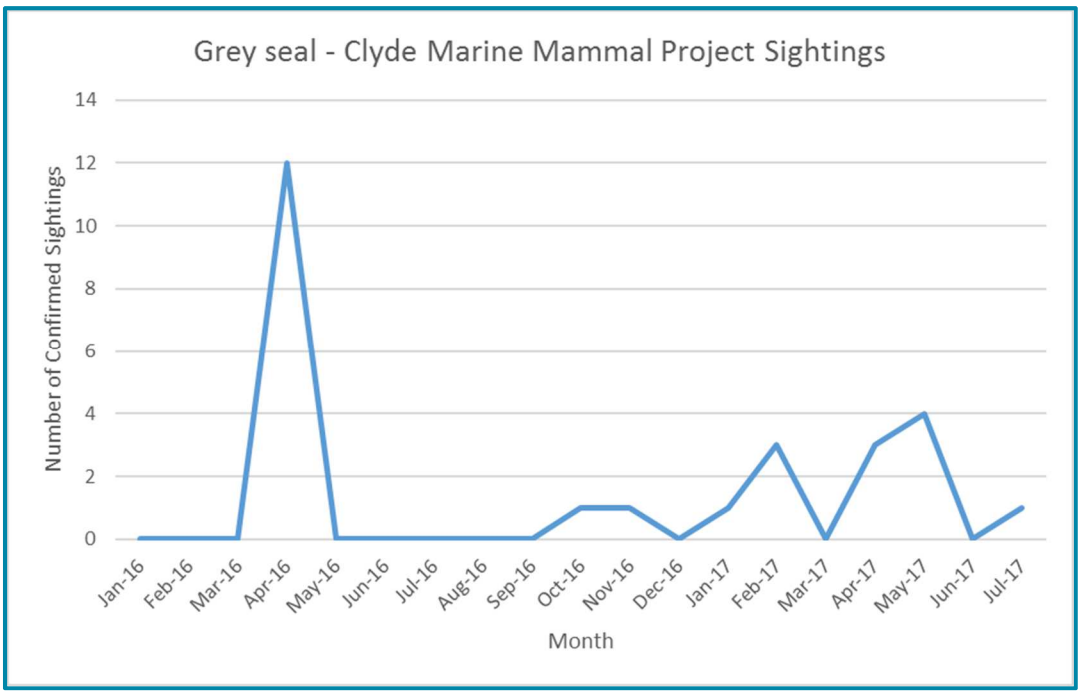


*Plate 10-13 Clyde Marine Mammal Project sightings data for grey seal January 2016 to July 2017 (data taken from Clyde Porpoise c.i.c, 2018)*

136. The seal at sea usage maps produced by SMRU combine information about the movement patterns of electronically tagged seals, with survey counts of seals at haul-out sites. The resulting maps show estimates of mean seal usage (seals per 5km x 5km grid cell; Russell *et al.,* 2017). These maps were used to determine the estimated grey seal density within the vicinity of the proposed scheme, calculated from the grid squares that are within 5km of Millport Bay, and taking into account areas of land. The grey seal total usage density estimate for this area is 0.375/km$^2$. See Figure 10-1 for the grey seal densities in the area around the proposed scheme.

### 10.5.8.2 Life History and Ecology

137. Grey seal haul-out for pupping, moulting and resting. The grey seal breeding season in north and west Scotland occurs mainly from September to late November and at these times, a large number of grey seal will be hauled-out (SCOS, 2018). Grey seals spend longer hauled out during their annual moult, between December and April, generally three and five months after the breeding season (SCOS, 2016). Pups are typically weaned 17 to 23 days after birth, when they moult their white natal coat and then remain on the breeding colony for up to two or three weeks before going to sea. Mating occurs at the end of lactation and then adult females depart to sea and provide no further parental care (SCOS, 2016).

138. In the UK, grey seals typically breed on remote uninhabited islands or coasts and in small numbers in caves, where they can avoid busy beaches and storm surges. Although there are also known to breed on some exposed beaches. For example, at Donna Nook in Lincolnshire, grey seals have

become habituated to human disturbance and over 70,000 people visit this colony during the breeding season with no apparent impact on the breeding seals (SCOS, 2016).

#### 10.5.8.3 Prey Species

139. Grey seal are generalist feeders and will prey upon a variety of species. The most common food sources for grey seal are sandeels, gadoid species (such as cod, haddock, whiting and ling *Molva molva*) as well as flatfish species (such as plaice *Pleuronectes platessa*, sole *Soleidae sp.,* flounder and dab *Limanda limanda*), however this does vary from season and by location (Hammond and Grellier, 2006). Food requirements for grey seal will depend on a number of factors, such as its size and fat content of the prey, but a general estimate is that a typical grey seal requires 4 to 7kg of prey a day, depending on the prey species (SCOS, 2018).

### 10.5.9 Harbour Seal

#### 10.5.9.1 Distributions and Abundance

140. Harbour seals are counted on land during their August moulting period, which gives a minimum population estimate only. the aim for harbour seal surveys is to cover the entire UK coast every 5 years, with some areas with large colonies being surveys every year. Combing the most recent counts available (2015-2017) gives a total count of 32,605 harbour seals in the UK (26,565 of which are in Scotland), and scaling this to reflect the number of seals missed by not being hauled-out gives a total UK population estimate of 45,100 (95% CI: 37,000-60,400) in 2017. In South-west Scotland, the 2015-17 counts show a minimum population estimate of 1,200 harbour seal, for West Scotland the estimate was 15,889 and for the Western Isles there were an estimated 3,533 harbour seal (SCOS, 2018).

141. The UK population of harbour seals has in recent years been in decline, but is now increasing and is close to the level it was before the decline occurred. The decline in population levels varies between colonies, with some in Scotland experiencing high levels of declines, while others were stable or increasing. Populations were stable until 2000, where rapid declines were observed in Orkney (85% loss from 1997-2016) and the east coast of Scotland (52% down from 1997-2016), Shetland also saw declines of 30% from 2000-09, before increasing again by 10% from 2009-15. The most recent counts for the West coast of Scotland (2013-15) and for the western isles (2011) were 43% and 50% higher respectively than previous estimates (2007-9). The most recent count for Scotland (2011-16) is 25% higher than the previous (2007-2009). The exact cause of these declines is not yet known, although several factors have now been rules out as the reason, leaving interactions with grey seals and exposure to toxins from harmful algae as the most likely reasons (SCOS, 2018).

142. Harbour seals normally feed within 40-50km around their haul out sites. Tracking studies have shown that harbour seal typically travel 50-100km offshore and can travel 200km between haul-out sites (Lowry *et al*., 2001; Sharples *et al*., 2012). Harbour seal exhibit relative short foraging trips from their haul out sites. The range of these trips does vary depending on the surrounding marine habitat (e.g. 25km on the west of Scotland (Cunningham *et al*., 2009); 30km-45km in the Moray Firth (Tollit *et al*., 1998; Thompson and Miller, 1990).

143. Plate 10-14 shows the august distributions of harbour seals in Scotland estimates from survey data collected from 2011 to 2017 (SCOS, 2018). There are relatively low numbers present within the south-west Scotland area, with a haul-out site on the Eileans (in Millport Bay) and off the Isle of Arran (approximately 20km from Millport), both with approximately 50 individuals, and off the south coast of Southend, with an estimate of 100 individuals (over 75km from Millport). For the Southwest Scotland MU, there are an estimated 1,200 harbour seals (SCOS, 2018).

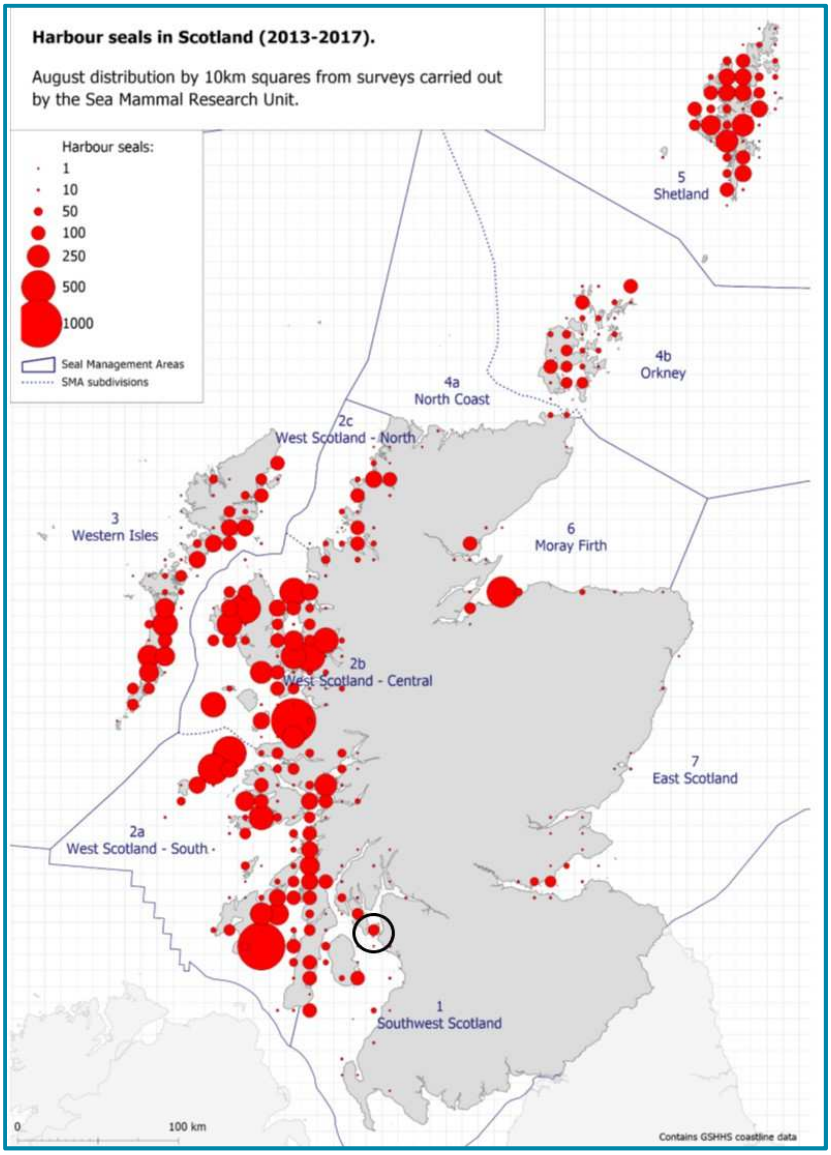


*Plate 10-14 August distribution of harbour seals in Scotland. Most areas were surveyed by helicopter using a thermal imaging camera. The Moray Firth area between Helmsdale and Findhorn, and the Tay and Eden estuaries were surveyed by fixed-wing aircraft without a thermal imager. (SCOS, 2018). The approximate Millport site location is shown by the black circle.*

144. Within the HWDT 2014 surveys, a total of 145 harbour seal individuals were sighted in 2014, with a sighting rate of 1.79 per 100km covered (HWDT, 2014). Harbour seal sightings were common through the Hebrides and west coast of Scotland, although none were sighted within the Firth of Clyde (the closest sighting being approximately 75km from the Millport site) (HWDT, 2014).

145. The Clyde Marine Mammal Project identified a total of 93 confirmed harbour seal sightings from January 2016 to July 2017 (Clyde Porpoise c.i.c, 2018). Plate 10-15 shows the number of sightings per month, identifying a clear seasonal trend with much higher sightings in the August than at any other time of year, with a total of 81 of 93 sightings made in this month alone (Clyde Porpoise c.i.c, 2018).

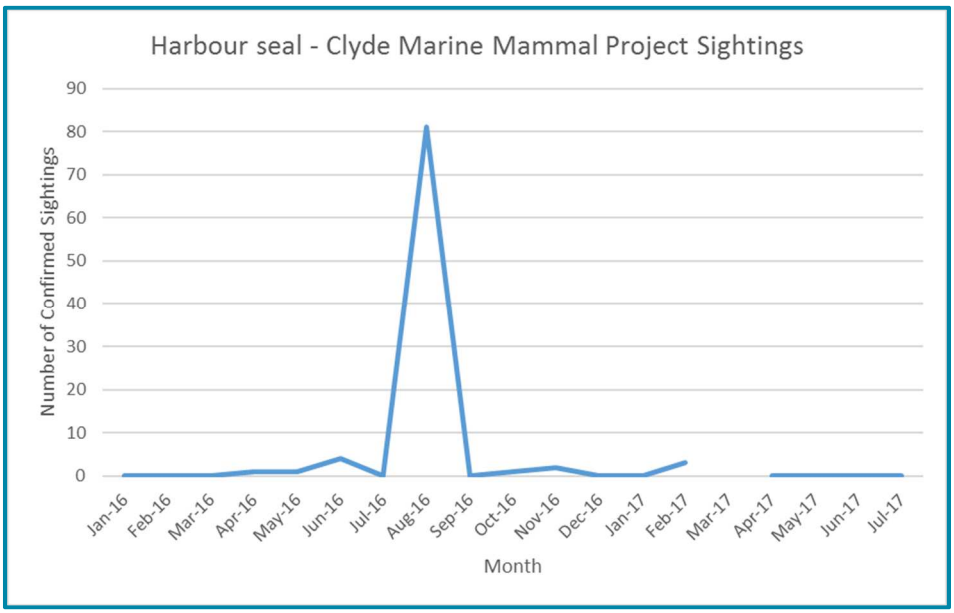


*Plate 10-15 Clyde Marine Mammal Project sightings data for harbour seal January 2016 to July 2017 (data taken from Clyde Porpoise c.i.c, 2018)*

146. The seal at sea usage maps produced by SMRU combine information about the movement patterns of electronically tagged seals, with survey counts of seals at haul-out sites. The resulting maps show estimates of mean seal usage (seals per 5km x 5km grid cell; Russell *et al.,* 2017). These maps were used to determine the estimated harbour seal density within the vicinity of the proposed scheme, calculated from the grid squares that are within 5km of Millport Bay, and taking into account areas of land. The harbour seal total usage density estimate for this area is 0.141/km$^2$. See Figure 10-1 for the grey seal densities in the area around the proposed scheme.

