Chapter 15: Fish and Shellfish Ecology

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15.1 Introduction

This chapter presents the fish and shellfish Ecological Impact Assessment (EcIA) of the proposed HVDC consenting corridor. Both fish and shellfish ecological receptors are considered in this chapter and are evaluated in the context of nature conservation legislation and relevant planning policy (see Chapter 5: Planning Policy). This EcIA presents baseline information, anticipated Impacts upon fish and shellfish receptors during installation and operation, as well as considering potential decommissioning impacts. Mitigation is proposed where appropriate, cumulative impacts are considered, and finally the residual impacts and their significance are assessed.

This chapter is supported by the following Appendices:

- E.1: Electromagnetic Field (EMF) and Sediment Heating literature review: Ecological Recommendations (NorthConnect, 2018)

15.2 Legislation, Policy and Guidance

This section outlines relevant legislation, policy and guidance applicable to the assessment of the potential effects on fish and shellfish ecology associated with installation, operation, and decommissioning phases of the project.

15.2.1 Legislative Framework

There are a number of different legislative instruments that are relevant to the assessment of potential impacts to fish and shellfish communities. These are detailed below:

International

- EC Directive 92/43/EEC on Conservation of Natural Habitats and of Wild Fauna and Flora known as the 'Habitats Directive', adopted in 1992. It was transposed into UK law via the Conservation (Natural Habitats, &c.) Regulations 1994 and Conservation of Habitats and Species Regulations 2010. In Scotland, the Habitats Directive is transposed through a combination of the 1994 and 2010 Regulations. For offshore UK waters (12 nautical miles from the coast out to 200 nm or the limit of the UK Continental Shelf Designated Area) the Habitat Directive is transposed via the Conservation of Offshore Marine Habitats and Species Regulations 2017. Under these regulations, fish species listed in Annex II of the European Union (EU) Habitats Directive which are native to the UK should be conserved through the designation of Special Areas of Conservation (SACs). A number of Special Areas of Conservation (SACs) are designated for the conservation of Atlantic salmon on the North-east coast of Scotland. This species is also included under Schedule IV of the Habitats regulations, as animals which must be captured or killed using certain methods.
- EC Directive 2000/60/EC known as the 'Water Framework Directive' (or WFD) which is the framework for an integrated approach to protection, improvement and sustainable use of water bodies in Europe, and necessitates member states to ensure that they meet 'good status' for ecological and chemical quality elements. This includes coastal waters up to 1 nautical mile offshore, and river and transitional water bodies have a fish quality element that is assessed to determine their status.
- EC Regulation 1100/2007 known as the 'Eel Recovery Plan', which aims to ensure recovery of European eel stocks. Scotland developed its own Eel Management Plan in 2010 under this

Regulation for the Scotland RBD area, and shares responsibility for the Solway-Tweed RBD area with England.

National

- Wildlife and Countryside Act 1981 as amended. Schedule 5 of the Wildlife and Countryside Act provides a list of threatened species for which killing, injuring or taking by any method is prohibited. The Nature Conservation (Scotland) Act 2004, Part 3 and Schedule 6 make amendments to the Wildlife and Countryside Act (1981 as amended), strengthening the legal protection for threatened species to include 'reckless' acts.
- Marine (Scotland) Act 2010 which provides a framework system for improved management and protection of marine and coastal environments in Scottish territorial waters (up to 12NM). It included the establishment of Marine Scotland to act as the competent marine planning authority. It also included the designation of Scottish Marine Protected Areas (MPAs) to protect areas that are key in safeguarding the diversity of nationally rare or threatened and representative habitats and support functioning communities of species. The aim is to supplement existing marine protected areas such as SACs and SPAs. There are more than 180 MPAs in Scotland designated under the Marine (Scotland) Act 2010.
- Marine and Coastal Access Act (MCAA) 2009 which provides the legal mechanism to help ensure clean, healthy, safe, productive and biologically diverse oceans and seas by putting in place a new system for improved management and protection of the marine and coastal environment, for offshore waters around Scotland (from 12NM to the UK Exclusive Economic Zone (EEZ) limit).
- The Nature Conservation (Scotland) Act 2004, which was passed by Scottish Parliament to develop an integrated approach to long term protection and management enforcement measures surrounding Scotland's natural heritage. The Act placed obligations on public bodies to conserve biodiversity, increased protection for SSSIs, amended legislation on Nature Conservation Orders, provided for Land Management Orders for SSSIs and associated land, strengthens wildlife enforcement legislation, and requires the preparation of a Scottish Fossil Code.
- Scottish Biodiversity Strategy, which comprises the 2020 Challenge for Scotland's Biodiversity (response to the Aichi Targets set by the United Nations Convention on Biological Diversity, and the European Union's Biodiversity Strategy for 2020) and supplements Scotland's Biodiversity: It's in Your Hands (2004).

15.2.2 Policy Framework

Further to legislative drivers, there is a policy framework in place to guide the assessment of the project including the following policies:

- UK Marine Policy Statement (MPS) which aims to contribute to attaining sustainable development in marine UK waters and is the main policy in determining marine licence applications.
- United Kingdom Biodiversity Action Plan (UKBAP) which creates actions plans for UK BAP priority species and habitats in the UK. It is succeeded by the UK Post-2010 Biodiversity Framework (2012), which runs from 2011-2020.
- Scottish Biodiversity List which is a list of species and habitats that are considered to be of principal importance for biodiversity conservation in Scotland.

- OSPAR convention, which guides international collaboration on the protection of the marine environment of the North-East Atlantic. Scottish Natural Heritage (SNH) and the Joint Nature Conservation Committee (JNCC), in conjunction with Marine Scotland, have developed a priority list of marine habitats and species in Scotland's seas, known as Priority Marine Features (PMFs) (Howson *et al.*, 2012). The list is intended to ensure that marine planning decisions are consistent, and in line with Marine Scotland's vision for marine nature conservation outlined in the Marine Nature Conservation Strategy. This list of PMFs included a number of fish species which may be present along the proposed consenting corridor.
- Common Fisheries Policy, which comprise rules for managing European fishing fleets and for conserving fish stocks as a common resource. This is discussed further in the commercial fisheries chapter.

15.2.3 Guidance

The following guidance will apply to this assessment:

- The Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland (2016) is the primary source of guidance for the assessment. The aim of the guidance is to promote good practice in EcIA relating to marine, coastal and estuarine environments of the UK. It updates CIEEM's Terrestrial EcIA 2006 Guidelines and CIEEM's Marine EcIA Guidelines 2010.
- The International Union for Conservation of Nature (IUCN) has compiled a Red list of threatened species that are facing a high risk of global extinction. The list (IUCN, 2017) includes fish species that may be present in the vicinity of the project.
- The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) produced the OSPAR List of Threatened and/or Declining Species and Habitats, considered to be of conservation concern within the north-east Atlantic (OSPAR, 2008). A number of fish species on the list may be present in the vicinity of the project.
- The Centre for Environment, Fisheries and Aquaculture Science (CEFAS) have developed a guidance document for Environmental Impact Assessment for the licensing of offshore windfarms (CEFAS, 2004). This guidance is not directly applicable to HVDC interconnectors; however, the document provides guidance on the impacts associated with windfarm HVDC transmission links, which are relevant to this project. The guidance states that the installation and operation of HVDC cables has the potential to impact fish. It goes on to state that an Environmental Impact Assessment (EIA) should present information that describes the baseline within the project site, and the wider area, in relation to the presence and importance of fish.
- Assessment of the environmental impacts of cables (OSPAR, 2009), which assesses the environmental impacts of sea cables in terms of their relevance for the area covered by the Convention.

15.2.4 Consultation

Responses to comments made in the Marine Scotland Scoping Opinion (July 2016) and Aberdeenshire Council Scoping Opinion (May 2016) are presented in Chapter 4: Consultation, Table 4.1. Post receipt of the Scoping Opinions, data requests have been placed with Scottish Natural Heritage (SNH), Scottish Environment Protection Agency (SEPA), Marine Scotland and a number of the District Salmon Fisheries Boards (DSFB's) in January and February 2018. This was done to identify whether these organisations

have existing available data, or have conducted any surveys, which may assist in the characterisation of the current status, abundance, distribution and/or diversity of the fish and shellfish populations of the relevant ICES areas IVa and IVb, and Scottish rivers upstream of the project.

A small amount of in-river electrofishing data was provided by SEPA, but no additional marine fisheries or shellfish survey or characterisation data was identified or made available.

15.3 Assessment Methodology

15.3.1 Overview

The identification and assessment of the potential fish and shellfish effects associated with the project was conducted in accordance with the CIEEM guidelines for EcIA (CIEEM, 2016). The method considers the importance (value / sensitivity) of the relevant ecological features and the magnitude of impacts, to determine an overall significance of effect upon these features. This method takes into account effect direction (beneficial or adverse), confidence, extent, duration, timing, frequency and reversibility.

The assessment approach was based on the conceptual 'source-pathway-receptor' model. This model was used to identify the likely impacts resulting from the installation, operation and decommissioning phases of the project. This model provided a transparent assessment route between impact sources and potentially sensitive receptors. The parameters of this model are defined as follows:

- **Source**: the origin of a potential impact (i.e. a project activity leading to an impact). Potential impact sources may have several pathways and receptors. For example, a potential impact source such as jetty foundation installation may result in several potential impacts such as resuspension of sediments, seabed abrasion and removal of substrata or underwater noise, which may each affect a number of receptors via different pathways.
- **Pathway**: the means by which the impact of the activity could influence a receptor. For the example above, resuspended sediment could settle across the seabed, or seabed disturbance could cause temporary or permanent habitat loss.
- **Receptor**: the element of the receiving environment which is affected by an impact. For the example above, demersal fish species living on or in the seabed could be smothered by the deposited sediments which could affect their movement, feeding or respiration.

The assessment was quantitative where suitable data, evaluation and assessment methods were available and otherwise was qualitative, based on a combination of empirical data, published literature and professional judgement.

Iterative steps involved in the assessment approach included:

- Determination of potential impact sources associated with the project (activities) and potential impacts;
- Definition of the fish and shellfish receptors within the zone of influence of the project;
- Determination of potential interactions between impacts and fish and shellfish receptors. At this point some impact / receptor combinations will be screened out, also considering those scoped out in the Scoping Report (NorthConnect, 2016);
- Determination of the value and sensitivity of fish and shellfish receptors;
- Assessment of the magnitude of impacts (considering embedded mitigation measures);
- Assessment of the significance of effects upon fish and shellfish receptors (with embedded mitigation measures in place), including interacting or synergistic effects from the project;

- Proposal of additional mitigation measures to reduce, prevent or where possible offset any significant adverse effects of the project;
- Assessment of the residual effects (i.e. effects after any additional mitigation measures have been considered); and
- Assessment of cumulative effects upon fish and shellfish receptors, considering other plans or projects in development. A full list of the other plans or projects considered is presented in Chapter 6: Cumulative Effects.

Further details for the assessment approach are provided in Section 15.3.4.

15.3.2 Desk Study

To enable the definition of fish and shellfish receptors and an assessment of potential effects of the project on these receptors, it was necessary to first establish the baseline (or existing) environment by conducting a desk-based review of grey and published literature, and examining available data including previous surveys conducted in the vicinity of the project.

Key data sources and information obtained from the desk-based review for fish and shellfish is summarised in Section 15.4 below. It was concluded that sufficient data for the fish and shellfish receptors likely to be affected by the project was available to conduct the assessment, supplemented by the detailed seabed habitat data collected by the benthic ecology field survey as described in Chapter 14: Benthic Ecology, Section 14.3.3, and no further targeted field surveys would significantly improve the confidence in the assessment.

15.3.3 Field Surveys

As discussed in Section 15.3.2 above, no targeted field surveys for fish and shellfish receptors have been conducted.

15.3.4 Impact Assessment Methodology

The general approach to the EIA is described in Chapter 3: Methodology, including the approach to assessing the significance of effects based on the magnitude of impact and value/sensitivity of receptor. The following section should therefore be read in conjunction with Chapter 3: Methodology.

The value of each fish and shellfish receptor was determined based on consideration of the factors outlined in Table 15.1.

Table 15.1 Receptor Value Criteria for Fish and Shellfish

Value	Definition
Very High	• An internationally designated site or potential/candidate site for designation (SPA, pSPA, SAC, cSAC, pSAC or Ramsar site) or an area which the Statutory Nature Conservation Body (SNCB) has determined meets the published selection criteria for such designation, irrespective of whether or not it has yet been notified. • Internationally significant and viable areas of a habitat type listed in Annex 1 of the Habitats Directive. • Globally threatened species (Critically endangered or endangered on IUCN Red list) or species listed on Annex 1 or 2 of the Bern Convention. • Regularly occurring populations of internationally important species that are rare or threatened in the UK or of uncertain conservation status. • A regularly occurring, nationally significant population/number of any internationally important species. • Habitats or species that are highly regarded for their important biodiversity, social, community and / or economic value.
High	• A nationally designated site (such as a Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR), Marine Nature Reserve (MNR) or Marine Conservation Zone (MCZ)) or a discrete area which the SNCB has determined meets the published selection criteria for national designation (such as SSSI selection guidelines) irrespective of whether or not it has yet been notified. • Regularly occurring, globally threatened species (Vulnerable or lower on IUCN Red list) or species listed on Annex 3 of the Bern Convention. • UK Post-2010 Biodiversity Framework habitats and species, Priority Marine Features or Scottish Biodiversity List • Habitats or species that possess important biodiversity, social, community and / or economic value.
Medium	• Viable areas of key habitat identified in the Regional/County BAP or smaller areas of such habitat which are essential to maintain the viability of a larger whole. • Viable areas of key habitat identified as being of Regional value in the appropriate Natural Area profile. • Water Framework Directive biological quality element. • Any regularly occurring significant population that is listed in a Local Red Data Book. • Significant populations of a regionally/county important species. • Habitats or species that possess moderate biodiversity, social, community and / or economic value.

Value	Definition
Low	• Areas of habitat identified in a sub-County (District/Borough) BAP or in the relevant Natural Area profile. • District sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves selected on District/Borough ecological criteria (District sites, where they exist, will often have been identified in local plans). • Sites/features that are scarce within the District/Borough or which appreciably enrich the District/Borough habitat resource. • Habitats or species that are abundant, common or widely distributed. • Habitats or species that possess low biodiversity, social, community and / or economic value.
Negligible	• No site designation for areas of habitat. • Species present are common and widespread. • Habitats or species that are not considered important for their biodiversity, social, community and / or economic value.

The magnitude of impacts were assessed based on consideration of the criteria in Table 15.2 and taking into account the application of any embedded mitigation measures to be incorporated at the installation, operation or decommissioning phases. Where embedded mitigation has been considered this has been clearly indicated within the impact assessment.