### 10.5.9.2 Life History and Ecology

147. Harbour seals come ashore in sheltered waters, often on sandbanks and in estuaries, but also in rocky areas. They give birth to their pups in June and July and moult in August. At these, as well as other times of the year, harbour seals haul out on land regularly in a pattern that is often related to the tidal cycle (SCOS, 2018).

### 10.5.9.3 Prey Species

148. Harbour seal take a wide variety of prey including sandeels, gadoids, herring and sprat, flatfish and cephalopods. Diet varies seasonally and regionally, prey diversity and diet quality also showed some regional and seasonal variation (SCOS, 2016). It is estimated harbour seals eat 3-5 kg per adult seal per day depending on the prey species (SCOS, 2018).

## 10.5.10 Basking Shark

149. Basking sharks are listed on schedule 5 of the Wildlife and Countryside Act 1981, CITES Appendix II, and are listed on the Bonn Convention on Migratory Species, and the Common Fisheries Policy. Basking shark are protected from disturbance up to 12nm offshore from the Countryside and Rights of Way Act (2000) in England and Wales, and from the Nature Conservation (Scotland) Act (2004).

### 10.5.10.1 Distributions and Abundance

150. Elasmobranchs (skates, sharks and rays) can be found throughout the oceans, both coastal and offshore. Scotland has over 30 species recorded within its water, 25 of which are usually found in coastal waters. Basking sharks are commonly found in areas with tidal fronts on the continental shelf and the shelf edge as they feed on plankton that are common on the edge.

151. Within UK waters, the basking shark is a seasonal visitor, arriving in significant numbers in May and remaining until October, with areas attracting higher abundancies, such as the Hebrides (particularly off the islands of Skye and Mull), the Isle of Man, Malin Head and south-west England. In the early spring and summer months, warmer waters move from the Atlantic into the coastal waters of west Scotland, England and Wales, which encourages greater marine productivity. It is thought that this increase is the reason for the higher abundancies of basking sharks during these months (The Shark Trust, 2018).

152. Baxter *et al.* (2011) identified key basking shark hotspots within the coasts of Scotland, using sightings from the Marine Conservation Society. Plate 10-16 shows the areas of highest sightings. Within the Clyde, there are a high number of basking shark sightings.

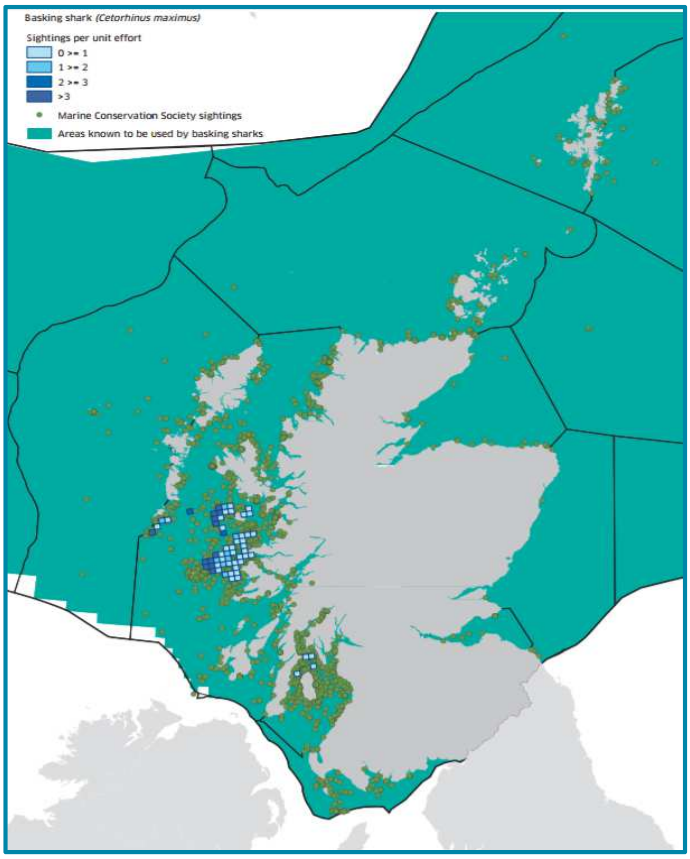


*Plate 10-16 Basking shark sightings and areas with high numbers of sightings (Baxter et al., 2011)*

Historically, the Clyde Sea and the Hebrides were important basking shark fisheries, indicating high numbers within these areas. In 2009, a study was undertaken in these areas to determine their importance for basking shark. Millport is located within the Clyde Sea (Area 11 as used within this study) (Speedie *et al.*, 2009). Surveys were undertaken from 2002-2004, with three weeks of survey coverage for the Clyde Sea alone. A total of 225.2 hours of survey effort were achieved within the Clyde Sea. A total of 593 basking

sharks were recorded over the entire survey, with only 11 identified within the Clyde Sea, despite the high number of survey hours within this area. Sharks per Unit Effort (SPUE) values were calculated, with 0.61/h found for the entire area, and only 0.05/h for the Clyde Sea, which is considerably lower than for the entire west coast of Scotland average (Speedie *et al*., 2009).

Plate 10-17 below shows the SPUE values per unit of effort for the Clyde Sea. Sightings of basking shark within the Clyde Sea were concentrated inshore of the 100m isobath where the seabed steeply rises to the shallow Lamonth Shelf off Ardlamonth Point and the Cowal Peninsula. It should be noted that for any shark surveys undertaken by vessel, there are limitations on the numbers that can be seen as it relies on individuals being at the surface.

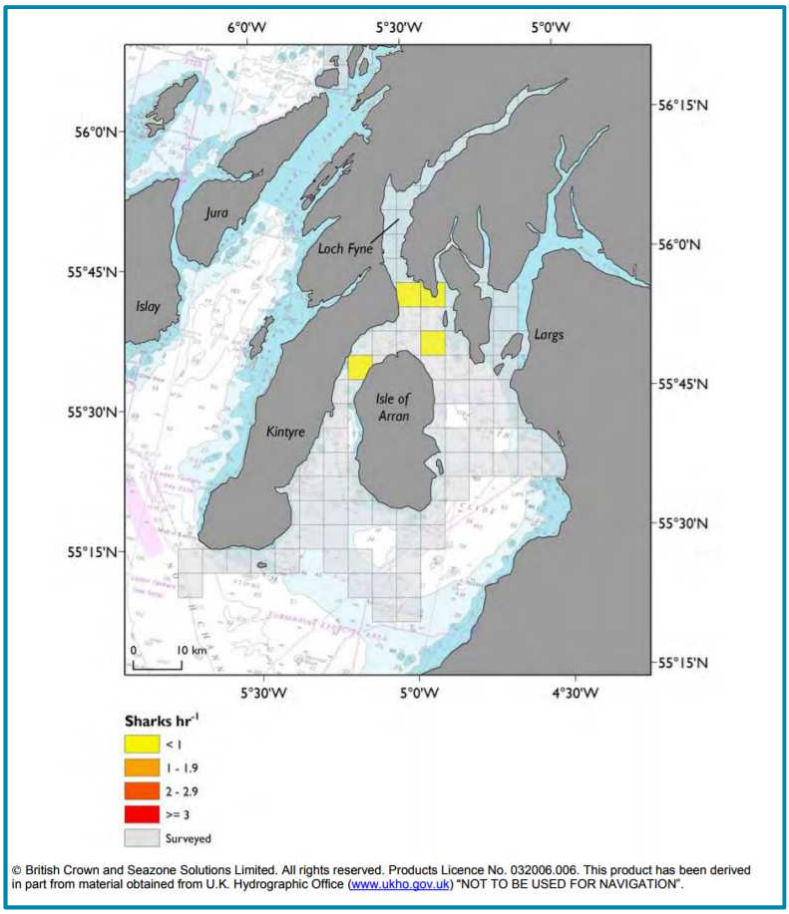


*Plate 10-17 Sharks per Unit of Effort for the Clyde Sea (Speedie et al, 2009)*

153. For the HWDT 2014 surveys, a total of 26 basking shark individuals were sighted in 2014, with a sighting rate of 0.22 per 100km covered (HWDT, 2014). Sightings of basking shark were found through the Inner Hebrides and west coast of Scotland, the closest basking shark sighting to the Millport was south of the Isle of Mull (HWDT, 2014).

154. The Clyde Marine Mammal Project identified a total of 13 confirmed basking shark sightings from January 2016 to July 2017 (Clyde Porpoise c.i.c, 2018). Plate 10-18Plate 10-18 shows the number of sightings per month, identifying a clear seasonal trend with much higher sightings in September

and October than at any other time of year, with a total of 12 of 13 sightings made in these months (Clyde Porpoise c.i.c, 2018).

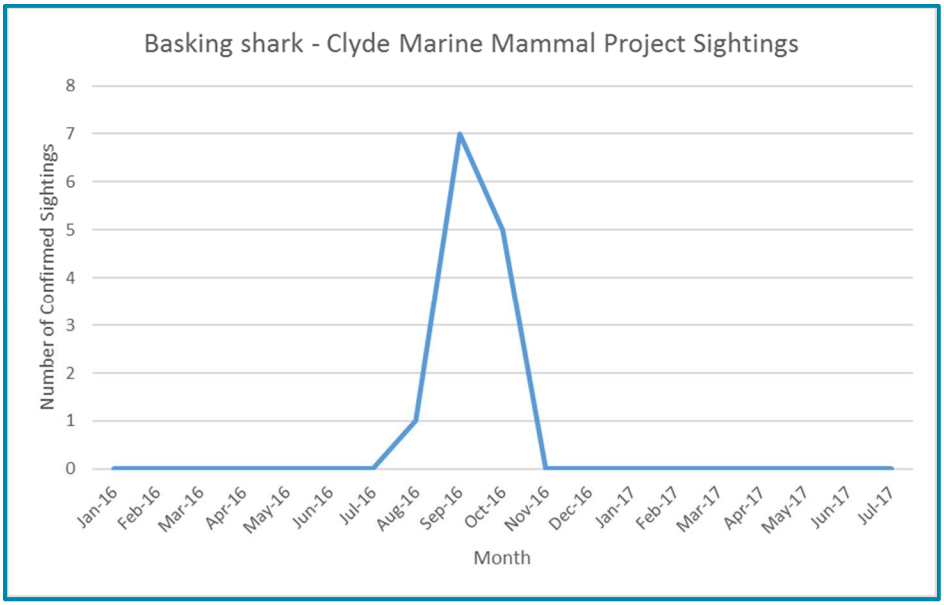


*Plate 10-18 Clyde Marine Mammal Project sightings data for harbour seal January 2016 to July 2017 (data taken from Clyde Porpoise c.i.c, 2018)*

### 10.5.10.2 Life History and Ecology

155. Basking sharks are the second largest fish in the world, and the largest to be recorded in UK waters, and can grow up to 9.8m in length. Basking sharks can migrate over very large distances in both offshore and coastal waters, and generally reside in depths from the sea surface to 750m.

156. Little is known on the breeding behaviour of basking sharks. It is though that the gestation period could be between 1 and 3.5 years, although it is thought to be around 14 months. Within UK waters, there is very little data on the occurrence of basking shark breeding, with only a single reported catch of a pregnant female (carrying six pups) in 1943. From this is has been proposed that female basking sharks will go to remote areas with little historical fishing activity in order to birth, possibly segregating themselves from the general population (The Shark Trust, 2018).

157. Basking sharks are seen regularly in small groups or schools of hundreds feeding in areas of high plankton concentrations. By-catch and historical fishing data indicates that the majority of basking shark in UK waters during the summer months are adult females, outnumbering males as much as 40:1. However, there are indications from the few individuals that have been caught in the winter that they were mostly male. Migration data suggests that they are travelling within groups of the same size and sex, suggesting that basking sharks segregate themselves according to age and sex (The Shark Trust, 2018).

### 10.5.10.3 Prey Species

158. The basking shark feeds by filtering plankton using its gill rakes. Basking sharks can often be seen to be feeding on the sea surface during plankton blooms, these are common where there are fronts (DECC, 2016). While basking sharks feed on zooplankton, there is a specific type that they prefer; *Calanus helgolandicus*. During blooms of this species, the sea can be seen to be a deep red colour.

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### 10.5.11 Anticipated Trends in Baseline Conditions

159. The existing baseline conditions for marine mammals and basking shark as described in Section **Error! Reference source not found.** are considered to be relatively stable. The baseline environment of the Celtic and Irish Seas areas has been influenced by fishing by various methods for hundreds of years, coastal and harbour developments and the construction and operation of offshore wind farms for over ten years (for example, North Hoyle, Rhyl Flats and Burbo Bank). The baseline will continue to evolve as a result of global trends which include the effects of climate change.

160. For harbour porpoise, the observed distribution of harbour porpoises during the SCANS-III survey in 2016 was similar to that observed in SCANS-II in 2005, but one notable difference was more sightings were made throughout the English Channel (block C) in 2016 than previously (Hammond *et al*., 2017). Similarly, the observed distribution of bottlenose dolphin and common dolphin in 2016 was also similar to that observed during the SCANS-II and CODA surveys in 2005/07 (Hammond *et a*l., 2017).

161. The Marine Mammal Atlas produced by the Hebridean Whale and Dolphin Trust (2019) reports on 15 years of visual surveys within the inner and outer Hebrides. Through 2003 to 2017, the number of common dolphin sightings has shown a steady and significant increase. All sightings data are corrected to effort, resulting in sightings per unit of effort (SPUE) values per 100km travelled. In 2003, the SPUE for common dolphin was 0.05 per 100km, and in 2017 this had risen to 1.1 per 100km, representing a 20-fold increase in the 15 year period (HWDT, 2019). While the reason for this increase has not been determined, sea temperatures have risen by 0.4°C per decade within the Hebrides, and it is suggested that this change could be the reason for the increase in common dolphin numbers (MacLeod *et al*., 2005). As sea temperatures are expected to continue to rise, it is therefore likely that this increase in common dolphin numbers in the area will continue.

162. The Marine Mammal Atlas also shows an increase in the number of harbour seal, grey seal, and harbour porpoise, although it has not been as significant a rise, with a general pattern of increase shown to be present for those species (HWDT, 2019). The number of basking shark has fluctuated over the years, with increases from 2004 to 2010, where a sharp decrease has been observed to 2011, and the numbers have been variable, although never reaching as high as in 2010, until 2017 (HWDT, 2019). It is difficult to determine from these patterns what the future baseline numbers may be in these four species, but it is possible that harbour porpoise, grey seal and harbour seal number may continue to slowly rise. The numbers of bottlenose dolphin, humpback whale, killer whale, minke whale, Risso's dolphin and white-beaked dolphin have been relatively similar over the years (HWDT, 2019). and it could therefore be inferred that these populations may not change much in the near future.

163. The Marine Conservation Society undertook analysis of 20 years of public basking shark sightings (form the Basking Shark Project), to determine the temporal (and spatial) patterns of basking shark sightings (Bloomfield and Solandt, 2006). This analysis revealed variations in the number of sightings recorded over the period. For the west coast of Scotland, an initial surge in basking shark numbers was present for the first four years, before a ten-year drop-in sightings numbers is present until 2000. Since 2000, a significant increase in basking shark numbers have been recorded, with less than 50 per year recorded prior to 2000, increasing to approximately 800 in 2005 and 2006. A similar pattern is also seen in the Isle of Mann sightings. Another pattern was noted in this analysis relating to the size of the sharks that were recorded, where a significant increase in the length of individuals has been noted over the 20 year period, which may show the recovery of the species since the ban in hunting of the species came into force, and more individuals being able to mature and grow. Since then, a further report includes analysis of the Basking Shark Project public sightings database from 2009 to 2013 (). Since the significant increase in 2005 and 2006 in basking shark numbers, a drop

has been seen in the number of sharks recorded, with variable numbers between 2007 and 2013, with approximately half the number of 2006 recorded in 2013 (Solandt *et al*., 2017).

164. The number of grey seal pups throughout Britain has grown steadily since the 1960s; when records began and there is clear evidence that the population growth is levelling off in all areas, except the central and southern North Sea where growth rates remain high (SCOS, 2018). Surveys of grey seal pup production and distribution in North wales in 2017 indicates an increase in pup production of 180% and a 145% increase in the number of nursery sites in comparison to the 2004 surveys (Clarke *et al*., 2017).

165. The potential impacts of climate change on marine mammals can be direct, such as the effects species tracking a specific range of water temperatures in which they can physically survive, or indirect effects, which could include changes in prey availability affecting distribution, abundance and community structure (Learmonth *et al*., 2006).

166. There is potential evidence of the effects of climate change on the composition and structure of cetacean communities off north-west Scotland (MacLeod *et al*., 2005). Analysis of strandings from 1948 to 2003 found that no new cetacean species per decade were recorded in north-west Scotland between 1965 and 1981, however, this rose to two new species per decade from 1988 onwards. The new species recorded since 1988 are generally restricted to warmer waters, while those recorded prior to 1981 regularly occur in colder waters. In the period 1992 to 2003, the relative frequency of stranding of white-beaked dolphin, a colder water species, had declined while stranding of common dolphin, a warmer water species, had increased. Similarly, sightings surveys conducted in May–September 2002 and 2003 show that the relative occurrence and abundance of white-beaked dolphins declined and common dolphins increased in comparison to previous studies. These observations are consistent with changes in the local cetacean community being driven by increases in local water temperature (MacLeod *et al*., 2005).

167. In a wider context, such changes may lead to populations of cetaceans moving out of areas specifically designated for their protection as they respond to changes in local conditions.

## 10.5.12 Designated Sites

168. There are a number of designated sites near the proposed Millport FPS. Table 10-11 identifies these, noting the approximate distance from the site (calculated using MAGIC.gov), and the marine mammal species listed as qualifying features of the site.

### 10.5.12.1 Harbour porpoise designated sites

169. The Skerries and Causeway Special Area of Conservation (SAC) (located 128km from the proposed scheme) is designated for harbour porpoise. Surveys of the presence of harbour porpoise within the site show presence of the species year-round, with the presence of calves and juveniles, suggesting that harbour porpoise breed in the area (Northern Ireland Environment Agency, 2012). The Conservation Objectives of the site are to "*ensure the species is a viable component of the site, to ensure there is no significant disturbance of the species, and to ensure the supporting habitats and processes relevant to harbour porpoises and their prey are maintained*" (Department of Agriculture, Environment and Rural Affairs, 2017).

170. The Inner Hebrides and Minches SAC for harbour porpoise covers over 13,800km$^2$ and supports over 5,000 individuals (SNH, 2017). The Conservation Objectives for this site state that significant disturbance should be interpreted to mean disturbance that "*affects the integrity of the site through alteration of the distribution of harbour porpoise within the SAC such that recovery cannot be expected*

*or effects can be considered long term. The effects of plans or projects that last beyond the average generation time of harbour porpoise are more likely to constitute significant disturbance and to have an impact on site integrity. It is expected that significant disturbance will lead to more than a transient effect on the distribution of harbour porpoise*". Therefore, any development that is within the Inner Hebrides and the Minches SAC, or has the potential to disturb harbour porpoise within the SAC, will be required to undertake an Appropriate Assessment. The proposed scheme is 134km from the Inner Hebrides and Minches SAC.

### 10.5.12.2 Seal designated sites

171. There are a number of designated sites for harbour and / or grey seal relatively near the proposed Scheme (see Table 10-11 below). These sites include important seal haul-out sites, with some also providing important pupping sites. The Conservation Objectives for these sites ensure that the obligations of the Habitats Directive are met; that the site is maintained and that it makes a full contribution to achieving favourable conservation status for its qualifying interests. Any project that has the potential to cause effect to these sites is required to undertake an assessment to ensure that project ensure that site still meets its Conservation Objectives. The closest of the seal designated sites is The Maidens at 99km from the proposed scheme, designated for grey seal.

### 10.5.12.3 Protected sites for other species

172. The Sea of the Hebrides pMPA is proposed to protect basking sharks, minke whales, fronts and geodiversity features (SNH, 2014b). Basking sharks are considered to be most sensitive to collision with vessels, and somewhat sensitive to entanglement in fishing gear and disturbance from underwater noise. Minke whales are sensitive to underwater noise (leading to disturbance and possibly injury), entanglement in fishing gear and collision with vessels. In order to conserve basking sharks and minke whales, risk of injury and death should be minimised, access to resources within the site should be maintained, and supporting features should also be conserved. An assessment of the potential impacts to the Sea of the Hebrides pMPA would therefore be required for any project that may have the potential to have functional connectivity with the designated site. The site is located 201km from the Millport FPS if taking into account the coastline, or 96km as a straight line.

*Table 10-11 Designated sites near the proposed Millport FPS (distance calculated from MAGIC.gov and taking into account coastlines)*

| Site | Designation | Distance (approx.) | Feature Grade | Feature |
|---|---|---|---|---|
| The Maidens | SAC | 99km | Qualifying | Grey seal |
| Skerries and Causeway | SCI | 128km | Qualifying feature | Harbour porpoise |
| South-East Islay Skerries | SAC | 129km | Primary feature | Harbour seal |
| The Inner Hebrides and Minches | SAC | 134km | Primary feature | Harbour porpoise |
| Strangford Lough | SAC | 161km | Qualifying feature | Harbour seal |
| Sea of the Hebrides | pMPA | 201km | Primary feature | Minke whale, basking shark |
| Eileanan agus Sgeiran Lios mor | SAC | 236km | Primary feature | Harbour seal |

| Site | Designation | Distance (approx.) | Feature Grade | Feature |
|---|---|---|---|---|
| Treshnish Isles | SAC | 237km | Primary feature | Grey seal |
| Sound of Barra | SCI | 305km | Qualifying feature | Harbour seal |

173. Due to the distance between the proposed scheme, and these designated sites, and the limited spatial extent of any impacts to marine mammal species (including for noise), no designated sites have been screened in for further assessment.

### 10.5.13 Summary of Reference Populations and Densities

174. Due to the low sightings and presence of both killer whale and humpback whale within the study area, these species have been scoped out of further assessment.

175. Table 10-12 below summarises the density estimates and reference population used for each marine mammal species included within the following assessments.

*Table 10-12 summary of marine mammal density estimates and reference populations to be used within the assessment*

| Species | Density estimate | Reference population |
|---|---|---|
| Harbour porpoise | 0.336<br>(Hammond *et al.*, 2017) | 24,370<br>(Hammond *et al.*, 2017) |
| Bottlenose dolphin | 0.121<br>(Hammond *et al.*, 2017) | 45<br>(IAMMWG, 2015) |
| Common dolphin | 0.133<br>(Hammond *et al.*, 2017) | 56,556<br>(IAMMWG, 2015) |
| Minke whale | 0.027<br>(Hammond *et al.*, 2017) | 23,528<br>(IAMMWG, 2015) |
| Grey seal | 0.375<br>(Russel *et al.*, 2017) | 374<br>(SCOS, 2018) |
| Harbour seal | 0.141<br>(Russel *et al.*, 2017) | 1,200<br>(SCOS, 2018) |

## 10.6 Impact Assessment

### 10.6.1 Overview of Potential Impacts

176. Following the methodology presented in Section 10.4 above, the impacts associated with the marine mammal species and basking sharks, as described in Section 10.5 have been assessed and are presented in this section. Where measures over and above the embedded mitigation described in Section 10.6.3 are required to avoid, reduce, remedy/compensate or enhance the adverse impacts of the proposed scheme, this information has been provided.

177. The scoping report and additional desk based assessment identified the following impacts (as listed in Table 10-13) the potential risk of impacts to marine mammal species and basking shark as a result of the Millport FPS.

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*Table 10-13 Summary of the risk of impact for the Millport FPS*

| Impact | Potential Risk of Impact |
|---|---|
| **Disturbance from underwater noise during dredging, rock dumping and vessel activities** | Dredging<br>No risk of impact to cetaceans, pinnipeds and basking sharks<br><br>Rock dumping<br>No risk of impact to all marine mammals and basking shark<br><br>Vessels<br>No significant risk of disturbance beyond 10m form vessel for all marine mammals and no increased potential impact for basking shark. |
| **Disturbance to seal haul outs from increased human activity** | Vessel disturbance<br>Negligible risk of impact to pinnipeds<br><br>Visual Disturbance during Construction<br>Potential disturbance of seals at haul-out site depending on construction activities in relation to the location of the haul-out site |

178. From this additional desk based assessment, two potential impacts on marine mammal and basking shark receptors resulting from the construction stage were determined to require further assessment. These are:

- Disturbance from underwater noise during dredging works, rock dumping and vessel activities; and
- Disturbance (and potential habitat loss) to seal haul outs.