Table 15.2 Impact Magnitude Criteria for Fish and Shellfish.

Magnitude	Definition
Major	**Habitat:** Impact causes changes to a large proportion of the receptor habitat extent or community composition, resulting in change of function of the wider habitat, that is not reversible through natural recruitment or recolonisation (permanent effect) or not reversible for several generations (temporary, long-term effect). **Species:** Impact causes changes to a large proportion of the receptor species population, resulting in a decline in the abundance of the overall population, that is not reversible through natural recruitment or recolonisation (permanent effect) or not reversible for several generations (temporary, long-term effect).
Moderate	**Habitat:** Impact causes a change to part of the receptor habitat extent or community composition, but does not result in change of function of the wider habitat, that is not reversible through natural recruitment or recolonisation (permanent effect) or not reversible for several generations (temporary, long-term effect) **or** impact causes changes to a large proportion of the receptor habitat extent or community composition, resulting in change of function of the wider habitat, that is reversible through natural recruitment or recolonisation in up to two generations (temporary, short-term effect). **Species:** Impact causes a change to part of the receptor species population but does not result in a decline in the abundance of the overall population, that is not reversible through natural recruitment or recolonisation (permanent effect) or not reversible for several generations (temporary, long-term effect) **or** impact causes a change to a large proportion of the receptor species population resulting in a decline in the abundance of the overall population, that is reversible through natural recruitment or recolonisation in up to two generations (temporary, short-term effect).
Minor	**Habitat:** Impact causes a change to part of the receptor habitat extent or community composition, but does not result in change of function of the wider habitat, that is reversible through natural recruitment or recolonisation in up to two generations (temporary, short-term effect). **Species:** Impact causes a change to part of the receptor species population but does not result in a decline in the abundance of the overall population that is reversible through natural recruitment or recolonisation in up to two generations (temporary, short-term effect).
Negligible	**Habitat:** Impact causes an effect on the receptor habitat that is not likely to change the extent or community composition of the wider habitat. **Species:** Impact causes an effect on the receptor species population that is undetectable or within the range of natural variation.
No Change	Impact causes no effect or has no interaction with the receptor.

Based on the value/sensitivity of the receptor and the magnitude of the potential impact, the significance of effect was then determined based on consideration of the matrix in Table 15.3.

Table 15.3 Categorising Significance of Effects for Fish and Shellfish.

Magnitude of Impact	Sensitivity/Value of Receptor				
	Very High	**High**	**Medium**	**Low**	**Negligible**
Major	Major	Major	Moderate	Minor	Minor
Moderate	Major	Moderate	Moderate	Minor	Negligible
Minor	Moderate	Moderate	Minor	Minor	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible
No Change	No Change	No Change	No Change	No Change	No Change

Key:

	Significant Effect
	Non-Significant Effect

For the purposes of this EIAR, an impact which has the potential to result in a significant effect on the environment has been defined as a moderate or major significance of effect (see Table), and mitigation is proposed where possible to prevent, reduce or offset the effect. Residual effects on fish and shellfish receptors (i.e. effects following implementation of specific mitigation measures) were then identified and their significance determined.

Consequently, a significance of effect determined to be minor or lower is considered not to be significant in terms of the EIA Regulations. For these effects, secondary mitigation measures have not been proposed to reduce the significance of the effect.

For each significance of effect determined for each receptor/impact combination, the assessment has indicated whether the effect is beneficial or adverse, and an assessment of the confidence in the assessment has been provided. The definitions for classifying the confidence in the assessment are provided in Table 15.4.

Table 15.4 Confidence in Assessment of Significance of Effects

Confidence	Guideline	Evidence base to evaluate likelihood of effects
High	Probability estimated at 95% chance or greater	Scientific evidence and project information is detailed, consistent and extensive. Studies are based on consideration of same pressures arising from similar activities, acting on the same type of receptor in comparable areas (i.e. UK).
Medium	Probability estimated above 50% but below 95%	Scientific evidence and project information is available but variable in detail, consistency and volume. Studies are based on consideration of same pressures arising from similar activities, acting on the same type of receptor in comparable areas (i.e. UK) or similar pressures on receptor/similar receptor in other areas (i.e. outside UK).
Low	Probability estimated at below 50%	Scientific evidence and project information is limited in availability, and variable in detail, consistency and volume. Studies are not based on consideration of same pressures arising from similar activities, acting on the same type of receptor in comparable areas (i.e. UK) or similar pressures on receptor/similar receptor in other areas (i.e. outside UK), but are based on more distant habitats, species or populations being affected by other pressures.

15.3.5 Limitations of Assessment

Conditions at or near to the project will be subject to change over time, with species movement both into and out of the area, and habitat changes. Therefore, this assessment reflects the conditions recorded at the time of the project-specific surveys and most recent desk study data available, as well as consideration of existing knowledge on the potential trends in the baseline in the future.

Description of the baseline for fish and shellfish has relied on a variety of published data sources of varying ages and survey methods, each with their own uncertainties and limitations, to develop the understanding of likely species populations present, and their extent, abundance and health.

15.4 Baseline Information

To develop an understanding of the fish and shellfish environmental baseline, a desk-based review was undertaken to characterise the diversity, abundance and distribution of relevant fish and shellfish species likely to be present within the vicinity of the project. This desk-based review was supported by the benthic ecology surveys conducted by NorthConnect (and described further in Chapter 14: Benthic Ecology) to identify the presence of certain habitats important for spawning fish. Sources of information included:

- Published data on diversity, abundance and spawning areas of fish and shellfish in the North Sea;
- Available fisheries survey data and records from Marine Scotland, SEPA and ICES; and

- Relevant academic literature and papers, reports and books.

The Greater North Sea, shown in Figure 15.1, is inhabited by approximately 230 species of fish (OSPAR, 2013). For the purposes of describing the fish and shellfish baseline for the project, species have been split into the following categories:

- Designated sites (for fish and shellfish species);
- Diadromous fish species;
- Elasmobranch species;
- Marine demersal fish species;
- Marine pelagic fish species;
- Cephalopods;
- Crustaceans;
- Molluscs; and
- Spawning and nursery grounds.

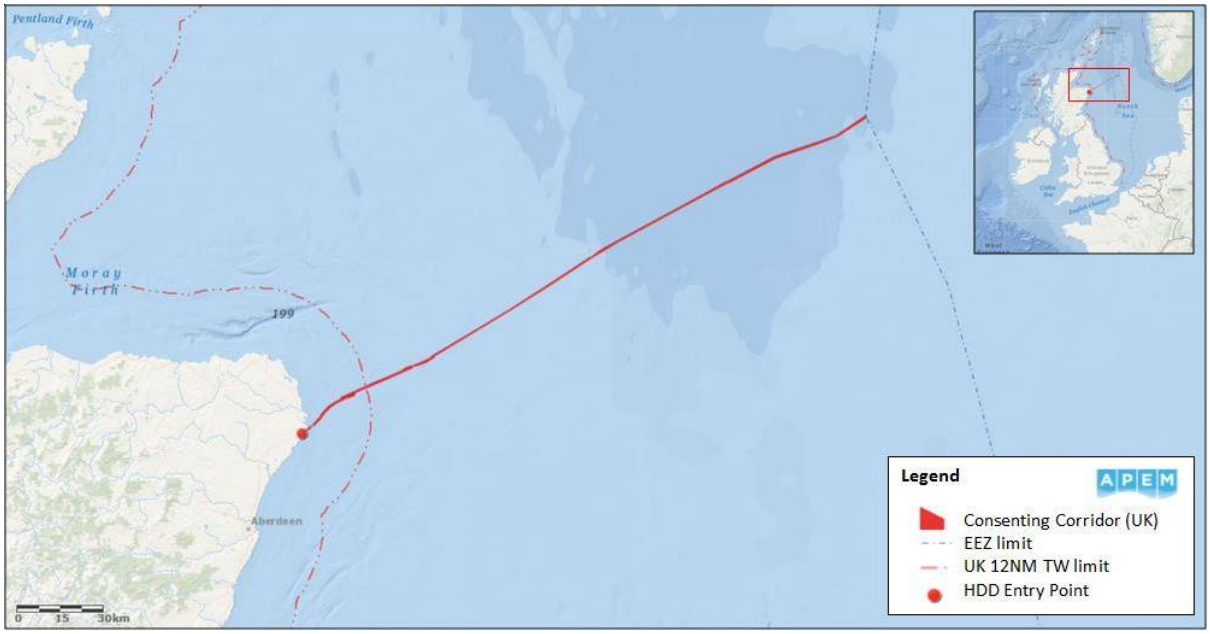

Figure 15.1 The Greater North Sea in UK Waters, between the coast of Scotland and Norway and the NorthConnect Consenting Corridor.

15.4.1 Designated Sites (for Fish and Shellfish Species)

The following sites within the vicinity of the project, shown in Figure 15.2, have been designated for their fish and shellfish species and populations under The Conservation of Habitats and Species Regulations 2010, Marine (Scotland) Act 2010, Conservation of Offshore Marine Habitats and Species Regulations 2017 and the Marine and Coastal Access Act 2009. Given the mobile nature of many fish species and their extensive migrations, those sites that the project is within or adjacent to are considered, and also those sites where individuals from the population may migrate past the consenting corridor as part of their lifecycle. These sites are designated for protection from development and other activities that may affect their biodiversity interest.

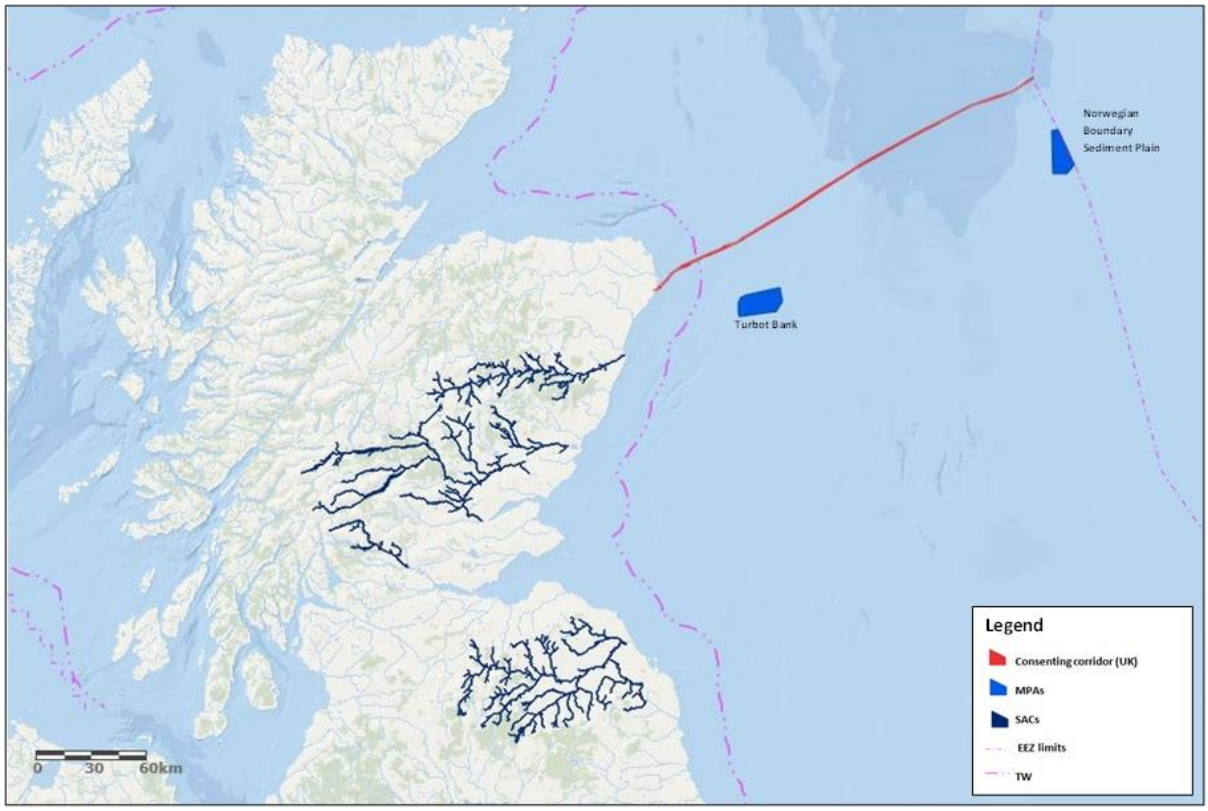

Figure 15.2 Designated sites (Special Areas of Conservation (SACs) and Marine Protected Areas (MPAs) within the Vicinity of the Project.

15.4.1.1 River Dee SAC

The River Dee and its tributaries, approximately 40km to the south west of the project, have been designated as a SAC as they provide a valuable habitat for important populations of several Annex II fish and shellfish species including Atlantic salmon *Salmo salar* and freshwater pearl mussel *Margaritifera margaritifera*.

15.4.1.2 River South Esk SAC

The River South Esk, approximately 95km to the south west of the project, has been designated as a SAC as it provides a valuable habitat for important populations of fish and shellfish species Atlantic salmon and freshwater pearl mussel.

15.4.1.3 River Tay SAC

The River Tay, approximately 125km to the south west of the project, has been designated as a SAC for its populations of Atlantic salmon, sea lamprey, brook lamprey and river lamprey *Lampetra fluviatilis*.

15.4.1.4 River Teith SAC

The River Teith, approximately 225km to the south west of the project, has been designated as a SAC for its populations of sea lamprey, brook lamprey, river lamprey and Atlantic salmon.

15.4.1.5 River Tweed SAC

The River Tweed, 200km to the south of the project, has been designated as a SAC for its populations of Atlantic salmon, sea lamprey, river lamprey and brook lamprey.

15.4.1.6 Turbot Bank MPA

The Turbot Bank Marine Protected Area (MPA) is located approximately 30km to the south of the project, and is designated for sandeels (*Ammodytes* spp.), as it encompasses an area where high numbers of sandeels have been found. Sandeels are designated as a Scottish Priority Marine Feature (PMF).

15.4.1.7 Norwegian Boundary Sediment Plain MPA

The Norwegian Boundary Sediment Plain MPA is located approximately 20km to the south of the project. It is designated for its ocean quahog *Arctica islandica* aggregations (including sands and gravels as their supporting habitat) and aims to protect them from potential deterioration from fishing activity. The ocean quahog is designated as a Scottish PMF.

15.4.1.8 Summary of Designated Sites

A summary of the fish and shellfish designated site receptors, along with their assigned value is presented in Table 15.5.