179. Even though underwater noise has been found to be negligible in the desk based assessment, a desk-based impact assessment will be conducted to determine any significant level of effects on the local population under a precautionary principle.

180. In the following impact assessment, effects on the maximum number of individuals and the resultant percentage of the reference population effected will be assessed for harbour porpoise, bottlenose dolphin, common dolphin, minke whale, harbour seal and grey seals; SCANS III density estimates (Hammond *et al*., 2017), seals at sea mapping (Russell *et al.,* 2017) and MU reference populations (IAMMWG, 2015 and SCOS, 2018) (summarised in Table 10-12) have been used to inform this assessment. For killer whale and humpback whale, screened in due to the number of sightings made by the Clyde Marine Mammal Project in close proximity to the proposed scheme, density estimates are not available, and therefore a quantitative assessment is not possible. Similarly, basking shark density estimates are not available, and therefore the assessments for these species are based on the potential impact ranges and the risk of high numbers being present within that impact range.

### 10.6.2 Worst Case Scenario

181. This section identifies the realistic worst-case parameters associated with the proposed scheme, and relevant for marine mammals and basking shark. This includes the following activities to be undertaken during the construction phase;

- Rock armour breakwater;
    - Underwater noise from rock placement and vessels.

- Dredging works;
    - Underwater noise from dredging (water injection dredging).
- Delivery vessels;
    - Underwater noise from all delivery vessels associated with the proposed scheme.

182. Table 10-14 identifies those realistic worst-case parameters of the offshore infrastructure that are relevant to potential impacts on marine mammal and basking sharks during construction of the proposed scheme. For more detail regarding specific activities, and their durations, which fall within the construction phase, see **Chapter 5 Project Description.**

*Table 10-14 Worst case parameters values*

| Impact | Parameter | Notes |
|---|---|---|
| Disturbance from underwater noise | Noise produced during dredging works, rock placement and vessel activities in the construction, maintenance and decommissioning phases. | Underwater noise generated by the construction / decommissioning of the offshore elements of the proposed scheme has the potential to disturb marine mammals in the area. The significance of the impact is likely to be greater due to the progression further out into the coastal waters. |
| Disturbance (and potential habitat loss) to seal haul outs | Disturbance during the construction, maintenance and decommissioning phases. | The proposed scheme (particularly options 2 and 3) could displace the local seals from the Eileans haul-out site, however this is not believed to be a breeding site. |

## 10.6.3 Embedded Mitigation

### 10.6.3.1 Scheme Design

183. Embedding mitigation into the proposed scheme design is a type of primary mitigation and is an inherent aspect of the EIA process. A full account of embedded mitigation measures is contained in **Chapter 5 Project Description.**

184. No embedded mitigation measures have been developed into the design of the proposed scheme with specific regard to marine mammals. Additional mitigation measure have been included within the following impact assessment sections wherever relevant.

185. Embedded mitigation measures that are relevant to marine mammals are those that are provided to ensure there are no water quality impacts. With regard to marine water quality, the standard best practice and policy requirements, as set out in Section 7.4.1, would be adhered to throughout the construction and operation of the proposed scheme. The risk of an accidental spill occurring is considered to be adequately mitigated and will not be considered further, as set out in the Scoping Report.

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### 10.6.4 Potential Impacts during Construction

186. This section discusses the potential impacts which may occur to marine mammals and basking shark receptors during activities associated with the construction of the proposed scheme.

#### 10.6.4.1 Construction Impact 1a: Underwater noise during dredging works

187. This section assesses the potential impacts that could be associated with underwater noise during dredging activities at the proposed scheme during the construction period.

188. The dredging process emits continuous, broadband sound into the marine environment. Sound Pressure Levels (SPL) can vary widely, dependent on the dredger type, operational stage, or environmental conditions (e.g. sediment type, water depth, salinity and seasonal phenomena such as thermoclines; Jones and Marten, 2016). These factors will also affect the propagation of sound from dredging activities and along with ambient sound already present, will influence the distance at which sounds can be detected.

189. Dredging has the potential to generate underwater noise at sound levels and frequencies for sufficient durations to disturb marine mammals. Noise measurements indicate that the most intense sound emissions from trailing suction hopper dredger (TSHD) dredgers are typically low frequencies, up to and including 1kHz (Robinson *et al*., 2011) and is comparable to those for a cargo ship travelling at modest speed (between 8 and 16 knots) (Theobald *et al*., 2011).

190. Reviews of published sources of underwater noise during dredging activity (e.g. Thomsen *et al*., 2006; Theobald *et al*., 2011; Todd *et al*., 2014), indicate that the sound levels that marine mammals may be exposed to during dredging activities are usually below auditory injury thresholds (Permanent Threshold Shift (PTS)) exposure criteria (as defined in Southall *et al*., 2019). Therefore, the potential risk of any auditory injury in marine mammals as a result of dredging activity is highly unlikely. The thresholds for temporary hearing loss (Temporary Threshold Shift (TTS)) could be exceeded during dredging, however, only if marine mammals remain in close proximity to the active dredger for extended periods, which is highly unlikely (Todd *et al*., 2014).

191. The noise levels produced by dredging activity could overlap with the hearing sensitivities and communication frequencies used by marine mammals (Todd *et al*., 2014), and therefore have the potential to impact marine mammals present in the area. However, species such as harbour porpoise have a relatively poor sensitivity below 1kHz and are less likely to be affected by masking, although for seals there could be the potential of masking communication, especially during the breeding season (Todd *et al*., 2014). There is the potential for behavioural reactions and disturbance to marine mammals in the area during dredging activity. Marine mammals may exhibit varying behavioural reactions as a result of exposure to underwater noise (Southall *et al.,* 2019).

192. Cetaceans, such as harbour porpoise, may respond to underwater noise by avoiding the vessel or increasing their diving times (Evans *et al*., 1993). Very little research has been carried out into the effects of dredging vessels on the behaviour of marine mammals. However, using passive acoustic monitoring techniques, Diederichs *et al*. (2010) found short-term avoidance in harbour porpoises at ranges of 600m from a TSHD operating to the west of Sylt (Northern Germany). Published research on the effect of dredging vessels on seal species are limited; however, Anderwald *et al*. (2013) found that grey seals showed some level of avoidance to high construction vessel traffic in Ireland (Todd *et al*., 2014). Todd *et al*., (2014) concluded that it is difficult to determine specific dredging noise effects on marine mammals, given that generally many activities occur concurrently. However, they suggest that most effects concern short, perhaps medium-term behavioural reactions (Todd *et al*., 2014).

193. Regarding basking sharks, there are a few studies that have revealed sharks to be sensitive to sudden underwater noise sources of 20 to 30 dB re 1 µPa above ambient levels, with sharks displaying rapid directional change of swimming to avoid the area if within 10m of the sound source (Klimley & Myrberg 1979). However, the same study found that the sharks would become accustomed to the noise within a few instances of the noise source being emitted (Casper *et al*, 2012). Casper *et al*. (2012) state that vessel sounds at 190 dB re 1 µPa are unlikely to seriously impact or injure sharks, but that it could cause masking of important sounds in the area (Casper *et al*., 2012). Fish with no gas-filled cavity (the swim bladder), such as elasmobranchs, are typically not as vulnerable to acoustic trauma from underwater noise sources as those with a swim bladder (Popper *et al*., 2014). Noise thresholds set out by Popper *et al*. (2014) for fish species include consideration of basking shark within the category of fish with no swim bladder. Therefore, the following sections include a prediction of impact ranges from underwater noise activities to basking shark based on modelling that has been completed using the Popper *et al*. (2014) criteria for fish with no swim bladder.

**Desk Based Approach and Assessment**

194. To inform the impact assessment of dredging works during the proposed scheme for marine mammal species, underwater noise modelling that was carried out for similar dredging activities has been applied in order to estimate the noise levels likely to arise during the dredging works at the proposed scheme. The modelling use in this assessment was undertaken using a numerical approach that is based on two different computational modelling methods; Parabolic Equation for low frequencies (12.5Hz to 160Hz) and a ray tracing solver for high frequencies (200Hz to 100kHz) (Stena Line Ports Limited, 2019). The modelling considers a wide array of input parameters, including variations in bathymetry, sediment types, sound speed and source frequency content to ensure as detailed results as possible.

195. The SPL is normally used to characterise noise and vibration of a continuous nature. The variation in sound pressure can be measured over a specific time period to determine the root mean square (RMS) level of the time varying acoustic pressure, therefore SPL (i.e. $SPL_{RMS}$) can be considered as a measure of the average unweighted level of the sound over the measurement period. Peak SPLs ($SPL_{peak}$) are often used to characterise sound transients from impulsive sources, such as for impact piling. A peak SPL is calculated using the maximum variation of the pressure from positive to zero within the wave. This represents the maximum change in positive pressure (differential pressure from positive to zero) as the transient pressure wave propagates.

196. The SEL sums the acoustic energy over a measurement period, and effectively takes account of both the SPL of the sound source and the duration the sound is present in the acoustic environment. To determine cumulative sound exposure level ($SEL_{cum}$) ranges, a fleeing animal model has been used. This assumes that the animal exposed to high noise levels will swim away from the noise source. A constant fleeing speed of 1.5 m/s has been used for harbour porpoise, dolphin species and grey seal (Otani *et al*., 2000), with a swimming speed of 3.25 m/s for minke whale (Blix and Folkow, 1995). This is considered a 'worst-case' scenario as marine mammals are expected to be able to swim faster. For example, the swimming speed of a harbour porpoise during playbacks of pile driving sounds (SPL of 154 dB re 1 µPa) was 1.97m/s (7.1km/h) and during quiet baseline periods the mean swimming speed was 1.2m/s (4.3km/h; Kastelein *et al*., 2018). The activities that were assessed include:

- TSHD with an estimated sound source of 175.6 dB re 1µP $SPL_{RMS}$ @ 1m

197. The results of the underwater noise modelling used in the following assessments shows that at the source levels predicted for the dredging activities, any marine mammal would have to remain in close proximity (i.e. less than 10m) of an active TSHD for 24 hours to be exposed to levels of sound that

could induce PTS as per the Southall *et al.* (2019) threshold criteria. Basking shark would have to remain with 38m of a cutter suction dredger (CSD) for a period of 12 hours to be at risk of injury, under the Popper *et al.* (2014) criteria. Table 10-15 shows the modelled results and areas of impact. THSD has been used to inform the impact assessment for marine mammals, while CSD has been used to inform the assessment for basking shark, as each is considered to represent the worst-case noise levels associated with any dredging works.

*Table 10-15 Maximum predicted impact ranges (and areas) for auditory injury (PTS and TTS) and for fleeing response from dredging activities based on underwater noise modelling (as undertaken for similar activities by Stena Line Ports Limited, 2019)*

| Potential Impact | Receptor | Criteria and threshold (Southall *et al.*, 2019) | Modelled Impact Range (m) and area ($km^2$) for TSHD works |
|---|---|---|---|
| Auditory injury (PTS) from cumulative SEL during dredging works (TSHD) over 24 hours | Low frequency [LF; harbour porpoise] | 173 dB re 1 µPa HF $SEL_{cum}$ | <10m<br>0.0003$km^2$* |
| | Mid frequency [MF; dolphin species] | 198 dB re 1 µPa MF $SEL_{cum}$ | <10m<br>0.0003$km^2$* |
| | Low frequency [LF; whale species] | 199 dB re 1 µPa LF $SEL_{cum}$ | <10m<br>0.0003$km^2$* |
| | Pinnipeds in water [PW; seal species] | 201 dB re 1 µPa PW $SEL_{cum}$ | <10m<br>0.0003$km^2$* |
| Injury from cumulative SPL during dredging works (CSD) over 12 hours | Fish species with no swim bladder (including shark species) | 158 dB re 1 µPa $SPL_{RMS}$ | 38m |
| Temporary auditory injury (TTS) or fleeing response to from cumulative SEL during dredging works (TSHD) over 24 hours | Low frequency [LF; harbour porpoise] | 153 dB re 1 µPa HF $SEL_{cum}$ | 360m<br>0.086km |
| | Mid frequency [MF; dolphin species] | 178 dB re 1 µPa MF $SEL_{cum}$ | <10m<br>0.0003$km^2$* |
| | Low frequency [LF; whale species] | 179 dB re 1 µPa LF $SEL_{cum}$ | <10m<br>0.0003$km^2$* |
| | Pinnipeds in water [PW; seal species] | 181 dB re 1 µPa PW $SEL_{cum}$ | <10m<br>0.0003$km^2$* |

* based on the area of a circle.

*Auditory injury and behavioural response from dredging works*

198. The number of harbour porpoise, bottlenose dolphin, common dolphin, minke whale, harbour seal and grey seal that could be at risk of PTS or TTS onset, or display a fleeing response, as a result of underwater noise dredging works (Table 10-16) has been assessed based on the number of animals that could be present in each of the modelled impact ranges and areas (Table 10-15). There is no density estimate available for humpback whale, killer whale and basking shark, and so a quantitative assessment has not been possible for these species.