Table 15.5 Summary of Designated Site Receptors

Designated site receptor	Fish and shellfish qualifying feature species	Designated site receptor value	Justification
River Dee SAC	Atlantic salmon Freshwater pearl mussel	**Very high**	An internationally designated site (SAC)
River South Esk SAC	Atlantic salmon Freshwater pearl mussel	**Very high**	An internationally designated site (SAC)
River Tay SAC	Atlantic salmon River lamprey Sea lamprey Brook lamprey	**Very high**	An internationally designated site (SAC)
River Teith SAC	Atlantic salmon River lamprey Sea lamprey Brook lamprey	**Very high**	An internationally designated site (SAC)
River Tweed SAC	Atlantic salmon River lamprey Sea lamprey Brook lamprey	**Very high**	An internationally designated site (SAC)
Turbot Bank MPA	Sandeel species	**High**	A nationally designated site (MPA)
Norwegian Boundary Sediment Plain MPA	Ocean quahog	**High**	A nationally designated site (MPA)

15.4.2 Diadromous Fish Species

Diadromous fish species comprise those that migrate from saltwater to freshwater to spawn (anadromous migrants) and those that migrate from freshwater to saltwater to spawn (catadromous

migrants). Relevant diadromous species that are likely to pass the project either as part of their spawning migrations, or during foraging or maturation lifestages are:

- Atlantic salmon *Salmo salar*;
- Anadromous brown trout (or "sea trout") *Salmo trutta*;
- Sea lamprey *Petromyzon marinus;*
- River lamprey *Lampetra fluviatilis;* and
- European eel *Anguilla anguilla*.

Atlantic salmon, sea trout, river lamprey and sea lamprey are all anadromous, and as such their spawning and nursery grounds are located in fresh water rivers (Maitland, 2004; Malcolm *et al.*, 2010). The European eel is catadromous, and reproduces in saltwater. Current understanding is that European eels spawn in the Sargasso Sea (Schmidt, 1923; Miller et al., 2014), but with the potential for other more distant spawning grounds (van Ginneken and Maes, 2005).

Spawning populations of Atlantic salmon are known to be present along numerous rivers on the eastern coast of Scotland and England, with the closest being the River Ugie, which enters the sea approximately 7km north of the project, and the River Ythan, 20km to the south. Other nearby rivers with larger Atlantic salmon populations are the River Tay, River Dee, River Deveron, River Earn, River Forth, River South Esk and River Tweed. Atlantic salmon post-smolts migrate to foraging grounds to the west of Greenland and the Faroe Islands, and as such the individuals leaving their rivers as post-smolts will migrate in a general northward direction to their foraging and maturation grounds (Malcolm *et al.*, 2010). Individuals departing from or returning to the rivers listed above will therefore, have to cross the consenting corridor during their migration.

Less information is available on the migration of sea trout on the east of Scotland, with only limited tracking work conducted on the Scottish West Coast and in Norway, as well as mark-recapture studies undertaken from the South Esk and Brvie (Malcolm, 2010; Nall, 1935; Shearer, 1990). These studies indicated that sea trout in general remain within approximately 10 nautical miles (NM) from their natal rivers, however some larger migrations exceeding 200NM were recorded. Individuals leaving their rivers along the east coast of Scotland as post-smolts may also therefore move into the vicinity of the project in the course of their marine migration and residency phase.

Juvenile electrofishing data and adult rod catch data from SEPA [received January 2018] for a series of rivers on the east coast of Scotland with appreciable Atlantic salmon and sea trout populations is presented in Figures 15.3-15.5. From this data, it would appear that densities of juvenile Atlantic salmon have declined in the last 10 years on the rivers Earn, South Esk, Ugie and Forth, whilst on the Dee and Ythan there has been an increase in density, before declines in recent years. Trout densities have varied historically in these rivers with no clear trend evident.

Rod catches of Atlantic salmon adults collated by SEPA [received January 2018] in the Rivers Deveron, Ythan, South Esk, Forth and Tay have remained relatively consistent since the 1950's. Catches in the Dee have declined since 1952, whilst catches in the Tweed have increased since 1952. Rod catches were highest in the Tweed and the Tay, which are two notable rivers for salmon populations and salmon fishing in Scotland. More recently, however, slight decreases in rod catches are noticeable from the time series. For trout, recorded rod catches decreased since 1952 in the Rivers Ythan and Ugie, remained stable on the Deveron and Tay and increased in the Dee, Forth and Tweed.

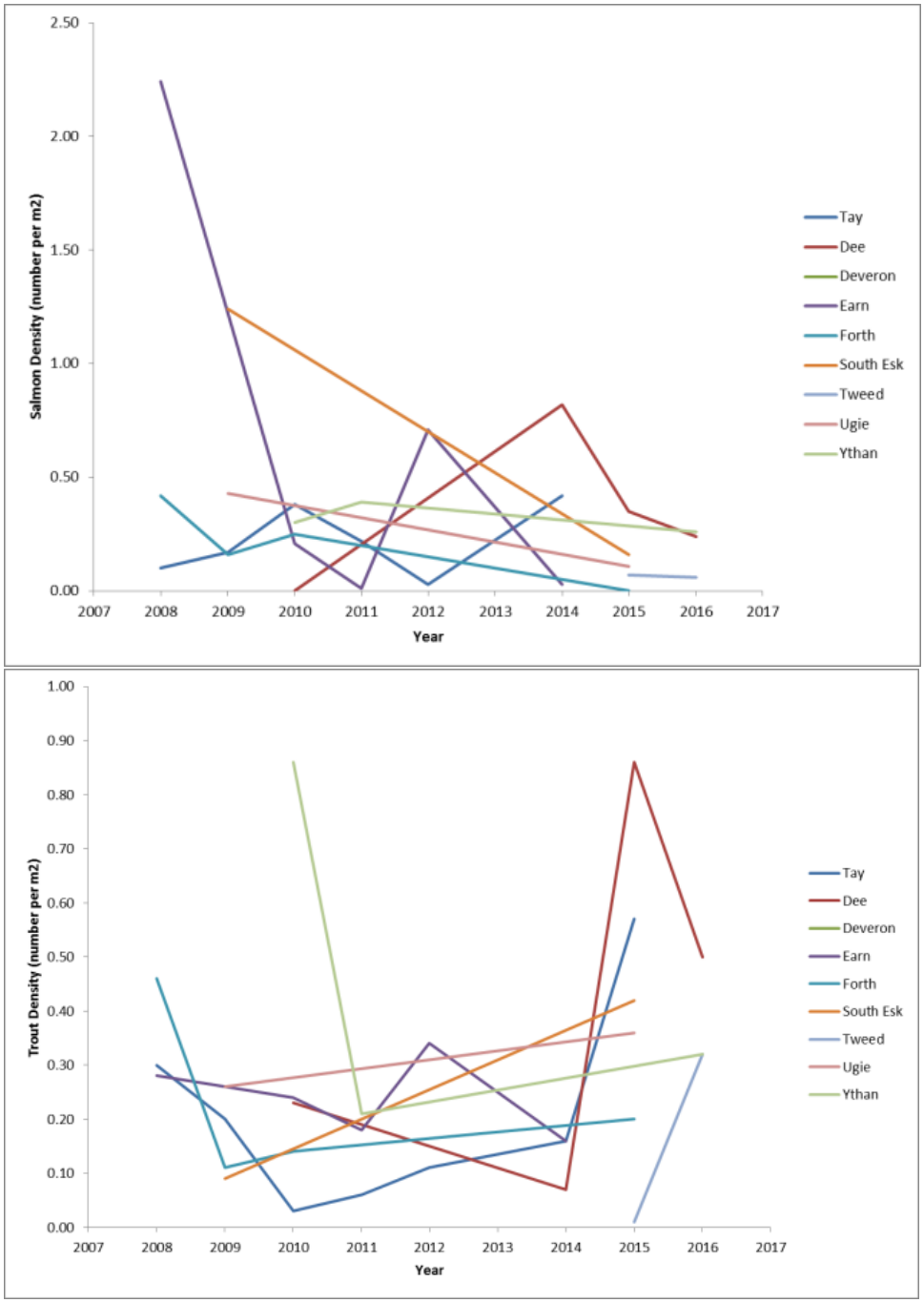

Figure 15.3 Atlantic Salmon and Sea Trout Juvenile Densities in Scottish Rivers from 2007 to 2016

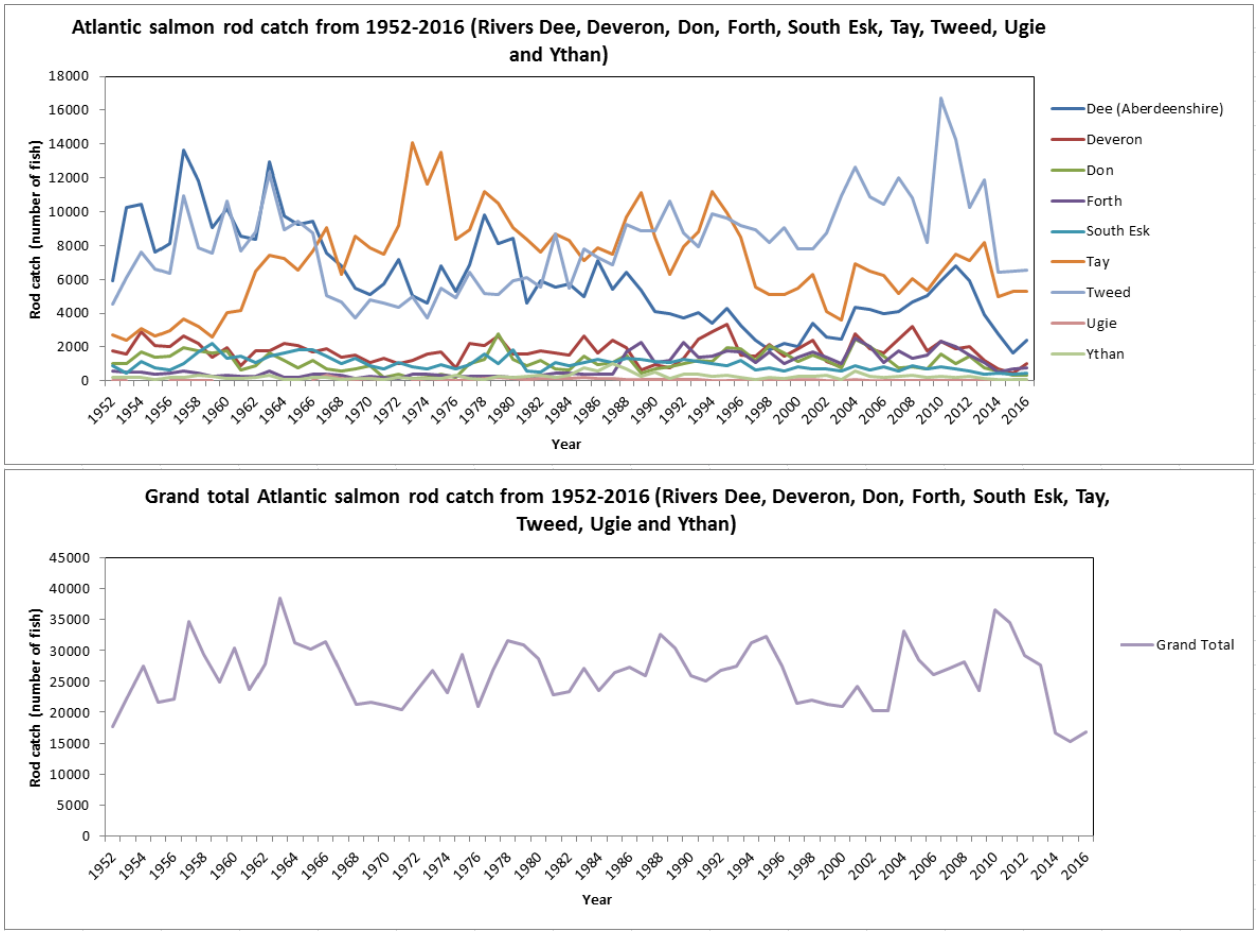

Figure 15.4 Atlantic Salmon Rod Catches in Scottish Rivers from 1952-2016.

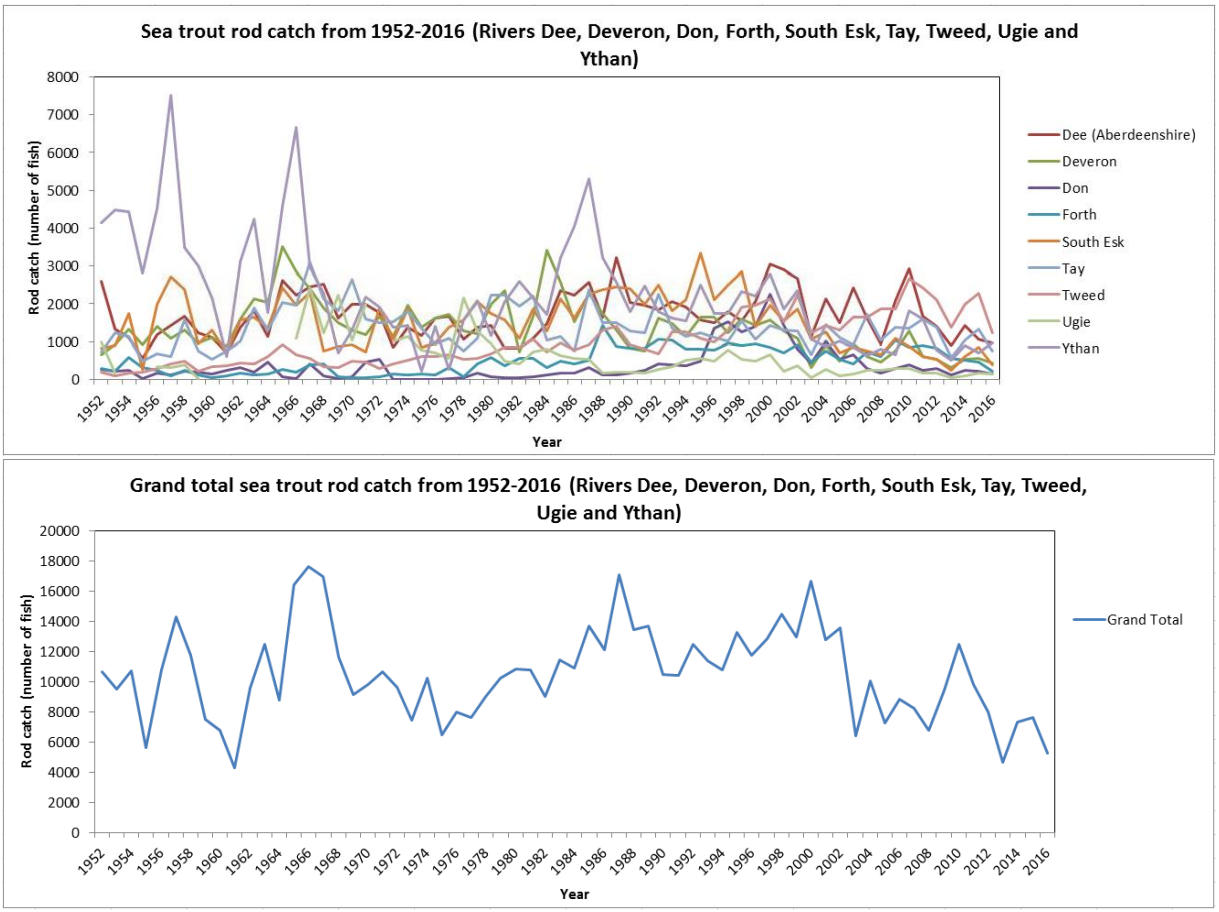

Figure 15.5 Sea Trout Rod Catches in Scottish rivers from 1952-2016

Very little information is known about the marine distribution and migration routes of the river lamprey, sea lamprey or European eel, however, the species are known to utilise rivers on the eastern coast of Scotland for spawning and foraging or, in the case of European eel, foraging only (Malcolm *et al.*, 2010; van Ginneken and Maes, 2005; Maitland, 2004). It is therefore likely that these species will be present within the vicinity of the consenting corridor during marine migration or residency.

European smelt *Osmerus eperlanus,* Atlantic sturgeon *Acipenser sturio,* twaite shad *Alosa fallax* and allis shad *Alosa alosa* may also be present in the vicinity of the consenting corridor during their periods of marine residency but their presence is likely to be rare given there are no spawning populations in Scottish Waters (Maitland, 2003; Aprahamian et al. 2003; Maitland and Lyle, 1996), and are therefore not considered further within the assessment.

Given the nature of the watercourses along the onshore cable corridor as small drains and the lack of connectivity with the sea due to the presence of the Longhaven Cliffs, they are not anticipated to support appreciable populations of any of these diadromous fish species and so are not considered further.

15.4.2.1 Summary of Diadromous Fish Species Receptors

A summary of the diadromous fish species receptors relevant to the project, along with their assigned value is presented in Table 15.6.

Table 15.6 Summary of Diadromous Fish Species Receptors

Diadromous fish species receptor	Diadromous fish species receptor value	Justification
Atlantic salmon *Salmo salar*	**Very high**	Habitats Directive Annex II Species
Sea trout *Salmo trutta*	**High**	Priority Marine Feature (PMF)
European eel *Anguilla anguilla*	**Very high**	IUCN Red List 'Critically Endangered'
Sea lamprey *Petromyzon marinus*	**Very high**	Habitats Directive Annex II Species
River lamprey *Lampetra fluviatilis*	**Very high**	Habitats Directive Annex II Species

15.4.3 Elasmobranch Species

Elasmobranchs are cartilaginous fish comprising sharks, skates and rays, and are characterised by slow growth, late maturity, low fecundity and productivity. Twelve of the elasmobranch species on the UK Post-2010 Biodiversity Framework list occur within Scottish waters. These are listed in Table 15.7 along with their associated legal and policy protection. The other elasmobranch species on the UK Post-2010 Biodiversity Framework which are excluded are the shortfin mako *Isurus oxyrinchus*, undulate ray *Raja undulata* and white skate *Rostroraja alba*, which given their geographic extent are unlikely to be present within the vicinity of the project. Other elasmobranch species, such as the Spotted ray *Raja montagui* and thornback ray *Raja clavata,* are also known to inhabit the waters around the project (Paramor *et al*, 2009).

Currently elasmobranch species in the North Sea are subject to spatial management measures, due to historic exploitation by targeted fisheries severely depleting stocks. In recent times, bycatch from demersal fisheries continues to impede recovery of many species (ICES, 2012).

Basking sharks are listed as "Endangered" on the Red List of European marine fish (Nieto *et al.*, 2015). Marked seasonality of basking shark sightings and significant correlation between the duration of the sightings season in each year and the North Atlantic Oscillation, has been reported (Witt *et al.*, 2012). Results within ICES (2017a) indicate a relatively large stock, and/or that the stock size may not be adequately traced by surface sightings.

Both the spurdog and tope shark give birth to live young, however, there is insufficient data available to establish the locations and temporal stability of the parturition grounds of these species (Ellis *et al.*, 2012). The common skate and spotted ray both deposit egg cases on hard substrate on the sea bed, but again, there is insufficient data on the occurrence of egg-cases, or egg-bearing females with which to delineate spawning grounds (Ellis *et al.*, 2012). As the majority of the consenting corridor is soft substrate (see Chapter 14: Benthic Ecology and MMT, 2017) then limited deposition of eggs of these species along the consenting corridor is expected.

Fisheries data indicates extremely high levels of population depletion of common skate around the UK since the early 20th century, and it has been extirpated from most inshore areas, but is still caught in Scottish waters (Abdulla, 2004; Dulvy *et al.*, 2006).

Table 15.7 Marine Elasmobranchs in Scottish Waters with Legislation and Convention Protection

Species	UK Post-2010 Biodiversity Framework	Scottish Biodiversity List	OSPAR Annex V.	IUCN Red List	Priority Marine Feature	Wildlife and Countryside Act 1981 (as amended in 1985)	The Conservation of Habitats and Species Regulations 2010	Convention on the Conservation of European wildlife and natural habitats (Bern Convention)	Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
Angel Shark *Squatina squatina*	y		y	y		y			
Basking Shark *Cetorhinus maximus*	y	y	y	y	y	y		y	y
Blue Shark *Prionace glauca*	y			y					
Common Skate *Dipturus batis*	y	y	y	y	y				
Gulper Shark *Centrophorus granulosus*	y		y	y					
Kitefin Shark *Dalatias licha*	y								
Leafscale gulper shark *Centrophorus squamosus*	y		y	y	y				
Porbeagle Shark *Lamna nasus*	y		y	y	y			y	
Portuguese Dogfish *Centroscymnus coelolepis*	y		y	y	y				
Sandy Ray *Leucoraja circularis*	y			y	y				
Spurdog or Spiny Dogfish *Squalus acanthias*	y		y	y	y				
Tope Shark *Galeorhinus galeus*	y			y					

15.4.3.1 Summary of Elasmobranch Species Receptors

A summary of the elasmobranch species receptors relevant to the project, along with their assigned value is presented in Table 15.8.

Table 15.8 Summary of Elasmobranch Species Receptors

Elasmobranch species receptor	Elasmobranch species receptor value	Justification
Angel Shark *Squatina squatina*	**Very High**	IUCN Red List 'Critically Endangered'
Basking Shark *Cetorhinus maximus*	**Very High**	Habitats Directive Annex II Species
Blue Shark *Prionace glauca*	**High**	UK Post-2010 Biodiversity Framework Species
Common Skate *Dipturus batis*	**Very High**	IUCN Red List 'Critically Endangered'
Gulper Shark *Centrophorus granulosus*	**High**	UK Post-2010 Biodiversity Framework Species
Kitefin Shark *Dalatias licha*	**High**	UK Post-2010 Biodiversity Framework Species
Leafscale gulper shark *Centrophorus squamosus*	**High**	UK Post-2010 Biodiversity Framework Species, PMF
Porbeagle Shark *Lamna nasus*	**High**	Bern Convention Annex III Species, UK Post-2010 Biodiversity Framework Species, PMF
Portuguese Dogfish *Centroscymnus coelolepis*	**High**	UK Post-2010 Biodiversity Framework Species, PMF
Sandy Ray *Leucoraja circularis*	**Very High**	IUCN Red List 'Endangered'
Spurdog or Spiny Dogfish *Squalus acanthias*	**High**	UK Post-2010 Biodiversity Framework Species, PMF
Tope Shark *Galeorhinus galeus*	**High**	UK Post-2010 Biodiversity Framework Species
Other elasmobranch species (e.g. spotted ray *Raja montagui*, thornback ray *Raja clavata*)	**Medium**	Not UK Post-2010 Biodiversity Framework species, not PMFs, not IUCN Red List 'Endangered' or 'Critically Endangered', not on Habitats Directive Annex II or Bern Convention Annex III.

15.4.4 Marine Demersal Fish Species

Demersal fish live on, or near, the seabed and are bottom-feeders. Those found in the North Sea in the vicinity of the project area include Atlantic cod, haddock and plaice, and these are the three main demersal species landed by the UK fleet in terms of weight (MMO, 2016). Demersal fish distribution is driven predominantly by abiotic factors (e.g. sediment type hydrography), although biotic processes including predator-prey interactions and interspecific competition are also important. The following demersal species are likely to occur along the project area (Coull *et al.*, 1998, Paramor *et al.*, 2009, and Ellis *et al.*, 2012) as part of the wider demersal fish assemblage:

- Anglerfish / sea monkfish *Lophius piscatorius;*
- Atlantic cod *Gadus morhua;*
- Atlantic halibut *Hippoglossus hippoglossus*;
- Blue ling *Molva dypterygia;*
- Common goby *Pomatoschitus microps;*

- Common sole *Solea solea;*
- European hake *Merluccius merluccius;*
- European plaice *Pleuronectes platessa;*
- Greenland halibut *Reinhardtius hippoglossoides*;
- Haddock *Melanogrammus aeglefinus;*
- Lemon sole *Microstomus kitt;*
- Ling *Molva molva;*
- Norway pout *Trisopterus esmarkii;*
- Saithe *Pollachius virens;*
- Sand goby *Pomatoschitus minutus;*
- Sandeel *Ammodytes spp.; and*
- Whiting *Merlangius merlangus.*

Sandeel in particular are a keystone species, important to the food webs in the North Atlantic, as they are the primary prey species of numerous marine predators including marine mammals, seabirds, and other fish species (ICES, 2017b; JNCC, 2014; Marine Scotland, 2017). Their spawning habitat requirements are discussed in more detail in Section 15.4.9 below, whilst their relevance to Turbot Bank Marine Protected area is discussed in Section 15.4.1.6. Sandeel activity patterns have strong seasonal components. During autumn and winter they hibernate in the seabed, generally in coarse sands or fine gravel. During spring and summer they exhibit diurnal movements between the seafloor, where they bury themselves at night, and the water column, where they feed on plankton during daylight (Wright *et al.*, 2000; Holland *et al.*, 2005; Winslade, 1974; Freeman *et al.*, 2004). Wright *et al.* (2000) showed that 80-90% of sandeels were buried between 10pm and 6am, 20-50% were buried between 6am and 8am, 15-30% were buried between 8am, and 4pm and 20-60% were buried between 4pm and 10pm.

Atlantic cod is one the most popular commercial species and, as a result, has been fished considerably in UK waters. They can often be found in large, dense shoals. Atlantic cod are productive breeders and spawning occurs between February and April. Similarly, Haddock is a valuable commercial species, exploited commercially in both mixed trawl and seine fisheries. It is also bycaught in langoustine fisheries (Hedger *et al.*, 2004).

The majority of these species are either species listed on Annex III of the Bern Convention, are a Scottish Priority Marine Feature or are listed as a UK Post-2010 Biodiversity Framework species. Therefore, as a group, marine demersal fish species have been assigned a receptor value of **High**. Atlantic halibut is listed on the IUCN Red List as 'Endangered' and therefore has been assigned a receptor value of **Very High.**

15.4.5 Marine Pelagic Fish Species

Pelagic fish inhabit the water column, rather than being close to the bottom as demersal fish are. Distribution and abundance of pelagic fish are strongly linked to hydrographic conditions, although bathymetric and biotic conditions are also important (Maravelias, 1999). Hydrographic factors influence distribution, through the drift of larvae and eggs in ocean currents. Bathymetry is important in the selection of spawning and nursery grounds, while biotic factors such as food availability influence migration patterns between spawning and feeding grounds (Maravelias, 1999). This results in the spatial distribution and abundance of pelagic fish varying significantly between years. The following pelagic species are likely to occur in the vicinity of the consenting corridor (Coull *et al.*, 1998;

Paramor *et al.*, 2009; Ellis *et al.*, 2012) as part of the wider pelagic fish assemblage (also including the diadromous species and some of the elasmobranch species discussed above):

- Atlantic bluefin tuna *Thunnus thynnus*;
- Atlantic herring *Clupea harengus*;
- Atlantic mackerel *Scomber scombrus;*
- Black scabbardfish *Aphanopus carbo;*
- Blue whiting *Micromesistius poutassou;*
- European sprat *Sprattus sprattus;*
- Horse mackerel *Trachurus trachurus;*
- Orange roughy *Hoplostethus atlanticus;* and
- Roundnose grenadier *Coryphaenoides rupestris;*

The majority of these species are either species listed on Annex III of the Bern Convention, are a Scottish Priority Marine Feature or are listed as a UK Post-2010 Biodiversity Framework species. Therefore, as a group, marine pelagic fish species have been assigned a receptor value of **High**. Roundnose grenadier is listed on the IUCN Red List as 'Critically endangered' and therefore has been assigned a receptor value of **Very High.**

15.4.6 Cephalopods

Cephalopods are short-lived, carnivorous invertebrates encompassing squids, nautiluses and octopuses. These species are characterised by rapid growth rates and play an important part in food-webs. There are at least 48 species of cephalopod in the UK (Stephen, 1944), but the main cephalopods of economic importance in the northeast Atlantic are:

- Long-finned (loliginid) squids *Loligo forbesi* and *Loligo vulgari;*
- Short-finned (ommastrephid) squids *Todarodes sagittatus, Todaropsis eblanae and Illex coindetii;*
- Cuttlefish *Sepia officinalis;* and
- Octopuses *Octopus vulgaris* and *Eledone cirrhosa.*

In general, the main Scottish fishery for long-finned squid takes place in coastal waters and exhibits a marked seasonal peak around October and November, corresponding to the occurrence of pre-breeding squid (Young *et al.*, 2006). Cuttlefish catches are mainly located in the English Channel and adjacent waters, the French Atlantic coast and the Bay of Biscay (Denis and Robin, 2001). Octopus fisheries are important in southern Europe, but landings from the North Sea are limited. No cephalopods are listed as Habitats Directive Annex II species, species listed on Annex III of the Bern Convention, PMFs or UK Post-2010 Biodiversity Framework species. The fishery is relatively small, and the species have limited biodiversity or community value, therefore they are considered to be of a **Low** receptor value.

15.4.7 Crustaceans

Crabs and langoustine (*Nephrops norvegicus*) are the two of the three main landings from the waters along the consenting corridor (MMO, 2016), with the third being scallops, discussed further in Section 15.4.8 below. Common lobster (*Homarus gammarus*) are also regularly fished within Scottish Waters and the North Sea. Commercial fisheries for crustaceans in the vicinity of the project are discussed further in Chapter 20: Commercial Fisheries.