*Table 10-16 Maximum number of individuals (and % of reference population) that could be impacted as a result of underwater noise associated with dredging activities, based on underwater noise modelling*

| Potential Impact | Receptor | Estimated number of individuals in impact area (% of the reference population) | Magnitude |
|---|---|---|---|
| Auditory injury (PTS) from cumulative SEL during dredging works (TSHD) | Harbour porpoise | 0.0001 harbour porpoise (0.0000005% WS MU) based density of 0.336/km$^2$ | Permanent effect with negligible / no impact magnitude (less than 0.001% of the reference population anticipated to be exposed to effect). |
| | Bottlenose dolphin | 0.00004 dolphins (0.0008% CWSH MU) based on a density of 0.121/km$^2$ | Permanent effect with negligible / no impact magnitude (less than 0.001% of the reference population anticipated to be exposed to effect). |
| | Common dolphin | 0.00004 common dolphin (0.00000007% CGNS MU) based on density of 0.133/km$^2$) | Permanent effect with negligible / no impact magnitude (less than 0.001% of the reference population anticipated to be exposed to effect). |
| | Minke whale | 0.00008 minke whale (0.0000003% CGNS MU) based on density of 0.027/km$^2$ | Permanent effect with negligible / no impact magnitude (less than 0.001% of the reference population anticipated to be exposed to effect). |
| | Harbour seal | 0.0004 harbour seal (0.000035% of SWS MU) based on density of 0.141/km$^2$ | Permanent effect with negligible / no impact magnitude (less than 0.001% of the reference population anticipated to be exposed to effect). |
| | Grey seal | 0.0001 grey seal (0.000002% of WS MU) based on density of 0.375/km$^2$ | Permanent effect with negligible / no impact magnitude (less than 0.001% of the reference population anticipated to be exposed to effect). |
| Temporary auditory injury (TTS) or fleeing response to underwater noise during dredging works (TSHD) | Harbour porpoise | 0.03 harbour porpoise (0.0001% WS MU) based density of 0.336/km$^2$ | Temporary effect with negligible / no impact magnitude (less than 1% of the reference population anticipated to be exposed to effect). |
| | Bottlenose dolphin | 0.0004 dolphins (0.0008% CWSH MU) based on a density of 0.121/km$^2$ | Temporary effect with negligible / no impact magnitude (less than 1% of the reference population anticipated to be exposed to effect). |
| | Common dolphin | 0.00004 common dolphin (0.00000007% CGNS MU) based on density of 0.133/km$^2$) | Temporary effect with negligible / no impact magnitude (less than 1% of the reference population anticipated to be exposed to effect). |
| | Minke whale | 0.00008 minke whale (0.0000003% CGNS MU) based on density of 0.027/km$^2$ | Temporary effect with negligible / no impact magnitude (less than 1% of the reference population anticipated to be exposed to effect). |
| | Harbour seal | 0.0004 harbour seal (0.000035% of SWS MU) based on density of 0.141/km$^2$ | Temporary effect with negligible / no impact magnitude (less than 1% of the reference population anticipated to be exposed to effect). |
| | Grey seal | 0.0001 grey seal (0.000002% of WS MU) based on density of 0.375/km$^2$ | Temporary effect with negligible / no impact magnitude (less than 1% of the reference population anticipated to be exposed to effect). |

199. The maximum duration of the dredging works is estimated to be completed over two weeks, with the works being intermittent in nature. Therefore, the potential effects that could result from underwater noise during the dredging works would be temporary in nature, not consistent throughout this period and would be limited to only part of the proposed scheme area (in the vicinity of the works while they

are taking place only). The number of harbour porpoise, bottlenose dolphin, minke whale, harbour seal and grey seal that could be impacted (as shown in Table 10-16) are the maximum number of animals that could potentially disturbed during the dredging works.

200. The magnitude of the potential impact of PTS, TTS and fleeing response as a result of dredging works, is **negligible/ no impact** for all marine mammals, with less than 0.001% of the reference population likely to be affected for any permanent impacts (PTS) and less than 1% temporary disturbed (TTS and fleeing response) (Table 10-16).

201. For killer whale, the impact range is less than 10m, meaning an individual would have to remain within 10m for a period of 24 hours to be at risk of either PTS or TTS onset. Given the very small number of individuals present in the Clyde, and the infrequency of the sightings made of the species, it is concluded that there would be very little to no potential for an impact to occur. It is therefore concluded that there would be a negligible / no impact magnitude of impact. For humpback whale, the impact range for PTS onset due to dredging works is less than 10m, and the TTS onset range is 360m. Given that an individual would have to remain within that distance of a dredging vessel for a 24 hour period, and the relatively low number of sightings within the Clyde, it is also considered that there would be a negligible / no impact magnitude for humpback whale.

202. With regard to basking shark, the very low level of basking shark presence within the Clyde itself (0.05/hr SPUE) and the small impact range (with an individual having to remain within 38m of the dredging activities to be at risk of injury; Table 10-16), it is considered that there would be a negligible / no impact magnitude of impact, with very few, if any, basking shark anticipated to be impacted.

**Mitigation**

203. No mitigation is required. However, during the grey and harbour seal breeding season and moult periods, individuals may be more sensitive to underwater noise. Therefore, although the dredging work for the proposed scheme will be of a limited scale (with a maximum dredge volume of up to 45,000m$^3$), expected to be undertaken sometime in spring to summer 2022, as much as possible, dredging activities will be undertaken in such a way as to minimise the potential for disturbance at the haul-out site during sensitive times of the year, such as the breeding and moulting periods. Dredging is anticipated to be undertaken over a two week period, and therefore there is limited risk of any overlap with the harbour and grey seal pupping of June to July and September to late November respectively, with the annual grey seal moult period lasting three to five months from December to April, and the harbour seal moult period being in August.

**Residual Impact**

204. Taking into account the receptor sensitivity (of high for PTS, and medium for TTS and fleeing response for marine mammals, and medium for basking shark (as a precautionary approach)) and the potential magnitude of the effect, along with the temporary nature of the disturbance, the impact significance for any auditory injury or behavioural impact as a result of underwater noise from the dredging works on marine mammal species and basking shark, has been assessed as **minor (not significant)** (Table 10-17).

*Table 10-17 Assessment of impact significance for underwater noise from dredging activities on marine mammals*

| Potential Impact | Receptor | Sensitivity | Magnitude | Significance | Mitigation | Residual impact |
|---|---|---|---|---|---|---|
| Auditory injury (PTS) from cumulative SEL during dredging works (TSHD) | Harbour porpoise | High | Negligible / no impact | Minor (not significant) | None required. | Minor (not significant) |
| | Bottlenose dolphin | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Common dolphin | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Killer whale | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Minke whale | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Humpback whale | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Harbour seal | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Grey seal | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| Injury from cumulative SPL during dredging works (CSD) | Basking shark | Medium | Negligible / no impact | Minor (not significant) | None required. | Minor (not significant) |
| Behavioural response cumulative SEL during dredging works (TSHD) | Harbour porpoise | Medium | Negligible / no impact | Minor (not significant) | None required. | Minor (not significant) |
| | Bottlenose dolphin | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Common dolphin | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Killer whale | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Minke whale | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Humpback whale | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Harbour seal | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Grey seal | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |

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### 10.6.4.2 Construction Impact 1b: Underwater noise during rock placement

205. Studies into the noise levels associated with rock placement have shown that they are not often discernible over and above the noise of the associated vessel. Measurements of rock laying vessels near the Shetland Isles in relatively deep water (60-70m in depth), reported that there was no evidence of rock laying sound over and above background levels (Subacoustech, 2004). Other reports that have reported on the noise levels expected from rock placement activities have estimated the source level to be 172 dB re 1 µPa @ 1m (RMS), less than the noise levels associated with the dredging works above (East Anglia TWO Ltd, 2019).

206. As noise levels for rock placement are considered to be no louder than the vessel noise associated with that activity or than the noise associated with dredging works as assessed above, the assessment of dredging works can therefore be used as a conservative proxy to determine the risk of impact to marine mammals and basking sharks.

207. The magnitude of the potential impact of PTS, TTS and fleeing response as a result of the rock dumping using dredging works as a proxy, is negligible/ no impact for all marine mammals, and negligible for basking shark, with less than 0.001% of the reference population likely to be affected for any permanent impacts (PTS) and less than 1% temporary disturbed (TTS and fleeing response). The resultant impacts for all species is therefore assessed to be **minor**.

**Mitigation**

208. No mitigation is required.

**Residual impact**

209. The residual impact would be of **minor (not significant)** significance for all marine mammal species, and basking shark.

### 10.6.4.3 Construction Impact 1c: Underwater noise during vessel activities

210. During the construction phase of the proposed scheme, there will be an increase in the number of vessels associated with construction activities. The breakwaters are located between 300m and 700m offshore, and will therefore be constructed by barge. It is currently assumed that the rock and other materials required to build the breakwater will be delivered by sea. The vessels used in construction activities are generally slow moving with noise emitted at a low frequency. Noise levels reported by Malme *et al*. (1989) and Richardson *et al*. (1995) for large surface vessels indicate that physiological damage to auditory sensitive marine mammals is unlikely. However, the levels could be sufficient to cause local disturbance to sensitive marine mammals in the immediate vicinity of the vessel, depending on ambient noise levels. Disturbance is therefore the only potential underwater noise impact associated with vessels.

211. Thomsen *et al*. (2006) reviewed the effects of ship noise on harbour porpoise and seal species. As harbour porpoise, grey seal and harbour seal have acute hearing capabilities at 2kHz, there is the potential for detection, avoidance and masking in these species. Thomsen *et al*. (2006) considered the detection thresholds for harbour porpoises (hearing threshold = 115dB rms re 1 µPa at 0.25 kHz; ambient noise = 91dB rms re 1 µPa at 2kHz) and concluded that ship noise around 0.25kHz could be detected by the species at distances of 1km; and ship noise around 2kHz could be detected at around 3km. These calculations were based on ambient noise levels typical for the German Bight / North Sea at wind-speeds between 3 and 8m/s.

212. The avoidance response threshold for harbour porpoise (i.e. the amplitude of noise required before a harbour porpoise will display an avoidance response) as reported by Lucke *et al.* (2009) is 145 dB re 1µPa$^2$s. Thomsen *et al.* (2006) reported that a vessel at 1m could have noise levels of 160dB re 1µPa and 150dB re 1µPa (for vessels producing sound at 0.25kHz and 2kHz, respectively). This is above the behavioural or avoidance response threshold for most marine mammal criterion, in close vicinity around the vessel.

213. Information provided by Marine Traffic (2016) identifies moderate levels of commercial and recreational vessels off the coastline at Millport. There are also several important navigation routes within the study area, particularly the Hunterston and the Firth of Clyde channels, which are major shipping routes. (see Figure 13-1 and Figure 13-2). A review of the Marine Scotland MAPS NMPI shows that the area around Millport is relatively high for vessel numbers, with between 20 and 50 vessels within Millport Bay every week, up to 150 vessels each week travelling east past Great Cumbae Island, and more than 150 a week passing east of the island (Marine Scotland, 2019). This gives an indication that any marine mammals and basking shark in the area will be well used to high vessel presence.

**Desk Based Approach and Assessment**

214. Underwater noise modelling has not been conducted for the proposed scheme, however, underwater noise modelling has been conducted for vessels at the Wylfa Newydd Development Area (HNP, 2018) and was updated to take into account the NOAA (NMFS, 2018) thresholds and criteria, and was modelled with the Popper *et al.* (2014) criteria for fish species. For the purposes of modelling, vessels were divided into two categories: medium sized and large sized. Medium sized vessels include support boats such as tugs and workboats, while the large sized vessels are equivalent of barges and the vessels used for rock placement.

215. The underwater noise propagation modelling was undertaken using a simple modelling approach for underwater noise associated with both medium and large sized vessels, using measured sound source data. The source levels used in the underwater noise modelling of large and medium vessels for Wylfa Newydd are (HNP, 2018);

- Large vessels - 168dB re 1µPa (RMS) @ 1m
- Medium vessels - 161dB re 1µPa (RMS) @ 1m

216. The maximum predicted impact ranges for the risk of PTS and TTS / disturbance to marine mammal species using the non-impulsive NMFS (2018) criteria for large and medium vessels at Wylfa Newydd, assuming a stationary animal remaining in the vicinity over a 24-hour period, are presented in Table 10-18.

*Table 10-18 Summary of the maximum predicted PTS and TTS / fleeing response impact ranges (and areas) for marine mammal species for large and medium vessels at Wylfa, based on NMFS (2018) weighted SELcum criteria for non-impulsive sounds.*

| Potential Impact | Receptor | Criteria and threshold (NMFS, 2018) | Large vessels | Medium vessels |
|---|---|---|---|---|
| Auditory injury (PTS) from cumulative SEL | Harbour porpoise | 173 dB re 1 µPa$^2$s Weighted $SEL_{cum}$ | 4m (0.00005 km$^2$) | <1m (0.000003 km$^2$) |
| | Dolphin sp. | 198 dB re 1 µPa$^2$s Weighted $SEL_{cum}$ | <1m (0.000003 km$^2$) | <1m (0.000003 km$^2$) |

| Potential Impact | Receptor | Criteria and threshold (NMFS, 2018) | Large vessels | Medium vessels |
|---|---|---|---|---|
| from vessel noise over 24 hours | Whale sp. | 199 dB re 1 µPa²s Weighted $SEL_{cum}$ | 10m (0.0003 km²) | 3m (0.00003 km²) |
| | Seal sp. | 201 dB re 1 µPa²s Weighted $SEL_{cum}$ | <1m (0.000003 km²) | <1m (0.000003 km²) |
| Temporary auditory injury (TTS) or fleeing response from cumulative SEL from vessel noise over 24 hours | Harbour porpoise | 153 dB re 1 µPa²s Weighted $SEL_{cum}$ | 140m (0.062 km²) | 30m (0.003 km²) |
| | Dolphin sp. | 178 dB re 1 µPa²s Weighted $SEL_{cum}$ | 3m (0.00003 km²) | <1m (0.000003 km²) |
| | Whale sp. | 179 dB re 1 µPa²s Weighted $SEL_{cum}$ | 480m (0.72 km²) | 130m (0.053 km²) |
| | Seal sp. | 181 dB re 1 µPa²s Weighted $SEL_{cum}$ | 40m (0.005 km²) | 9m (0.0003 km²) |

**based on area of a circle*

*Auditory injury and behavioural response from vessel noise*

217. The maximum number of harbour porpoise, bottlenose dolphin, common dolphin, minke whale, harbour seal and grey seal that could be at risk of PTS and TTS / disturbance from cumulative exposure over a 24 hour period, based on the density estimates for the area and maximum area of impact for large vessels at Millport FPS, are presented in Table 10-19. There is the potential that there could be up to two vessels on site at any one time, and therefore an assessment for two vessels has also been presented below. As noted above, there are no density estimates available for humpback whale, killer whale, or basking shark, and so a quantitative assessment has not been possible for these species.

*Table 10-19 Maximum number of individuals (and % of reference population) that could be impacted as a result of underwater noise associated with vessel noise, based on underwater noise modelling*

| Potential Impact | Receptor | Estimated number of individuals in impact area (% of the reference population) for 1 Large Vessel | Estimated number of individuals in impact area (% of the reference population) for 2 Large Vessels | Magnitude |
|---|---|---|---|---|
| Auditory injury (PTS) from cumulative SEL from vessels | Harbour porpoise | 0.00002 harbour porpoise (0.0000001% WS MU) based density of 0.336/km² | 0.00004 harbour porpoise (0.0000002% WS MU) based density of 0.336/km² | Permanent effect with negligible / no impact magnitude (less than 0.001% of the reference population anticipated to be exposed to effect). |
| | Bottlenose dolphin | 0.0000004 dolphins (0.000001% CWSH MU) based on a density of 0.121/km² | 0.000001 dolphins (0.0000002% CWSH MU) based on a density of 0.121/km² | Permanent effect with negligible / no impact magnitude (less than 0.001% of the reference population anticipated to be exposed to effect). |
| | Common dolphin | 0.0000004 common dolphin (0.000000001% | 0.000001 common dolphin (0.000000001% | Permanent effect with negligible / no impact |

| Potential Impact | Receptor | Estimated number of individuals in impact area (% of the reference population) for 1 Large Vessel | Estimated number of individuals in impact area (% of the reference population) for 2 Large Vessels | Magnitude |
|---|---|---|---|---|
| | | CGNS MU) based on density of 0.133/km$^2$) | CGNS MU) based on density of 0.133/km$^2$) | magnitude (less than 0.001% of the reference population anticipated to be exposed to effect). |
| | Minke whale | 0.00008 minke whale (0.0000003% CGNS MU) based on density of 0.027/km$^2$ | 0.0002 minke whale (0.000001% CGNS MU) based on density of 0.027/km$^2$ | Permanent effect with negligible / no impact magnitude (less than 0.001% of the reference population anticipated to be exposed to effect). |
| | Harbour seal | 0.000004 harbour seal (0.0000003% of SWS MU) based on density of 0.141/km$^2$ | 0.00001 harbour seal (0.000001% of SWS MU) based on density of 0.141/km$^2$ | Permanent effect with negligible / no impact magnitude (less than 0.001% of the reference population anticipated to be exposed to effect). |
| | Grey seal | 0.000001 grey seal (0.000000004% of WS MU) based on density of 0.375/km$^2$ | 0.000002 grey seal (0.0000005% of WS MU) based on density of 0.375/km$^2$ | Permanent effect with negligible / no impact magnitude (less than 0.001% of the reference population anticipated to be exposed to effect). |
| Temporary auditory injury (TTS) or fleeing response to underwater noise from vessels | Harbour porpoise | 0.02 harbour porpoise (0.00001% WS MU) based density of 0.336/km$^2$ | 0.04 harbour porpoise (0.00001% WS MU) based density of 0.336/km$^2$ | Temporary effect with negligible / no impact magnitude (less than 1% of the reference population anticipated to be exposed to effect). |
| | Bottlenose dolphin | 0.0000008 dolphins (0.000002% CWSH MU) based on a density of 0.121/km$^2$ | 0.000002 dolphins (0.000004% CWSH MU) based on a density of 0.121/km$^2$ | Temporary effect with negligible / no impact magnitude (less than 1% of the reference population anticipated to be exposed to effect). |
| | Common dolphin | 0.000004 common dolphin (0.00000001% CGNS MU) based on density of 0.133/km$^2$) | 0.00001 common dolphin (0.00000002% CGNS MU) based on density of 0.133/km$^2$) | Temporary effect with negligible / no impact magnitude (less than 1% of the reference population anticipated to be exposed to effect). |
| | Minke whale | 0.02 minke whale (0.0001% CGNS MU) | 0.04 minke whale (0.0002% CGNS MU) | Temporary effect with negligible / no impact magnitude (less than 1% of |

| Potential Impact | Receptor | Estimated number of individuals in impact area (% of the reference population) for 1 Large Vessel | Estimated number of individuals in impact area (% of the reference population) for 2 Large Vessels | Magnitude |
|---|---|---|---|---|
| | | based on density of 0.027/km$^2$ | based on density of 0.027/km$^2$ | the reference population anticipated to be exposed to effect). |
| | Harbour seal | 0.0007 harbour seal (0.00006% of SWS MU) based on density of 0.141/km$^2$ | 0.0014 harbour seal (0.0001% of SWS MU) based on density of 0.141/km$^2$ | Temporary effect with negligible / no impact magnitude (less than 1% of the reference population anticipated to be exposed to effect). |
| | Grey seal | 0.002 grey seal (0.0005% of WS MU) based on density of 0.375/km$^2$ | 0.004 grey seal (0.001% of WS MU) based on density of 0.375/km$^2$ | Temporary effect with negligible / no impact magnitude (less than 1% of the reference population anticipated to be exposed to effect). |

218. The magnitude of the potential risk of PTS is assessed as **negligible** / **no impact** for all species, with less than 0.001% of all relevant reference populations anticipated to be exposed to the permanent effect and the magnitude of the potential of TTS / fleeing response is assessed as **negligible** / **no impact** for all species, with less than 1% of all relevant reference populations anticipated to be exposed to the temporary effect (Table 10-19). For killer whale, the impact range is less than 1m for PTS onset, and 3m for TTS onset, meaning an individual would have to remain within either 1m or 3m of a vessel for a period of 24 hours to be at risk of either PTS or TTS onset respectively. Given the very small number of individuals present in the Clyde, and the infrequency of the sightings made of the species, it is concluded that there would be very little to no potential for an impact to occur. It is therefore concluded that there would be a negligible / no impact magnitude of impact. For humpback whale, the impact range for PTS onset from vessels is less than 10m, and the TTS onset range is 480m. Given that an individual would have to remain within that distance of a vessel for a 24 hour period, and the relatively low number of sightings within the Clyde, it is also considered that there would be a negligible / no impact magnitude for humpback whale.

219. As outlined above, studies suggest that vessel sounds at 190 dB re 1 µPa are unlikely to seriously impact or injure basking sharks, but that it could cause masking of important sounds in the area (Casper *et al.*, 2012). Modelling results for fish species with a swim bladder (fish criteria which includes shark species), are not available in the above used modelling report ((HNP, 2018), however, the noise associated with vessels is expected to be the same or less than that of dredging works as assessed above for this species. Therefore, the potential impact to basking shark is expected to be the same or less from vessels as for dredging; with a negligible (at worst) magnitude of impact.

**Mitigation**

220. No mitigation is required.

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### Residual Impact

221. Taking into account the high sensitivity of all marine mammal species to any permanent auditory injury (i.e. receptor has very limited capacity to recover from the anticipated impact; Table 10-5) and the medium sensitivity of all marine mammal species to any temporary auditory injury (i.e. receptor has limited capacity to recover from the anticipated impact and the potential magnitude of the effect (negligible/ no impact for all species), the impact significance (as defined in Table 10-9) for any PTS or TTS / disturbance in harbour porpoise, bottlenose dolphin, common dolphin, minke whale, harbour seal and grey seal from cumulative exposure for vessel noise has been assessed as **minor (not significant)** (Table 10-20). For basking shark, the medium sensitivity and negligible magnitude of impact leads to an assessment of **minor** (**not significant**).

*Table 10-20 Assessment of impact significance for underwater noise from vessel noise on marine mammals*

| Potential Impact | Receptor | Sensitivity | Magnitude | Significance | Mitigation | Residual impact |
|---|---|---|---|---|---|---|
| Auditory injury (PTS) from cumulative SEL from vessels | Harbour porpoise | High | Negligible / no impact | Minor (not significant) | None required. | Minor (not significant) |
| | Bottlenose dolphin | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Common dolphin | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Minke whale | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Harbour seal | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Grey seal | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| Injury from cumulative SPL from vessels | Basking shark | Medium | Negligible / no impact | Minor (not significant) | None required. | Minor (not significant) |
| Behavioural response cumulative SEL from vessels | Harbour porpoise | Medium | Negligible / no impact | Minor (not significant) | None required. | Minor (not significant) |
| | Bottlenose dolphin | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Common dolphin | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Minke whale | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Harbour seal | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |
| | Grey seal | | Negligible / no impact | Minor (not significant) | | Minor (not significant) |

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### 10.6.4.4 Construction Impact 2: Disturbance (and potential habitat loss) to seal haul outs

**Vessel Disturbance**

222. Hauled-out seals are sensitive to disturbance, particularly during the breeding or moult periods. Taking into account that there is a small grey and harbour seal haul-out located very near the project at the Eileans, there is the potential for seals to be disturbed by construction vessels and activity.

223. Studies on the distance of disturbance, on land or in the water, from hauled-out harbour seals have found that the closer the disturbance, the more likely seals are to move into the water. The estimated distance between a disturbance and haul out site, at which most seal movements into the water occur, varies for different locations and type of disturbance, but has been estimated at typically less than 100m (Wilson, 2014). Further research defines the probability of this, stating that at 100m from a vessel, a seal is 25 times more likely to exhibit a flee response than if it were 500m away from a visual disturbance source (Anderson *et al.*, 2012). For the grey seal, mothers responded by moving into the water more due to boat speed than as a result of the distance, although movement into the water was generally observed to occur at distances of between 20m and 70m, with no detectable disturbance at 150m (Wilson, 2014; Strong and Morris, 2010). However, grey and harbour seals have also been reported to move into the water when vessels are at a distance of approximately 200m to 300m (Wilson, 2014). However, a study was carried out by SMRU (Paterson *et al.,* 2015) using a series of controlled disturbance tests at harbour seal haul-out sites, consisted of regular (every three days) disturbance through direct approaches by vessel and effectively 'chasing' the seals into the water. The seal behaviour was recorded via GPS tags and found that even intense levels of disturbance did not cause seals to abandon their haul-out sites more than would be considered normal (for example seals travelling between sites), and were found to haul-out again or to undertake a foraging trip in response to the disturbance (but would later return).

224. Other studies have indicated that for a vessel at more than 1,500m from a seal will not cause a reaction from visual change alone, between 900 and 1,500m grey seal will be able to detect the presence of vessels, and at less than 900m grey seal could be expected to react (Scottish Executive, 2007). The breakwaters are located between 300m and 700m offshore, and will be constructed by barge. It is currently assumed that the rock and other materials required to build the breakwater will be delivered by sea. If a concrete armour unit solution is required, then an existing off-site batching plant may be used, with the units transported to site by barge.

225. The current levels of vessels in the area is already very high and therefore it is expected that seals are accustomed to the presence and movements of vessels, and that the increase in number due to the construction works will be insignificant and unlikely to result in any significant disturbance of seals at haul-out sites.