Common lobster is found on rocky areas, living in holes and excavated tunnels from the lower shore to approximately 60m depth and can grow up to 1m in length, though 50cm individuals are more common (Wilson, 2008). Langoustine are smaller, growing to a maximum length of 25cm and are usually found in soft sediments and at water depths of greater than 200m (Sabatini and Hill, 2008). The consenting corridor crosses some areas of circalittoral muddy sand, which may be characterised by burrowing megafauna such as langoustine (MMT, 2017). The consenting corridor passes through Fladen Ground, which is indicated by OSPAR as a langoustine spawning area (OSPAR, 2010), and sea pen and burrowing megafauna communities were present along the consenting corridor from Kilometre Post (KP) 128.322 to the limit of the UK Exclusive Economic Zone (UK EEZ) (MMT, 2017).

Other crustaceans of note that may be present along the consenting corridor of the project are:

- Edible crabs (*Cancer pagurus*);
- Velvet swimming crab (*Necora puber*);
- Shore crab (*Carcinus maenas*);
- Squat lobster (*Munida rugosa*);
- Crayfish (*Palunirus elegans*); and
- European spiny lobster (*Palinurus elephas*).

In the vicinity of the consenting corridor, creel fisheries exist for lobsters (*Homarus gamarus*), edible crabs (*Cancer pagurus*) and velvet swimming crab (*Necora puber*), which predominantly take place in inshore waters, although an important offshore fishery for edible crabs has developed off the north coast of Scotland (Scottish Government, 2015). Commercial fisheries in the vicinity of the consenting corridor are discussed further in Chapter 20: Commercial Fisheries.

15.4.7.1 Summary of Crustacean Species Receptors

A summary of the crustacean species receptors relevant to the project, along with their assigned value, is presented in Table 15.9.

Table 15.9 Summary of Crustacean Species Receptors

Crustacean species receptor	Crustacean species receptor value	Justification
Langoustine *Nephrops norvegicus*	**Medium**	Not UK Post-2010 Biodiversity Framework species, not PMFs, not IUCN Red List 'Endangered' or 'Critically Endangered', not on Habitats Directive Annex II or Bern Convention Annex III. Economic value of fishery only
Common lobster *Homarus gammarus*	**High**	Bern Convention Annex III Species
European spiny lobster *Palinurus elephas*	**High**	Bern Convention Annex III Species , PMF, UK Post-2010 Biodiversity Framework Species
Squat lobster *Munida rugosa*	**Low**	Not UK Post-2010 Biodiversity Framework species, not PMFs, not IUCN Red List 'Endangered' or 'Critically Endangered', not on Habitats Directive Annex II or Bern Convention Annex III. Limited economic value of fishery.

Crustacean species receptor	Crustacean species receptor value	Justification
Edible crabs *Cancer pagurus*	**Medium**	Not UK Post-2010 Biodiversity Framework species, not PMFs, not IUCN Red List 'Endangered' or 'Critically Endangered', not on Habitats Directive Annex II or Bern Convention Annex III. Economic value of fishery only.
Velvet swimming crab *Necora puber*	**Medium**	Not UK Post-2010 Biodiversity Framework species, not PMFs, not IUCN Red List 'Endangered' or 'Critically Endangered', not on Habitats Directive Annex II or Bern Convention Annex III. Economic value of fishery only
Shore crab *Carcinus maenas*	**Low**	Not UK Post-2010 Biodiversity Framework species, not PMFs, not IUCN Red List 'Endangered' or 'Critically Endangered', not on Habitats Directive Annex II or Bern Convention Annex III. Limited economic value of fishery.
Crayfish *Palunirus elegans*	**Low**	Not UK Post-2010 Biodiversity Framework species, not PMFs, not IUCN Red List 'Endangered' or 'Critically Endangered', not on Habitats Directive Annex II or Bern Convention Annex III. Limited economic value of fishery.

15.4.8 Molluscs

Molluscs comprise bivalves and gastropods, with ocean quahog (*Artica Islandica*), common cockle (*Cerastoderma edule*), king scallop (*Pecten maximus)*, queen scallop (*Aequipecten opercularis)* and razorfish (*Ensis spp*.) all being species that may be found around the project area. Commercial fisheries for molluscs in the vicinity of the project area are discussed further in Chapter 20: Commercial fisheries.

The ocean quahog (*Artica Islandica)* is a large, cockle shaped bivalve which can grow up to 13cm across. They are a long-lived animal and can take up to 50 years to reach market size, and are regularly fished within Scottish Waters and the North Sea. Although found extensively throughout the North Sea, it is on the OSPAR list of threatened and/or declining species and habitats. They are at particular risk from bottom fishing gear, and are threatened due to their long growth periods. Ocean quahog is not characteristic of any particular habitat and is known to occur in a range of sediments from coarse clean sand to muddy sand and over a wide depth range up to 400m. The Norwegian Boundary Sediment Plain MPA is designated due to ocean quahog aggregations, discussed in Section 15.4.1 above. In the consenting corridor, only one replicate grab sample (S11, KP 95.411 (296200, 6420974) contained one individual of ocean quahog (MMT, 2017).

The king scallop *(Pecten maximus)* is the second most valuable of the shellfish species fished in Scottish waters, and is fished mainly with scallop dredges. A smaller fishery harvests the queen scallop *(Aequipecten opercularis)*, using dredges or trawls. In recent years hydraulic dredge fisheries have also

developed for razorfish (*Ensis spp.*) and a range of other bivalve species. Both scallops and razorfish are also fished commercially by divers in some areas.

15.4.8.1 Summary of Mollusc Species Receptors

A summary of the mollusc species receptors relevant to the project, along with their assigned value is presented in Table 15.10.

Table 15.10 Summary of Mollusc Species Receptors

Mollusc species receptor	Mollusc species receptor value	Justification
Ocean quahog *Artica Islandica*	**High**	PMF
Common cockle *Cerastoderma edule*	**Low**	Not UK Post-2010 Biodiversity Framework species, not PMFs, not IUCN Red List 'Endangered' or 'Critically Endangered', not on Habitats Directive Annex II or Bern Convention Annex III. Limited economic value of fishery.
King scallop *Pecten maximus*	**Medium**	Not UK Post-2010 Biodiversity Framework species, not PMFs, not IUCN Red List 'Endangered' or 'Critically Endangered', not on Habitats Directive Annex II or Bern Convention Annex III. Economic value of fishery only
Queen scallop *Aequipecten opercularis*	**Low**	Not UK Post-2010 Biodiversity Framework species, not PMFs, not IUCN Red List 'Endangered' or 'Critically Endangered', not on Habitats Directive Annex II or Bern Convention Annex III. Limited economic value of fishery.
Razorfish *Ensis spp*.	**Low**	Not UK Post-2010 Biodiversity Framework species, not PMFs, not IUCN Red List 'Endangered' or 'Critically Endangered', not on Habitats Directive Annex II or Bern Convention Annex III. Limited economic value of fishery.

15.4.9 Spawning and Nursery Areas

Spawning and nursery habitats for a variety of fish species are found within the North Sea and species likely to be spawning along the consenting corridor include herring, sandeel, cod, whiting, and plaice (Coull *et al.*, 1998; Ellis *et al.*, 2012). Both sandeel and herring spawn on the seabed in specific habitat types and their eggs are demersal, remaining on the seabed and therefore may be at risk from the project. Conversely, cod, whiting and plaice eggs, once spawned, are pelagic and distributed through the water column and will therefore be carried by ocean currents, transient and potentially distant from the project and so are unlikely to be at risk of impacts.

Nursery areas of several demersal fish species will also be crossed by the consenting corridor (Coull *et al.*, 1998; Ellis *et al.*, 2012). High intensity nursery areas for both anglerfish and whiting, as well as low intensity areas for cod, European hake, ling, plaice and sandeels are predicted to be present along the

consenting corridor. In addition, nursery areas for haddock, lemon sole, Norway pout, and saithe are also predicted by Coull *et al.* (1998), but no information on intensity is provided. Individuals of these species are assessed as receptors in their own right under the Marine demersal fish species group (see Section 15.4.4).

Sandeels *Ammodytes spp.* in particular are thought to be very sensitive to disturbance, due to the fact these fish have highly specific spawning habitat requirements, which results in tight zoning of their spawning grounds. Sandeels favour a particular seabed composition containing a high proportion of medium and coarse sand, (≥0.25-<2mm), and a very low silt content (Holland *et al.*, 2005). They are particularly sensitive to the silt content (particles ≤0.63µm) of the seabed, and are only rarely encountered in soils where this fraction exceeds 10% (Holland *et al.*, 2005). Juvenile sandeels have similar requirements for the substrate into which they will burrow following their larval stage, and this again results in the species having a patchy distribution. This, in conjunction with the fact that post-settled sandeels do not move far from their habitat, again results in sandeels being particularly sensitive to disturbance (Jensen *et al.*, 2011).

The cable corridor within Scottish Territorial Waters (STW) (the 12NM limit) is located within the Northeast UK sandeel closure, established for nature conservation purposes of sandeels. The area is subject to year round closure on sandeel fishing. During the benthic survey, sandeels were identified in the grab samples at sample locations within STW in the south western part of the consenting corridor. The sites are located within an area with coarse sediment, composed of 80 to 90 % sand and 8 to 18 % gravel. Sandeels were encountered in two of the grab replicates at grab sample location S03, and in one replicate at sample location S04 (MMT, 2017). The sediment at grab sample location S03 was predominantly composed of sand with shell gravel covering the surface, and S04 had a mixed sediment, consisting predominantly of sand with some coarser particles. Sediment potentially suitable for sandeels was found within the corridor, between KP 3.500 (215411, 6379261) to KP 17.500 (226101, 6388076), as illustrated in Figure 15.6 below.

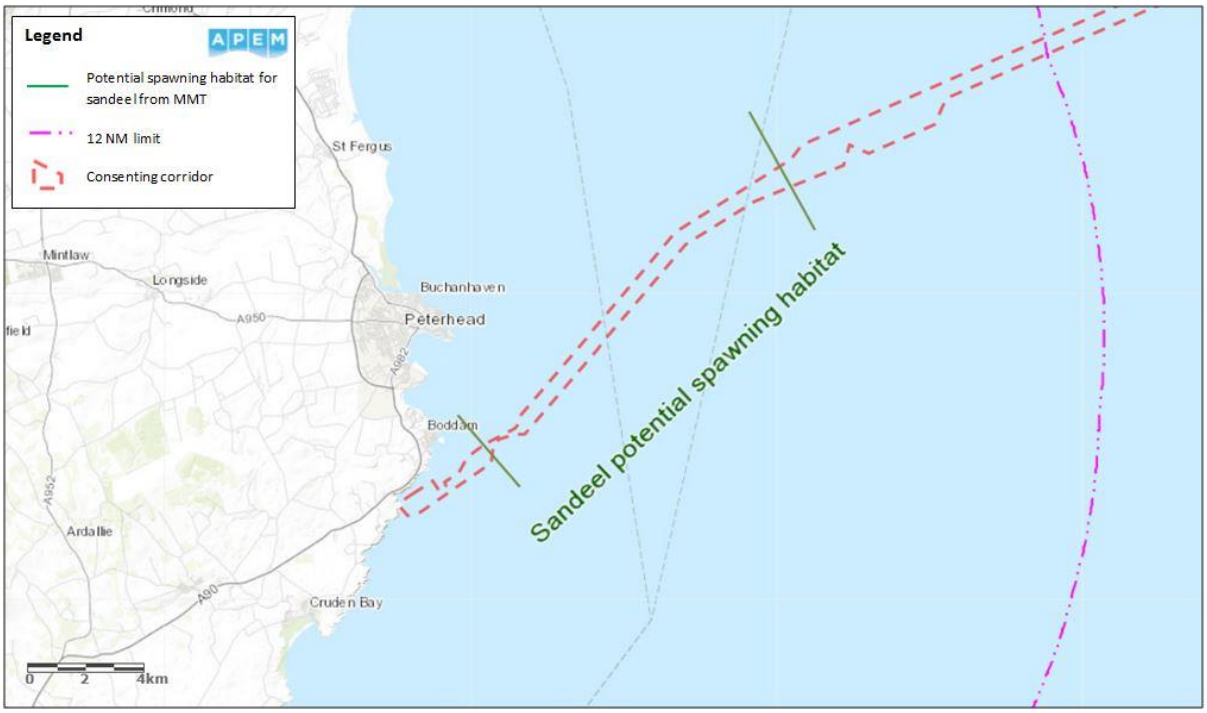

Figure 15.6 Areas of Consenting Corridor Identified as Potentially Suitable Sandeel Spawning Habitat by MMT (2017).

Herring is numerically one of the most important pelagic species in the North Sea, a keystone species and the target of a commercial fishery, and have therefore been considered separately. Like sandeels, herring have specific requirements for the substrate in their spawning areas and prefer to deposit their eggs on gravels, resulting in tightly geographically defined spawning grounds (Maravelias, 1997). The eggs of herring are demersal and the larval stages are pelagic (Ellis *et al.*, 2012; ICES, 2017c). The substrate in the preferred spawning beds is often coarse sand, maerl, shells or gravel, with a low proportion of fine sediment and well-oxygenated water (Ellis *et al.*, 2012). This makes the species particularly sensitive to anthropogenic activities which affect the sea bed.

The North Sea stock of Atlantic herring *Clupea harengus* is divided into different spawning stocks: the North Sea autumn spawning herring; and the spring spawning herring (Dickey-Collas *et al.*, 2010). The autumn spawning herring spawns in UK waters, primarily along the coast of north eastern Scotland and Shetland and Orkney. The spring spawning herring spawns primarily in Norwegian waters, but also in the Wash and in the Firth of Forth along the UK east coast (Dickey-Collas *et al.*, 2010; Ellis *et al.*, 2012; Dragesund *et al.*, 2008).

No herring and/or eggs from herring were found along the consenting corridor during the benthic survey operations, though the survey was conducted at the very beginning of the spawning season and before hatching, which generally occurs between August and September (ICES, 2017c). Substrates of the preferred geophysical characteristics for spawning, i.e. coarse sand and gravel, were found within the consenting corridor between KP 1.396 (213603, 6378185) and KP 4.947 (216591, 6380083), as illustrated in Figure 15.7 below.

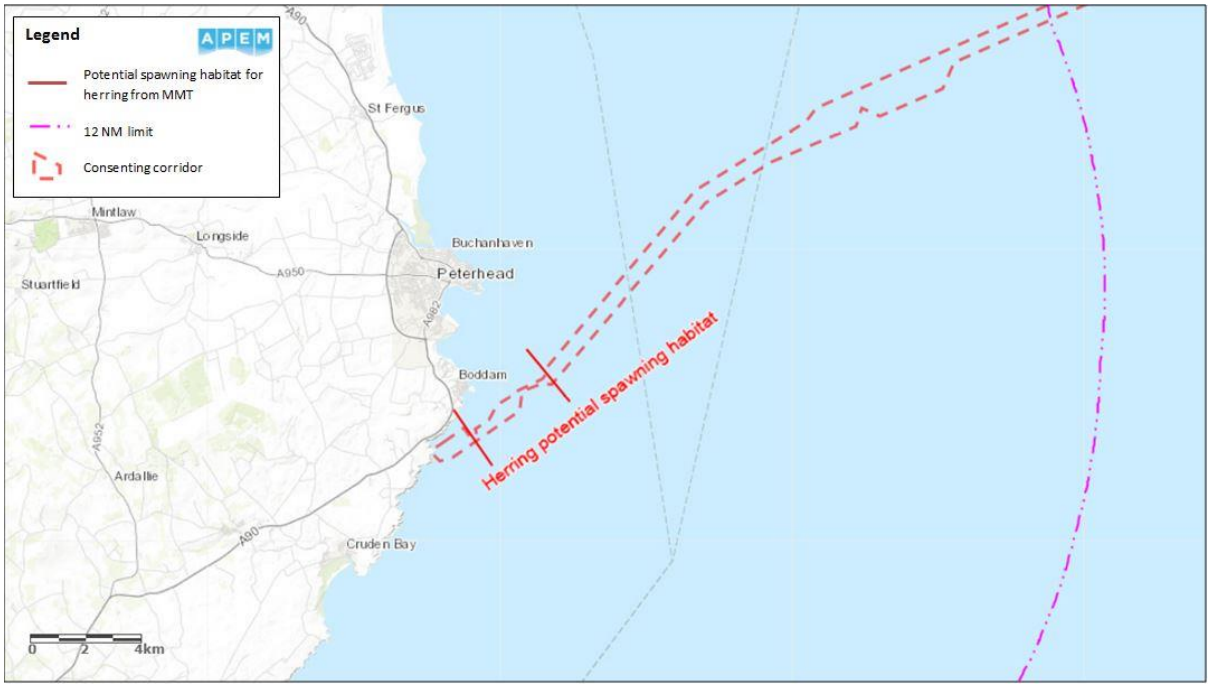

Figure 15.7 Areas of consenting corridor identified as suitable herring spawning habitat by MMT (2017).

The spawning and nursery habitat and grounds of sandeel species and Atlantic herring will therefore be assessed separately, and have both been assigned **High** receptor values, reflecting the receptor value of the individuals of the species.

15.4.10 Future Baseline

Given the anticipated lifetime of the project there is the potential that species populations or ranges may alter due to climate change. Species with a natural range that does not currently extend as far north as the corridor, may colonise this area in future decades as mean water temperatures increase, such as allis shad, twaite shad or common sturgeon. This is unlikely to occur by the time of cable installation, so no effects would be expected on these species during this phase. During operation and decommissioning, effects on these species are likely to be no greater than on other diadromous species given their similar life history strategies and so the conclusion of the assessment would remain unchanged should these species also be present. These species are therefore not considered further within this assessment.

Furthermore, a spawning population of invasive pink salmon *Oncorhynchus gorbuscha* is understood to be establishing within the Ness catchment in north east Scotland (Ness DSFB, 2017), and should this species spread and establish through other Scottish river catchments then it may pose a risk to native Atlantic salmon and brown trout populations through competition for food. As such, these species are likely to be more sensitive to additional pressures. This future sensitivity and risk to Atlantic salmon and brown trout populations has been considered through the assessment when assigning the magnitude of impact to these species.

15.5 Impact Assessment

The potential impacts of the project during the installation, operation and decommissioning phases have been assessed to determine their magnitude of impact upon the fish and shellfish receptors described in Section 15.4, and the subsequent significance of effect. The potential impacts of the

project are summarised in Table 15.11, along with their pathways of impact to the relevant fish and shellfish receptors. A summary table of the assessment is provided in Tables 15.13a-c, which fully details the valuation of each receptor, the magnitude of each impact upon each receptor and also the final significance of effect from the combination of value and magnitude, and whether that effect is considered to be significant in terms of the EIA Regulations.

The assessment is based on the information that has been provided to date in relation to methods of installation, operation and decommissioning. Some aspects of the installation and operation of the project are not yet finalised, as discussed in Chapter 2: Project Description, and so a series of worst-case assumptions have been made for the purposes of the assessment, or the adoption of a Rochdale Envelope approach where relevant. The various worst-case assumptions for the purposes of the assessment are discussed below:

- **Number of cables and bundling arrangements** – there will be two HVDC cables laid in up to two trenches (either bundled and laid in one trench, or laid separately in two trenches). The fibre-optic cable will be laid in the same trench as one of the HVDC cables (or both if bundled). The assessment will consider bundled cables in a single trench as a worst-case for operational sediment heating effects, and unbundled cables in two trenches as a worst-case for electromagnetic field (EMF) effects, cable trenching and installation and associated effects on habitats and species;
- **Micro-siting of the cables within the 500m wide consenting corridor and cable separation distances** – the separation distance between the cables, if not laid bundled, is likely to vary along the consenting corridor. Separation will be a minimum of 20m and a maximum of 40m within STW (to 12NM). Separation will then likely be a minimum of 20m and maximum of the entire consenting corridor between 12NM to the UK EEZ limit. A bundled cable will be used as a worst-case for operational sediment heating effects, and the maximum separation distances will be used as a worst-case for the EMF effects. Other effects are expected to be similar regardless of separation distance;
- **Cable depth of lowering along the consenting corridor** – the minimum depth of lowering will be 0.4m in hard substrates and 0.5m in soft substrates, with an aim to achieve a 0.8m depth of lowering if possible, and a likely maximum depth of lowering of 1.5m. The minimum depth of lowering will be used for the assessment;
- **Cable burial methods** – a combination of jet-trenching, mechanical trenching or ploughing may be required to protect the cables. Burial will be assumed to be via natural infill rather than backfill rock placement as a worst-case for habitat recovery times. Within UK waters (to 200NM) rock placement will be in the region of 25m either side of the 4 cable crossings and 70m either side of the 14 surface laid pipeline crossings, and at a worst-case for extent of a 1:3 slope. Rock placement at the HDD exit point will be to a depth of 0.8m for a 70m distance at a 1:3 slope;
- **Cable trench** – methods of trenching will generate disturbance of the seabed around the trench and, depending upon the method used, the trench and excavated material footprint will be a maximum of 5m distance either side of the centre-line of the cable (a total of 10m width) as a worst-case;
- **HDD** – a number of different drilling materials could be used, but it is assumed that the drilling fluid will solely comprise Bentonite;
- **Installation programme** – the detailed installation programme and start date is not yet finalised and so it is assumed that installation could be conducted at any time of year as a

worst-case apart from the HDD, which will occur between September-March, and the cable laying, which will be between April-September;

- **Installation programme** – The cable installation programme may vary depending upon cable section length used (which will be between 75km and 170km) and cable production ability. The worst-case programme duration of 5 years has been used as shown in Chapter 2: Project Description, which is based on use of a 170km cable due to the time of production of a cable of this length. The cable installation programme in UK waters also assumes a worst-case programme of two separate HVDC cables being installed;
- **Operational repairs** – repairs could be once every 3 years as a likely worst-case and require disturbance of the seabed of up to twice the water depth at the repair location;
- **Decommissioning phase arrangements** – the majority of the cable will be removed at decommissioning; however, some sections may be left in-situ without transferring electricity. Full removal will be assessed as a worst-case.

Table 15.11 Summary of impacts of the project and the presence of impact pathways to receptors (indicated with a tick). Those without a tick indicate that effects upon receptors from the impacts were either scoped out during the Scoping process (habitat loss of adult fish and underwater noise effects from cable installation) or no pathway is considered to be present (Changes in hydrodynamic regime (scour and accretion) and sediment heating on pelagic fish species and cephalopods).

Receptor	Designated sites (for fish and shellfish species)	Diadromous fish species	Elasmobranch species	Marine demersal fish species	Marine pelagic fish species	Cephalopods	Crustaceans	Molluscs	Spawning and nursery grounds
Potential development impact									
Seabed Preparation and Cable Installation									
Habitat loss	✓						✓	✓	✓
Habitat creation	✓			✓			✓	✓	✓
Changes to water quality (resuspension of sediments and increased sediment loading)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Changes to water quality (release of hazardous substances)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Underwater noise and vibration	✓	✓	✓	✓	✓	✓	✓	✓	✓
Changes to water quality (Release of drilling fluids)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Introduction of invasive non-native species	✓	✓	✓	✓	✓	✓	✓	✓	✓
Operation									
Change in hydrodynamic regime (scour and accretion)	✓			✓			✓	✓	✓
Sediment heating	✓			✓			✓	✓	✓
Electro-magnetic fields (EMFs)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Introduction of invasive non-native species	✓	✓	✓	✓	✓	✓	✓	✓	✓
Physical disturbance during inspection and repair	✓	✓	✓	✓	✓	✓	✓	✓	✓
Decommissioning									

Receptor	Designated sites (for fish and shellfish species)	Diadromous fish species	Elasmobranch species	Marine demersal fish species	Marine pelagic fish species	Cephalopods	Crustaceans	Molluscs	Spawning and nursery grounds
Habitat loss	✓						✓	✓	✓
Changes to water quality (resuspension of sediments and increased sediment loading)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Changes to water quality (release of hazardous substances)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Underwater noise and vibration	✓	✓	✓	✓	✓	✓	✓	✓	✓
Introduction of invasive non-native species	✓	✓	✓	✓	✓	✓	✓	✓	✓

15.5.1 Primary and Tertiary Mitigation

The primary and tertiary mitigation measures (see Chapter 2: Project Description) that have been considered within the assessment are described below:

- For the consenting corridor, routing studies have been undertaken to minimise environmental impacts of the consenting corridor;
- For HDD activities, the drill will stop before it reaches the end point of the hole and all the excess material and drilling fluid will then be pumped out of the hole to minimise loss of HDD fluid. Therefore, only the final short drilling section will result in a loss of fluids and solids to the sea;
- For HDD activities, these will occur from September to March only, with activities commencing in September. No breakouts of the drilling will therefore occur during herring spawning season (August/September);
- For cable installation, this will occur from April to September only, which is outside of the sandeel spawning season (January/February).
- For cable operation, a depth of lowering of at least 0.4m in hard substrate and 0.5m in soft substrate will be achieved to reduce EMF and sediment heating effects. Greater depths of lowering will be achieved where possible;
- For cable operation, electric fields will be contained within cable armouring due to shielding effects. The use of direct currents in the marine cables will prevent the formation of induced electric fields outside the cable armouring. Magnetic fields can, however, be detected beyond the cable armouring (Gill *et al.*, 2005);
- To minimise the introduction of invasive non-native species, all vessels used during installation, operation and decommissioning will follow the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) which entered into force in 2017;
- To minimise the introduction of invasive non-native species, all vessels used during installation, operation and decommissioning will be sourced from the North Atlantic Biogeographic region, or will be subject to appropriate decontamination procedures if sourced from elsewhere to remove the risk of INNS introduction – through the use of hull anti-fouling materials; and
- To minimise changes to water quality (release of hazardous substances), all vessels used during installation, operation and decommissioning will comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) regulations.

15.5.2 Installation

15.5.2.1 Habitat Loss

Disturbance of the seabed will occur as a result of trenching during cable laying, removal of the two out of service (OOS) cables, and also from rock protection where cable burial is not possible (such as at crossing points).

The trenching during cable laying will disturb a worst-case of two 10m wide areas of seabed along the whole length of each cable being laid, totalling 30km length from MHWS to 12nm limit, and 200km length from 12nm to the limit of UK EEZ. Existing habitat loss beneath the trenching footprint will therefore be a maximum of 60ha from MHWS to 12nm limit, and 400ha from 12nm to the limit of UK EEZ. As a worst-case, if natural infilling of the trench is assumed to occur, rather than any backfill, then

recovery of the habitats in this seabed strip is likely to take a number of years, but any disturbance of the seabed will still result in a temporary effect.

The removal of the two OOS cables will disturb around a 5.7km length of seabed within the consenting corridor.

The rock placement at crossing points will be to up to a 1m burial depth for the 4 cable crossings, and 2m burial depth for the 14 surface laid pipeline crossings. Existing habitat loss beneath the rock placement in the UK EEZ will therefore be a maximum of 300m^2 for each cable crossing, 1680m^2 for each surface laid pipeline crossing, and 336m^2 at each HDD exit point. Assuming a worst-case of two separately laid cables and three HDD exit points, altogether the habitat loss beneath rock placement will total 5.0ha. Rock will also be placed as cable protection on areas of rocky ground or hard substrate along the consenting corridor, however, this placement is unlikely to significantly change the nature of the seabed substrate and therefore the utilisation of this habitat by fish and shellfish receptors is unlikely to be affected.

The rock will remain in place for the lifetime of the project and therefore the loss of any existing soft substrate habitat beneath rock placement is expected to be a permanent effect.

15.5.2.1.1 Designated Sites (for Fish and Shellfish Species)

Given the separation achieved between the consenting corridor and designated sites for fish and shellfish species, then no habitat loss in these sites or for their populations is anticipated, and the magnitude of impact upon designated sites for fish and shellfish species is assessed as **No Change.**

15.5.2.1.2 Crustaceans

Given the limited extent of the habitat loss from trenching and the mobile nature of the crustaceans assessed, crustaceans along the consenting corridor will be able to move to alternative habitat nearby during cable installation and return once the trench has infilled. For rock placement, given the extent of the placement there may be some burial of individuals, and species favouring finer sediments may be deterred from recolonization of the hard substrates. This will, however, occur in just 0.04% of the consenting corridor, and an even smaller proportion of the wider habitats in the North Sea and so will have a highly localised effect that will not be detectable within crustacean populations locally or more regionally. As such, the magnitude of impact upon crustaceans is assessed as **Negligible**.

15.5.2.1.3 Molluscs

As the mollusc species assessed are generally sessile, then loss of habitats which these species are inhabiting during trenching may cause disturbance or burial of these species present in the footprint of the trench. As the trench infills, then this habitat will recover and the mollusc species are likely to recolonise it given their preferential habitation of optimum seabed and hydrodynamic conditions. Any effects from trenching are therefore anticipated to be temporary.

For rock placement, given the extent of the placement there may be some burial of individuals, and species favouring finer sediments may be deterred from recolonization of the hard substrates. This will, however, occur in just 0.04% of the consenting corridor, and an even smaller proportion of the wider habitats in the North Sea and so will have a highly localised effect that will not be detectable within mollusc populations locally or more regionally.