226. The magnitude of the impact of vessel disturbance to seal haul-out sites is defined as **negligible/no impact** due to the intermittent and temporary nature of the vessel disturbance and the already busy nature of vessel movements in the area. Seal species are highly protected and as such have a very high value. However, their sensitivity to the small increase in vessel disturbance and their habituation to the already relatively high vessel use in the area, gives a sensitivity of very low. Therefore, the overall sensitivity is considered to be **medium** to take account of both the high value and the very low sensitivity. This gives an overall impact significance of **minor** (not significant).

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**Visual Disturbance during Construction**

227. There is potential for unfamiliar visual stimuli, such as temporary infrastructure, machinery and people, or any changes to lighting levels on land to impact on seals during construction. These will mostly be associated with vessel traffic, as outlined above, but additionally with the personnel and infrastructure associated with depositing sediment along the coast. Seals that are hauled-out on land, whether resting or breeding, are particularly sensitive to visual disturbance (Hoover-Miller *et al*., 2013). Responses can vary from increased alertness to fleeing into the water (Wilson, 2014).

228. The potential impact of any disturbance at breeding sites, including changes to visual stimuli can result in temporary or permanent pup separation, disruption of pups suckling, impacts to energetic costs (including an energy deficit for pups), physiological stress and fleeing responses or suboptimal habitats (Wilson, 2014). For moulting seals, impacts can range from energy loss and stress to loss of resting and digestion time (Wilson, 2014). The response by seals to changes in visual stimuli is dependent on a number of factors; the species of seal, age, weather and the level of habituation.

229. Research has shown that harbour seals will flee from their haul-out sites if a vessel comes within 560-850m of their location, or if a pedestrian comes within 200-425m (Anderson *et al*., 2012). During the breeding season, they were less inclined to flee at those same distances and returned to their locations almost immediately after the disturbance occurred (Anderson *et al*., 2012). A study was carried out by SMRU (Paterson *et al*., 2015) using a series of controlled disturbance tests at harbour seal haul-out sites. The disturbance consisted of regular (every three days) disturbance through direct approaches by vessel and effectively 'chasing' the seals into the water and determined that repeated disturbance by boat. The seal behaviour was recorded via GPS tags and found that even intense levels of disturbance did not cause seals to abandon their haul-out sites more than would be considered normal (for example seals travelling between sites), and were found to haul-out again or to undertake a foraging trip in response to the disturbance (but would later return). However, similar studies undertaken in Denmark showed that disturbance via land (for example pedestrians) caused significantly longer periods of disturbance before the seals would return to the haul-out site (Anderson *et al*., 2012), although seals would still return to the same haul-out site but after longer foraging trips.

230. Grey seals have historically been thought to be highly sensitive to disturbance from humans (both visual and acoustic) however, in recent years it has become apparent that grey seals in Donna Nook (on the Humber Estuary, east England) have become habituated to the presence of people with over 70,000 visitors during the breeding season with no apparent impact on the breeding seals (SCOS, 2016). That site is also home to a RAF bombing range with little apparent impact on the grey seals present here indicating that they have become habituated to the noise levels and disturbance at the site. Seals have been seen to continue using the site through both bombing and firing range practices (SCOS, 2015).

231. Although there is evidence that seal species can become habituated to visual disturbance, seals are still known to be sensitive to disturbance when they are not regularly exposed to the same type of disturbance and therefore have the potential to be disturbed in and around the proposed activities during the construction period. The project is very close to the small seal haul-out site at the Eileans (within 100m) and therefore has the potential to be impacted by the proposed construction activities.

232. The magnitude of the impact of visual disturbance to seal haul-out sites is defined as **negligible** / **no impact** due to the intermittent and temporary nature of the disturbance and the already busy nature of vessel movements in the area. Seal species are highly protected and as such have a very high value. However, their sensitivity to the small increase in vessel disturbance and their habituation to the already high vessel use in the area, gives a sensitivity of very low. Therefore, the overall sensitivity

is considered to be **medium** to take account of both the high value and the very low sensitivity. This gives an overall impact significance of **minor** (not significant).

**Mitigation**

233. No mitigation measures are required. Consideration will be given to the types and timing of construction activities undertaken and their potential to cause disturbance at the haul-out site, particularly to reduce potential impacts during sensitive times of the year, such as the breeding and moulting periods.

**Residual Impact**

234. The residual impact would be of **negligible** significance.

### 10.6.5 Potential Impacts during Operation

235. As discussed in **Chapter 5 Project Description**, maintenance will be undertaken as required to check the integrity of the flood walls, sea walls and breakwater, and conduct any remedial works required. During the operation phase the following impacts have been considered:

- Increased disturbance to seals at haul-out sites.

#### 10.6.5.1 Operational Impact 1: Increased disturbance to seals at haul-out sites

236. For this assessment, it is assumed that the potential impacts would be the same as for the construction phase (see Section 10.6.4.4) and is therefore assessed as having a **negligible** (not significant) impact on seal species.

**Mitigation Measures and Residual Impact**

237. No mitigation measures are required. The residual impact would be of **negligible** significance

### 10.6.6 Potential Impacts during Decommissioning

238. No decision has been made regarding the final decommissioning policy for the offshore infrastructure of the proposed scheme as it is recognised that industry best practice, rules and legislation change over time.

239. However, the decommissioning of the proposed scheme is expected to consist of a similar process to construction. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. As discussed in **Chapter 5 Project Description**, a decommissioning plan will be submitted for approval by the regulatory authorities prior to construction. As such, for the purposes of a worst-case scenario, impacts no greater than those identified for the construction phase are expected for the decommissioning phase.

## 10.7 Cumulative Impact Assessment

240. This section describes the CIA for marine mammals and basking sharks and will consider the Hunterston Marine Construction Yard Proposals. Currently there are no other marine construction projects planned which could result in cumulative effects with the Millport FPS. This summary assessment is set out in Table 10-21 below.

241. The proposed improvements to Hunterston Marine Construction Yard have the potential to result in cumulative impacts with the Millport FPS. Peel Ports own Hunterston Marine Construction Yard which is currently underutilised. It is therefore planned to allow not only the construction but also the decommissioning or reverse engineering of large marine related structures. This will require improvements to the hammerhead quay (and associated dredging) and creation of dock gates to the existing dry dock. The proposals will take place within the Largs Channel (Fairlie Roads) coastal water body and is approximately 3km from the Millport Bay and therefore could result in cumulative impacts for underwater noise with the Millport FPS.

*Table 10-21 Potential Cumulative Impacts*

| Impact | Potential for Cumulative Impact | Data confidence | Rationale |
|---|---|---|---|
| Construction | | | |
| Impact 1a: underwater noise during dredging works | Yes | Medium | Where the piling and dredging works for the Hunterston proposal overlap with the construction of the Millport FPS, there could be potential for cumulative impact. |
| Impact 1b: Disturbance from underwater noise during rock dumping | Yes | Medium | |
| Impact 1c: Disturbance from underwater noise during vessel activities | Yes | Medium | |
| Impact 2: Disturbance (and potential habitat loss) to seal haul outs | No | Medium | As the works for the Hunterston proposal are over 3km from the seal haul out in Millport Bay no cumulative impacts are expected |
| Operation | | | |
| No impacts anticipated | | | |
| Decommissioning | | | |
| As a flood prevention scheme, the proposed scheme is anticipated to be maintained rather than removed and therefore decommissioning activities are currently unknown. This will be assessed at the time of any decommissioning activities required. | | | |

242. There is the potential for a cumulative impact to occur in marine mammal species should the construction of both the proposed scheme and the Hunterston proposal projects be constructed at the same time, particularly if any of the works overlap with the piling. However, durations and timings of the works at the Hunterston proposal are yet to be confirmed. The potential cumulative impact between the Millport FPS and the Hunterston proposals will therefore be assessed within the submission for the Hunterston proposals.

## 10.8 Inter-relationships

243. Table 10-22 lists out the inter relationships between other chapters within the ES.

*Table 10-22 Inter-topic relationships*

| Topic | Related Chapter | Where addressed in this chapter | Rationale |
|---|---|---|---|
| Commercial and recreational shipping | 13 | 10.6.4.3 & 10.6.4.4 | Vessel noise and disturbance - Baseline underwater noise and habituation of species present |
| Marine water and sediment quality | 7 | 10.6.1 | Scoped out |
| Fish and shellfish | 9 | 10.6.1 | Scoped out |
| Commercial and recreational shipping | 13 | 10.6.1 | Collisions – scoped out |

## 10.9 Interactions

244. The impacts identified and assessed in this chapter have the potential to interact with each other, which could give rise to synergistic impacts as a result of that interaction. The worst case impacts assessed within this chapter take these interactions into account and for the impact assessments are considered conservative and robust. For clarity, the areas of interaction between impacts are presented in Table 10-23 along with an indication as to whether the interaction may give rise to synergistic impacts.

*Table 10-23 Potential interaction between impacts*

| Potential interaction between impacts | | | | |
|---|---|---|---|---|
| Construction | 1a | 1b | 1c | 2 |
| 1a | | Yes<br>There is the potential for underwater noise from vessels, and dredging and rock placement activities to be present at the same time. | Yes<br>There is the potential for underwater noise from vessels, and dredging and rock placement activities to be present at the same time. | Yes<br>There is the potential for underwater noise from vessels, and dredging and rock placement activities to cause disturbance to seals hauled-out at the same time as disturbance to haul-out sites occurring. |
| 1b | Yes<br>There is the potential for underwater noise from vessels, and dredging and rock placement activities | | Yes<br>There is the potential for underwater noise from vessels, and dredging and rock | Yes |

| Potential interaction between impacts | | | | |
|---|---|---|---|---|
| | to be present at the same time. | | placement activities to be present at the same time. | |
| 1c | Yes<br>There is the potential for underwater noise from vessels, and dredging and rock placement activities to be present at the same time. | Yes<br>There is the potential for underwater noise from vessels, and dredging and rock placement activities to be present at the same time. | | Yes |
| 2 | Yes<br>There is the potential for underwater noise from vessels, and dredging and rock placement activities to cause disturbance to seals hauled-out at the same time as disturbance to haul-out sites occurring. | Yes<br>There is the potential for underwater noise from vessels, and dredging and rock placement activities to cause disturbance to seals hauled-out at the same time as disturbance to haul-out sites occurring. | Yes<br>There is the potential for underwater noise from vessels, and dredging and rock placement activities to cause disturbance to seals hauled-out at the same time as disturbance to haul-out sites occurring. | |
| Operation | 1 | | | |
| 1 | | | | |

245. While there is the potential for synergistic impacts between the construction impacts relating to underwater noise, it is likely that the presence of any of these activities will disturb any marine mammal from the area prior to any further impact from any further activity occurring (i.e. there cannot be any underwater noise impact from vessels on the site if any marine mammals are already excluded from the area due to disturbance; an impact that has also already been assessed for). Therefore, the interaction of these impacts during construction would not represent an increase in the significance level. Likewise, if any seals are disturbed from their haul-out sites during construction, then they cannot also be present in order to be at risk of any impact from underwater noise associated with the construction activities.

## 10.10 Summary

246. The main potential impacts of the proposed scheme on marine mammals and basking shark receptors have been identified. Two potential impacts during construction have been identified. A summary of the potential impacts and proposed mitigation is presented in Table 10-24.