In the case of the ocean quahog, the benthic survey (MMT, 2017) found a very low abundance of the species along the consenting corridor and therefore the effect of trenching and rock placement causing habitat loss on this species wider population will be undetectable, especially given the high

abundances associated with designated areas for this species in other locations in the North Sea. The magnitude of impact on the ocean quahog is therefore assessed as **Negligible**. There may be higher abundances of other sessile molluscs along the consenting corridor that will be subject to a temporary, short-term effect from habitat loss due to cable trenching (with rock placement effects being undetectable) and may cause a change to the local population abundance, but not the wider populations in the North Sea. The magnitude of impact on the remaining mollusc species is therefore assessed as **Minor**.

15.5.2.1.4 Spawning and Nursery Grounds

The project will result in the temporary disturbance to 28ha of suitable sandeel spawning habitat due to trenching, along the 14km length of suitable habitat within the consenting corridor identified by MMT (2017). This equates to 0.002% of the local sandeel spawning grounds as designated by Coull *et al.* (1998) and Ellis *et al.* (2012). The project will also result in placement of rock at 2 cable crossings within the suitable sandeel spawning habitat, causing a permanent loss of 0.06ha, and less than 0.0001% of the local sandeel spawning grounds. The removal of one of the service cables will be partly within the suitable sandeel habitat, for a length of around 1.7km. There are extensive wider spawning areas for this species around the Scottish coast and therefore this is a worst-case. As this habitat loss will be temporary or affect a very small proportion of the wider spawning ground, then the magnitude of impact is assessed as **Negligible**.

The project will result in the temporary disturbance to 7.2ha of suitable herring spawning habitat, due to trenching, along the 3.6km length of suitable habitat within the consenting corridor identified by MMT (2017). This equates to 0.0006% of the local herring spawning ground as designated by Coull *et al.* (1998) and Ellis *et al.* (2012). No cable or pipeline crossings are in areas of suitable herring spawning habitat and therefore rock placement will not result in the loss of any suitable habitat. The removal of the two service cables will also not be in areas of suitable herring spawning habitat. There are extensive wider spawning areas for this species around the Scottish coast and therefore this is a worst-case. As this habitat loss will be temporary or affect a very small proportion of the wider spawning ground, then the magnitude of impact is assessed as **Negligible**.

15.5.2.2 Habitat Creation

The rock placement at crossing points will be to up to a 1m burial depth for the 4 cable crossings, and 2m burial depth for the 14 surface laid pipeline crossings. Rock placement will be for 25m either side of the 4 cables and 70m either side of the 14 surface laid pipelines, and at a worst-case for extent of a 1:3 slope. Rock placement at the HDD exit point will be to a depth of 0.8m for a 70m distance at a 1:3 slope. Introduction of new habitat from the rock placement in the UK EEZ will therefore be a maximum of 300m^2 for each cable crossing, 1680m^2 for each surface laid pipeline crossing, and 336m^2 at each HDD exit point. Assuming a worst-case of two separately laid cables and three HDD exit points, altogether the introduction of new habitat beneath rock placement will total 5.0ha. Rock will also be placed as cable protection on areas of rocky ground or hard substrate along the consenting corridor, however, this placement is unlikely to change the nature of the seabed substrate and therefore the utilisation of this habitat by fish and shellfish receptors is unlikely to be affected.

The rock will remain in place for the lifetime of the project and therefore the creation of any hard substrate habitat is expected to be a permanent effect.

15.5.2.2.1 Designated Sites (for Fish and Shellfish Species)

Given the separation achieved between the consenting corridor and designated sites for fish and shellfish species, the rock placement will not create any new habitat in these sites or for their designated species, and the magnitude of impact upon designated sites for fish and shellfish species is assessed as **No Change.**

15.5.2.2.2 Marine Demersal Fish Species

Rock placement creates hard substrate habitat, which may be suitable for species such as cod, whiting, saithe and ling which prefer or utilise rocky seabed's. This will, however, occur in just 0.04% of the consenting corridor, and an even smaller proportion of the wider habitats in the North Sea and so will have a highly localised effect that will not be detectable within the populations of these species locally or more regionally. The magnitude of impact upon these marine demersal fish species is therefore assessed as **Negligible** (beneficial).

For all other marine demersal fish species, the rock placement will not create any suitable new habitat and therefore the magnitude of impact upon these species is assessed as **No Change**.

15.5.2.2.3 Crustaceans

Rock placement creating hard substrate habitat will not generally be suitable for crustacean inhabitation and therefore the magnitude of impact is assessed as **No Change**.

15.5.2.2.4 Molluscs

Rock placement creating hard substrate habitat will not generally be suitable for mollusc inhabitation and therefore the magnitude of impact is assessed as **No Change**.

15.5.2.2.5 Spawning and Nursery Grounds

Rock placement creating hard substrate habitat will not be suitable for sandeel or herring spawning and therefore the magnitude of impact is assessed as **No Change**.

15.5.2.3 Changes to Water Quality (Resuspension of Sediments and Increased Sediment Loading)

Trenching and rock placement activities, as well as the OOS cable removal, may resuspend seabed sediments into the water column. Any increases in water column sediment loading and deposition resulting from the trenching and rock placement activities will be very localised and short-term in duration (see Chapter11: Water Quality (Marine Environment)), and will occur sequentially along the consenting corridor given the nature of the cable installation.

Sands and silts released during trenching and rock placement activities will be temporarily deposited on the seabed but will be more likely to be remobilised and redistributed through natural hydrodynamic processes than gravels and clays which are likely to remain on the seabed for a longer period of time after settlement. The consenting corridor comprises the following split of seabed substrate types:

- 69% muds and gravels;
- 29% sands and silts; and
- 2% rocky and hard substrates.

15.5.2.3.1 Designated Sites (for Fish and Shellfish Species)

Given the separation achieved between the consenting corridor and designated sites for fish and shellfish species, then the trenching and rock placement activities will not cause increases in water column sediment loading in these sites, or on their designated species, and the magnitude of impact upon designated sites for fish and shellfish species is assessed as **No Change.**

15.5.2.3.2 Diadromous Fish Species

As migrating individuals of these species will be crossing the project during migration to or from freshwater, then they will be exposed to any increased water column sediment loading for only a very short period of time. Also, the increased sediment loading will be short-term and localised in nature along the consenting corridor, occurring sequentially with the location of the installation activity and near the seabed. Therefore, the likelihood of migrating or marine resident individuals of these pelagic species encountering an area of increased water column sediment loading is very low. Furthermore, as they are highly mobile species then, should they encounter an area of suspended sediment concentrations, they are capable of navigating away and avoiding the area. As these species are all highly mobile and pelagic then there is also no risk of smothering or burial. Therefore, the magnitude of impact upon diadromous fish species is assessed as **No Change**.

15.5.2.3.3 Elasmobranch Species

As individuals of these species, if present, will be foraging then there is a potential effect upon their feeding success from the increased water column sediment loading (Robertson *et al.*, 2006). As the increased sediment loading will be short-term and localised in nature along the consenting corridor, occurring sequentially with the location of the installation activity, and near the seabed, the likelihood of pelagic species encountering an area of increased sediment loading is very low. Encounter may be more likely for demersal elasmobranchs such as the common skate, sandy ray, Portuguese dogfish, spiny dogfish or other elasmobranch species (such as the spotted ray or thornback ray). However, as these are highly mobile species then should they encounter an area of increased sediment loading, they are capable of navigating away and avoiding the area. As these species are all highly mobile then there is no risk of smothering or burial, even for the demersal individuals. Therefore, the magnitude of impact upon the common skate, sandy ray, Portuguese dogfish, spiny dogfish, spotted ray and thornback ray is assessed as **Negligible** and, on all the elasmobranch fish species, is assessed as **No Change**.

15.5.2.3.4 Marine Demersal Fish Species

As individuals of these species, if present, will be foraging then there is a potential effect upon their feeding success from the increased water column sediment loading (Robertson *et al.*, 2006). As the increased sediment loading will be short-term and localised in nature along the consenting corridor, occurring sequentially with the location of the installation activity, the likelihood of demersal species encountering an area of increased sediment loading is low. As these are highly mobile species then should they encounter an area of increased sediment loading, they are capable of navigating away and avoiding the area. As these species are all highly mobile then there is no risk of smothering or burial. Any changes to behaviour or reduced feeding success as a result of the increased sediment loading for demersal species are anticipated to be short-term and temporary, and have no impact upon the structure and functioning of the populations of these species. The magnitude of impact upon marine demersal fish species is, therefore, assessed as **Negligible**.

15.5.2.3.5 Marine Pelagic Fish Species

As individuals of these species, if present, will be foraging then there is a potential effect upon their feeding success from the increased water column sediment loading (Robertson *et al.*, 2006). As the increased sediment loading will be short-term and localised in nature along the consenting corridor, occurring sequentially with the location of the installation activity, and near the seabed, the likelihood of pelagic species encountering an area of increased sediment loading is very low. These species are also highly mobile and so should they encounter an area of increased sediment loading, they are capable of navigating away and avoiding the area. As these species are all highly mobile and pelagic then there is no risk of smothering or burial. Therefore, the magnitude of impact upon marine pelagic fish species is assessed as **No Change**.

15.5.2.3.6 Cephalopods

As individuals of these species, if present, will be feeding and foraging then there is a potential effect upon their feeding success from the increased water column sediment loading (Robertson *et al.*, 2006). As the increased sediment loading will be short-term and localised in nature along the consenting corridor, occurring sequentially with the location of the installation activity, the likelihood of cephalopods encountering an area of increased sediment loading is low. As these are mobile species (though with lower swimming capacity than teleost fish species) then should they encounter an area of increased sediment loading, they are capable of navigating away and avoiding the area. As these species are all highly mobile then there is no risk of smothering or burial. Any changes to behaviour or reduced feeding success as a result of the increased suspended sediment concentrations for cephalopods are anticipated to be short-term and temporary and have no impact upon the structure and functioning of the populations of these species. The magnitude of impact upon marine demersal fish species is, therefore, assessed as **Negligible**.

15.5.2.3.7 Crustaceans

Crustacean species are less mobile and may not readily move away from areas of increased water column sediment loading, though some species, including Langoustine, are particularly tolerant of a degree of smothering (OSPAR, 2010). As the increased sediment loading will be short-term and localised in nature along the consenting corridor then, whilst there is a risk of some effect upon nearby individuals, the risk to the wider population is very limited and, therefore, the magnitude of impact upon crustaceans is assessed as **Negligible**.

15.5.2.3.8 Molluscs

Mollusc species have limited mobility with which to move away from areas of increased water column sediment loading, or to prevent themselves from being smothered. Some mollusc species show tolerance to increased suspended sediment concentrations (Mainwaring *et al.*, 2014). As the increased sediment loading will be short-term and localised in nature along the consenting corridor, whilst there is a risk of some effect upon nearby individuals, the risk to the wider population is very limited and therefore the magnitude of impact upon molluscs is assessed as **Negligible**.

15.5.2.3.9 Spawning and Nursery Grounds

The project will result in potential increased sediment loading across a 14km length of suitable sandeel spawning habitat identified by MMT (2017). However, as sandeels spawn in December and January with eggs hatching in February and March, and cable installation will only occur between April and September, there is no risk of smothering of sandeel eggs. As a result, the magnitude of effect is assessed as **No Change**.

The project will result in potential increased sediment loading across a 3.6km length of suitable herring spawning habitat identified by MMT (2017), which equates to just 0.0006% of the local herring spawning ground. As herring from the Buchan stock spawn in August and September, then some herring eggs in this area may be at risk of being smothered. The survival and development of herring eggs have been reported to be tolerant to even high levels of water column sediment loading, but studies have concluded that smothering is likely to be detrimental unless the material is removed rapidly by the current (Birklund and Wijsam, 2005). Given the limited extent of the wider spawning ground affected, and the temporary, short-term nature of the impact, then the magnitude of effect is assessed as **Negligible**.

15.5.2.4 Changes to Water Quality (Release of Hazardous Substances)

Trenching, OOS cable removal and rock placement activities may resuspend seabed sediments which could contain contaminants, though low concentrations were found within the sediment sampling survey for the project, as detailed in Chapter 7: Seabed Quality. Any sediment, and thus contaminant suspension and deposition, as a result of the trenching and rock placement activities will be very localised and short-term in duration (see Chapter 11: Water Quality (Marine Environment)).

The use of vessels could lead to a fuel release, or of cleaning fluids, oils and hydraulic fluids used on board vessels and during ROV operations, which could be released overboard or accidentally discharged. Also, discharges of grey water, sewage, food waste and drain water from vessels outside of 12NM may occur. These discharges can be potentially harmful and can lead to localised organic enrichment and a change in the balance of the food chain. As discussed further within Chapter 11: Water Quality (Marine Environment), given that all vessels will be compliant with IMO and MARPOL then the risk of oils and other contaminants entering the marine environment is very low. Neither organic enrichment nor oxygen depletion is considered likely, due to the relatively small cumulative volume of any discharges. Furthermore, the amount of shipping activity in the North Sea area is unlikely to be affected by addition of the installation vessels.

15.5.2.4.1 Designated Sites (for Fish and Shellfish Species)

Given the separation achieved between the consenting corridor and designated sites for fish and shellfish species, then the trenching and rock placement activities, and vessels will not cause changes to water quality in these sites or on their populations, and the magnitude of impact upon designated sites for fish and shellfish species is assessed as **No Change.**

15.5.2.4.2 Diadromous Fish Species

As migrating individuals of these species will be crossing the consenting corridor during migration to or from freshwater then they may be exposed to any reduced water quality for only a very short period of time. Also, the reduction of water quality will be short-term and localised in nature along the consenting corridor, occurring sequentially with the location of the installation activity and near the seabed. Therefore, the likelihood of migrating or marine resident individuals of these pelagic species encountering an area of reduced water quality is very low. Furthermore, as they are highly mobile species then should they encounter an area of reduced water quality they are capable of navigating away and avoiding the area. Therefore, the magnitude of impact upon diadromous fish species is assessed as **No Change**.

15.5.2.4.3 Elasmobranch Species

As any reduced water quality will be short-term and localised in nature along the consenting corridor, occurring sequentially with the location of the installation activity, and near the seabed the likelihood

of pelagic species encountering an area of reduced water quality is very low. Encounter may be more likely for demersal elasmobranchs such as the common skate, sandy ray, Portuguese dogfish, spiny dogfish or other elasmobranch species (such as the spotted ray or thornback ray), however, as these are highly mobile species then, should they encounter an area of reduced water quality, they are capable of navigating away and avoiding the area. Therefore, the magnitude of impact upon the common skate, sandy ray, Portuguese dogfish, spiny dogfish, spotted ray and thornback ray is assessed as **Negligible**, and on all the elasmobranch fish species is assessed as **No Change**.