*Table 10-24 Potential Impacts Identified for marine mammals and basking sharks*

| Potential Impact | Receptor | Sensitivity | Magnitude | Significance | Examples of Potential Mitigation Measures | Residual Impact |
|---|---|---|---|---|---|---|
| Construction | | | | | | |
| Impact 1: Auditory injury (PTS) from under water noise from all activities | All marine mammal species | High | Negligible / no impact | Minor (not significant) | None required. | Minor (not significant) |
| Impact 1: Injury from under water noise from all activities | Basking shark | Medium | Negligible / no impact | Minor (not significant) | None required. | Minor (not significant) |
| Impact 1: Behavioural response cumulative SEL for under water noise from all activities | All marine mammal species and basking shark | Medium | Negligible / no impact | Minor (not significant) | None required. | Minor (not significant) |
| Impact 2: Disturbance (and potential habitat loss) to seal haul outs | Grey and harbour seal | Medium | Negligible / no impact | Minor (not significant) | None required. Consideration will be given to the types and timing of construction activities undertaken and their potential to cause disturbance at the haul-out site. | Negligible |
| Operation | | | | | | |
| Impact 1: Disturbance (and potential habitat loss) to seal haul outs | Grey and harbour seal | Medium | Negligible / no impact | Minor (not significant) | None required. Consideration will be given to the types and timing of construction activities undertaken and their potential to cause disturbance at the haul-out site. | Negligible |

| Potential Impact | Receptor | Sensitivity | Magnitude | Significance | Examples of Potential Mitigation Measures | Residual Impact |
|---|---|---|---|---|---|---|
| Decommissioning | | | | | | |
| As a flood prevention scheme, the proposed scheme is anticipated to be maintained rather than removed and therefore decommissioning activities are currently unknown. This will be assessed at the time of any decommissioning activities required. | | | | | | |

## 10.11 References


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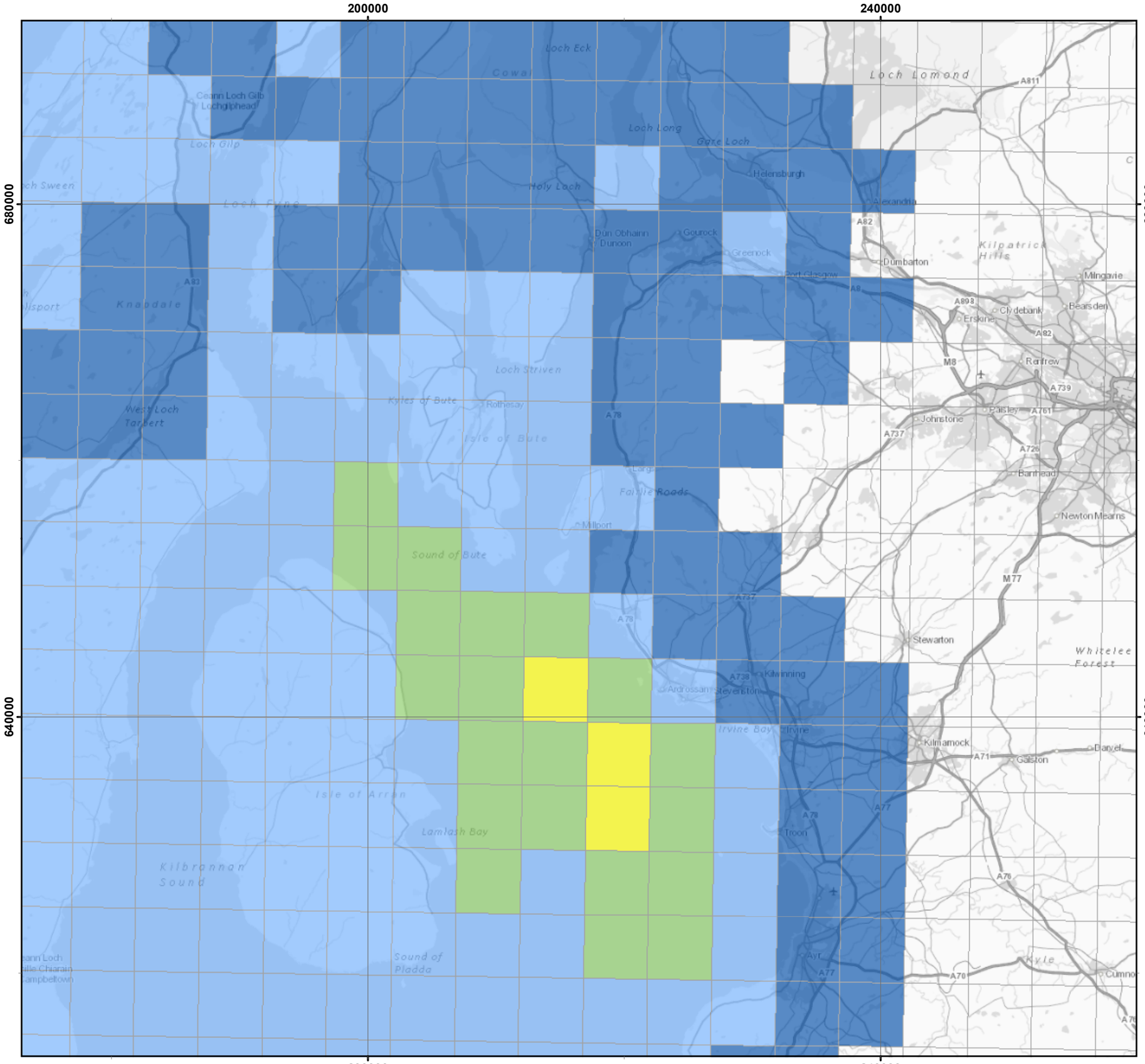

## Legend

★ Site Location

**HgSeaUsage** (Russell et al., 2017)

- 0 - 0.01
- 0.01 - 1
- 1 - 5
- 5 - 10
- 10 - 50
- 50 - 100
- 100+

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| Client: | Project: |
|---|---|
| North Ayrshire Council | Millport Flood Protection Scheme - EIA Report |

Title: Grey Seal Density Map

Figure: 10.1 | Drawing No:

| Revision: | Date: | Drawn: | Checked: | Size: | Scale: |
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Co-ordinate system: British National Grid

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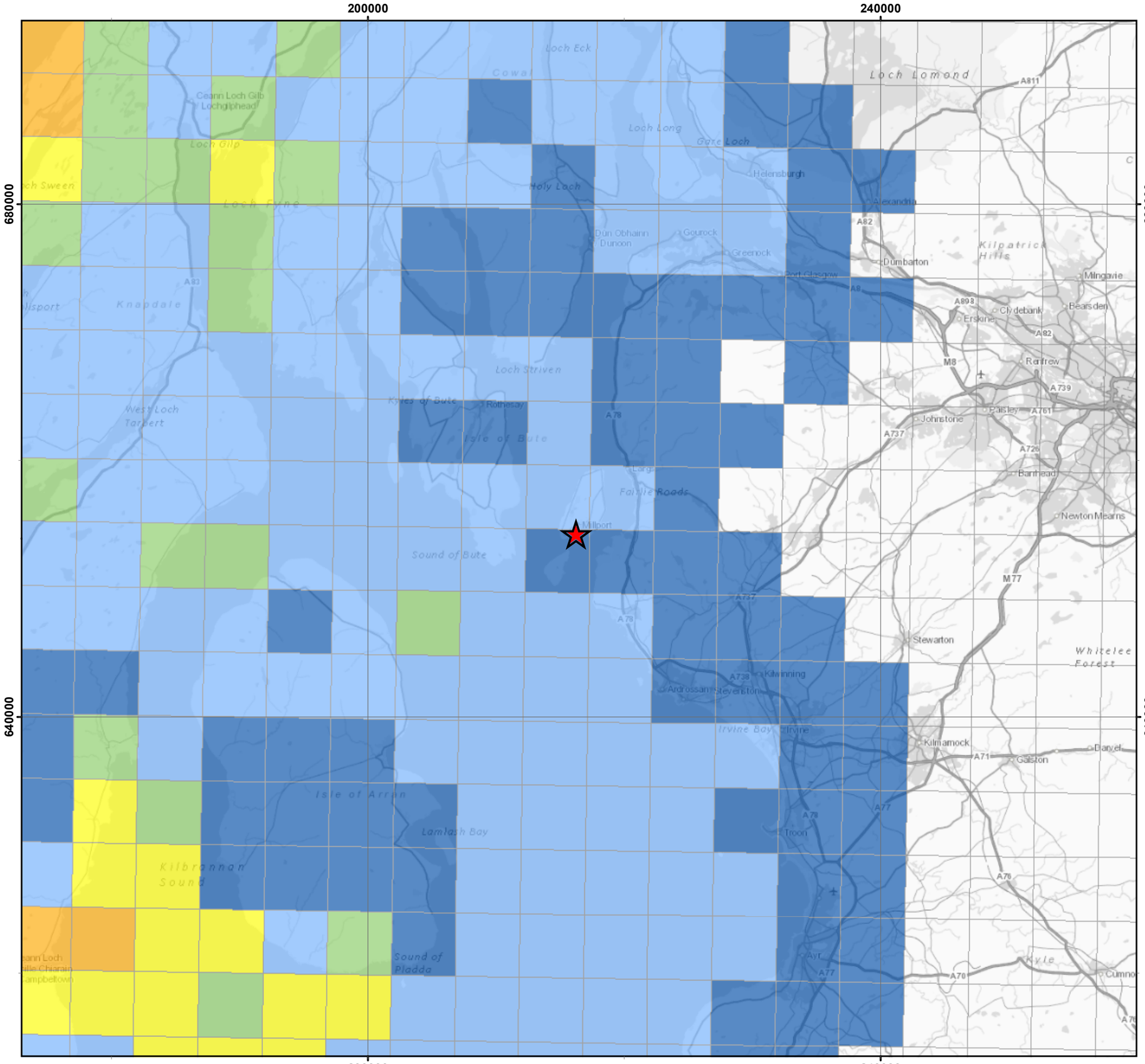

## Legend

Site Location

**PvSeaUsage** (Russell et al., 2017)

- 0 - 0.01
- 0.01 - 1
- 1 - 5
- 5 - 10
- 10 - 50
- 50 - 100
- 100+

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Title: Harbour Seal Density Map

Figure: 10.2 | Drawing No:

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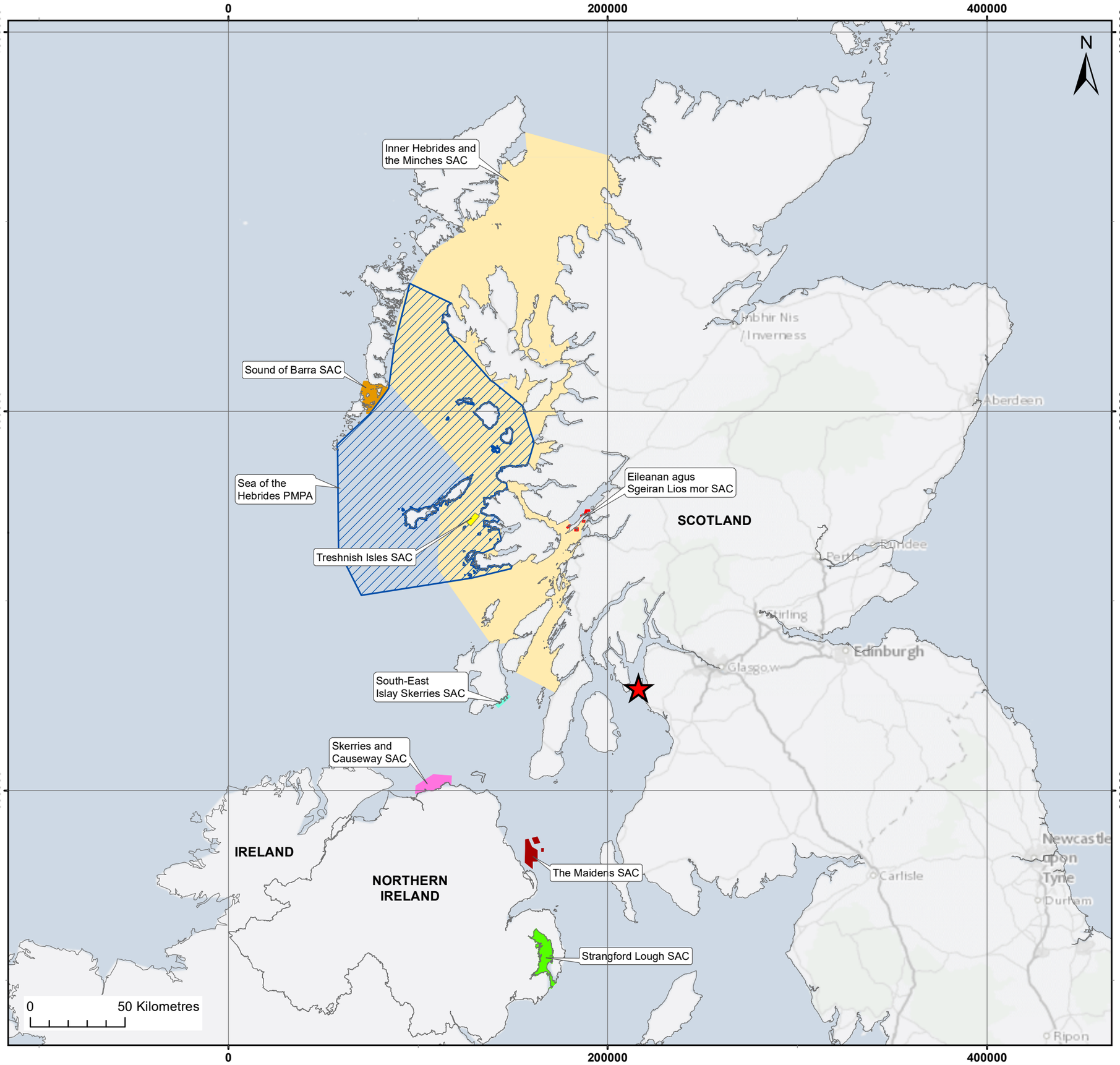

## Legend

- Site Location
- Proposed Marine Protected Area (PMPA)

**Special Areas of Conservation (SAC)**

- Eileanan agus Sgeiran Lios mor
- Inner Hebrides and the Minches
- Skerries and Causeway
- Sound of Barra
- South-East Islay Skerries
- Strangford Lough
- The Maidens
- Treshnish Isles

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Client: North Ayrshire Council

Project: Millport Flood Protection Scheme - EIA Report

Title: Marine mammal and basking shark designated sites

Figure: 10.3

Drawing No:

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Co-ordinate system: British National Grid

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