15.5.2.4.4 Marine Demersal Fish Species

As any reduced water quality will be short-term and localised in nature along the consenting corridor, occurring sequentially with the location of the installation activity, the likelihood of demersal species encountering an area of reduced water quality is low. As these are highly mobile species then, should they encounter an area of reduced water quality, they are capable of navigating away and avoiding the area. Any changes to behaviour or reduced feeding success as a result of the reduced water quality for demersal species are anticipated to be short-term and temporary and have no impact upon the structure and functioning of the populations of these species. The magnitude of impact upon marine demersal fish species is, therefore, assessed as **Negligible**.

15.5.2.4.5 Marine Pelagic Fish Species

As any reduced water quality will be short-term and localised in nature along the consenting corridor, occurring sequentially with the location of the installation activity, and near the seabed for the cable installation activities, the likelihood of pelagic species encountering an area of reduced water quality is very low. These species are also highly mobile and so, should they encounter an area of reduced water quality, they are capable of navigating away and avoiding the area. Therefore, the magnitude of impact upon marine pelagic fish species is assessed as **No Change**.

15.5.2.4.6 Cephalopods

As any reduced water quality will be short-term and localised in nature along the consenting corridor, occurring sequentially with the location of the installation activity, the likelihood of cephalopods encountering an area of reduced water quality is low. As these are mobile species (though with lower swimming capacity than teleost fish species) then should they encounter an area of reduced water quality they are capable of navigating away and avoiding the area. Any changes to behaviour or reduced feeding success as a result of reduced water quality for cephalopods are anticipated to be short-term and temporary and have no impact upon the structure and functioning of the populations of these species. The magnitude of impact upon marine demersal fish species is therefore assessed as **Negligible**.

15.5.2.4.7 Crustaceans

Crustacean species are less mobile and may not move away from areas of reduced water quality readily. Any reduction in water quality will be short-term and localised in nature along the consenting corridor then whilst there is a risk of some effect upon nearby individuals, the risk to the wider population is very limited and therefore the magnitude of impact upon crustaceans is assessed as **Negligible**.

15.5.2.4.8 Molluscs

Mollusc species have limited mobility with which to move away from areas of reduced water quality. As the reduced water quality will be short-term and localised in nature along the consenting corridor

then, whilst there is a risk of some effect upon nearby individuals, the risk to the wider population is very limited and therefore the magnitude of impact upon molluscs is assessed as **Negligible**.

15.5.2.4.9 Spawning and Nursery Grounds

The project will result in potential reductions in water quality across a 14km length of suitable sandeel spawning habitat identified by MMT (2017). As sandeels, however, spawn in December and January with eggs hatching in February and March, and cable installation will only occur between April and September, then there is no risk of spawning individuals or eggs being exposed to reduced water quality. As a result, the magnitude of effect is assessed as **No Change**.

The project will result in potential reductions in water quality across a 3.6km length of suitable herring spawning habitat identified by MMT (2017), which equates to just 0.0006% of the local herring spawning ground. As herring from the Buchan stock spawn in August and September, then some herring eggs in this area may be at risk of being subjected to reduced water quality. Given the limited extent of the wider spawning ground affected and the temporary, short-term nature of the impact, then the magnitude of effect is assessed as **Negligible**.

15.5.2.5 Underwater Noise and Vibration (Cable Installation)

During cable installation, vessels and cable burial machinery will generate underwater noise. The underwater noise generated by the vessels and equipment has been assessed and modelled in Chapter 23: Noise and Vibration (Underwater). The sound generated during cable installation will be transient, and present in an area for only a short time, as installation moves along the consenting corridor in a sequential manner. The underwater noise generated by the HDD has also been considered within Chapter 23: Noise and Vibration (Underwater), and is reported as being within the range of baseline noise levels expected in the area.

Chapter 23: Noise and Vibration (Underwater) confirms that the noise sources associated with the installation of the NorthConnect HVDC cables do not have the potential to cause injury in fish species. However, sources are within the hearing thresholds of the fish species likely to be present within the consenting corridor, and have the potential to cause localised disturbance, including Dynamic Positioning (DP) vessel noise, conventional (non-DP) vessel noise, pre- and post-installation survey equipment noise (the greatest noise levels generated by the sub-bottom profiler), and cable burial noise. A summary of the predicted disturbance ranges detailed in Chapter 23: Noise and Vibration (Underwater) is provided in Table 15.12 below.

Table 15.12 Maximum predicted impact ranges on fish resulting from underwater noise associated with the installation of the marine HVDC cables.

	Dynamic Positioning Vessel Noise	**Non-Dynamic Positioning vessel Noise**	**Sub-bottom profiler (SBP)**	**Cable Burial**
Maximum Behavioural Disturbance Range	1359m	100m	2154m	215m

It is noted that there is a paucity of empirical data relating to underwater noise levels that provoke a behavioural response (disturbance) in fish and, as such, there are very few thresholds for the onset of disturbance published in the literature. The modelling presented in Chapter 23: Noise and Vibration (Underwater) uses a disturbance threshold for fish of 150dB re 1µPa, which is from the United States National Marine and Fisheries Service (US NMFS) Interim Injury and Disturbance criteria, since this is

the only threshold available that is suitable for use in the calculation of disturbance ranges from continuous (non-impulse) noise sources. However, this threshold is acknowledged within published literature to be conservative and likely to be lower than the sound pressure level that would actually provoke a behavioural response for many species (Popper *et al.*, 2014). As such, the disturbance ranges detailed here should be considered to be conservative and precautionary.

Dynamic Positioning (DP) thruster noise results in potential disturbance during cable installation, at a range of approximately 1.4km, while non-DP vessel noise and cable burial have low potential disturbance ranges of 100m and 215m respectively. Vessels using DP will be used throughout the cable installation process, including the cable lay vessel, cable burial vessel, rock placement vessels and other support vessels. However, DP vessel noise resulting from the NorthConnect project must be set against the existing vessel usage of the area (see Chapter 19: Navigation and Shipping), which is high given the existing North Sea oil and gas activities. DP vessels are utilised regularly by the oil and gas industry to support the offshore infrastructure in the North Sea, and in the vicinity of the consenting corridor. In addition, the North Sea is a busy shipping area and is frequently transited by large vessels including bulk cargo ships, tankers, and cruise ships. Such vessels are reported as generating underwater noise levels ranging from 185-200dB re 1µPa at 1m and, therefore, the noise levels from the DP vessels associated with the project would be analogous to the reported levels for other vessel traffic which already operate in the area, and the project would not significantly increase the numbers of vessels present in the area (see Chapter 19: Navigation and Shipping).

The SBP results in potential disturbance during the pre- and post-installation surveys at a range of approximately 2.2km. The SBP is a geophysical survey device that will only be used during the pre-installation Marine Route Survey. The marine route geophysical survey in UK waters is anticipated to last no more than 14 days, and will be conducted prior to commencement of the cable installation works. The survey vessel will be moving at approximately 2kt during the survey operations and, as such, the SBP will only result in short lived, temporary and transient disturbance, confined to a relatively small area around the survey vessel. Given the extremely conservative disturbance threshold, transient nature of the survey and the duration of the exposure to this sound level, any avoidance of the sound field will be a temporary and short-term change in behaviour.

The consenting corridor passes through an area with numerous oil and gas assets and associated DP vessels, is frequently transited by existing vessel traffic and is on the approaches to a major port at Peterhead. The additional vessel noise from the cable installation will therefore not result in an appreciable change from baseline conditions and, as such, the magnitude of impact upon all fish and shellfish species and receptors is assessed as **Negligible.**

15.5.2.6 Changes to Water Quality (Release of Drilling Fluids)

From Chapter 2: Project Description, the estimated HDD fluid losses to the sea from the three HDD holes, for the two HVDC cables and one fibre optic cable, will be 3,000m^3. The estimated solid losses to the sea will be 18m^3. These losses will not be concurrent from all three HDD holes, but will be sequential as holes are drilled individually, and so only 1,000m^3 of fluid and 6m^3 of solids will be discharged at any one time. The solids will be a mixture of granite bedrock particles and bentonite, a naturally occurring substance. The HDD will be undertaken during the winter months.

15.5.2.6.1 Designated Sites (for Fish and Shellfish Species)

Given the separation achieved between the consenting corridor and designated sites for fish and shellfish species, and the highly localised nature of the HDD within the marine environment, then any

HDD fluids released at the HDD exit point will not affect these sites or on their populations, and the magnitude of impact upon designated sites for fish and shellfish species is assessed as **No Change.**

15.5.2.6.2 Diadromous Fish Species

Given the very small scale of the release from the HDD exit point into the water column, the likely dilution of the plume and the timing of the releases in the winter, there are unlikely to be high numbers of diadromous fish species present in this coastal environment, and hence the likelihood of individuals encountering the increased sediment loading is very low. Any that are present are pelagic and highly mobile, and so will be able to avoid the affected areas during either their migration or foraging activities. The magnitude of impact upon diadromous fish species is assessed as **No Change**.

15.5.2.6.3 Elasmobranch Species

Given the very small scale of the release from the HDD exit point into the water column and the likely dilution of the plume; the likelihood of individuals encountering the area of increased sediment loading is very low. Any elasmobranch species that do are highly mobile and so will be able to avoid these areas during either their migration or foraging activities. The magnitude of impact upon elasmobranch species is assessed as **No Change**.

15.5.2.6.4 Marine Demersal Fish Species

Given the very small scale of the release from the HDD exit point into the water column and the likely dilution of the plume, the likelihood of individuals encountering the area of increased sediment loading is very low and so few marine demersal species are likely to encounter it. Any marine demersal species that do are highly mobile species and so will be able to avoid these areas during either their migration or foraging activities. The magnitude of impact upon marine demersal species is therefore assessed as **No Change**.

15.5.2.6.5 Marine Pelagic Fish Species

Given the very small scale of the release from the HDD exit point into the water column and the likely dilution of the plume, the likelihood of individuals encountering the area of increased sediment loading is very low. Any marine pelagic species that do are highly mobile species and so will be able to avoid these areas during either their migration or foraging activities. The magnitude of impact upon marine pelagic species is therefore assessed as **No Change**.

15.5.2.6.6 Cephalopods

Given the very small scale of the release from the HDD exit point into the water column and the likely dilution of the plume, the likelihood of individuals encountering the area of increased sediment loading is very low. As these are mobile species (though with lower swimming capacity than teleost fish species) then should they encounter an area of increased sediment loading they are capable of navigating away and avoiding the area. The magnitude of impact upon cephalopods is therefore assessed as **No Change**.

15.5.2.6.7 Crustaceans

Given the very small scale of the release from the HDD exit point into the water column and the likely dilution of the plume, the extent of the effect upon the relevant crustacean species is expected to be limited. Whilst they do not have the same mobility as fish species to avoid the increased sediment loading, and so some settlement of material may occur on them, the numbers within the vicinity of the HDD exit point are not anticipated to comprise an appreciable proportion of the population and so the magnitude of impact is therefore assessed as **Negligible**.

15.5.2.6.8 Molluscs

Given the very small scale of the release from the HDD exit point into the water column and the likely dilution of the plume, the extent of the effect upon the relevant mollusc species is expected to be limited. Whilst they do not have the same mobility as fish species to avoid the increased sediment loading, and so some settlement of material may occur on them, the numbers within the vicinity of the HDD exit point are not anticipated to comprise an appreciable proportion of the population and so the magnitude of impact is therefore assessed as **Negligible**.

15.5.2.6.9 Spawning and Nursery Grounds

Given the very small scale of the release from the HDD exit point into the water column and the likely dilution of the plume, the effect on spawning and nursery grounds is limited. The HDD fluid discharge will occur in the winter, outside of the herring spawning season and so the magnitude of impact upon spawning herring or herring eggs is therefore assessed as **No Change**. The HDD fluid discharge may occur in the sandeel spawning season but suitable sandeel spawning habitat is sited over 3.5km offshore along the consenting corridor (MMT, 2017) and therefore no effects upon spawning sandeels or their habitat are likely. The magnitude of impact upon spawning sandeel or sandeel eggs is therefore assessed as **No Change**.

15.5.2.7 Introduction of Invasive Non-native Species

Vessels to be used for installation have the potential to carry INNS via their ballast waters and hulls, depending upon the origin of the vessels or previous ports, which if released and are mobile in nature could compete with fish and shellfish populations within the designated sites.

Any released INNS by the vessels to be used for installation could colonise existing designated sites for fish and shellfish species and compete with them for resources, causing a potential decline in population abundance. Whilst this is possible it is considered to be unlikely given the extent of shipping activity which exists within the North Sea and given that the BWM Convention has been ratified and all vessels will be fully IMO compliant. The magnitude of impact upon all fish and shellfish receptors is assessed as **Negligible**.

15.5.3 Operations

15.5.3.1 Change in Hydrodynamic Regime (Scour and Accretion)

Where seabed type and morphology have changed, such as in the case of the rock placement areas on soft substrates, there may be localised changes in the flows causing scour and accretion but these are likely to be very localised to near the areas of rock placement and only occur in the short term as an equilibrium re-establishes.

15.5.3.1.1 Designated Sites (for Fish and Shellfish Species)

Given the separation achieved between the consenting corridor and designated sites for fish and shellfish species, then any changes in the hydrodynamic regime will not be detectable in these sites or on their populations, and the magnitude of impact upon designated sites for fish and shellfish species is therefore assessed as **No Change.**

15.5.3.1.2 Marine Demersal Fish Species

Scour and accretion is likely to have little effect on marine demersal species individuals, as they can move away from areas to forage elsewhere. The magnitude of impact is therefore assessed as **No Change**.

15.5.3.1.3 Crustaceans

Localised accretion may cause burial or smothering of individuals as they are less mobile and may be unable to move away from the area. This is only anticipated to potentially occur in the immediate vicinity of the rock placement areas and therefore the extent of impacts will be highly localised and temporary and have no effect on wider populations. The magnitude of impact upon crustaceans is therefore assessed as **Negligible**.

15.5.3.1.4 Molluscs

Localised accretion may cause burial or smothering of individuals as they are less mobile and may be unable to move away from the area. This is only anticipated to potentially occur in the immediate vicinity of the rock placement areas and therefore the extent of impacts will be highly localised and temporary and have no effect on wider populations. The magnitude of impact upon crustaceans is therefore assessed as **Negligible**.

15.5.3.1.5 Spawning and Nursery Grounds

Localised accretion around areas of rock placement may cause burial or smothering of herring and sandeel eggs where the rock is placed in areas of suitable spawning habitat for these species, if these species spawn in these locations. However, given the change in substrate caused by the rock placement, and the assessment of habitat loss to the spawning grounds in Section 15.5.2.1.4, it is considered unlikely that individuals will choose to spawn in these locations given the unsuitability of the habitat. Therefore, the magnitude of impact is assessed as **No Change**.

15.5.3.2 Sediment Heating

When operational, the HVDC cables will emit heat. An assessment of the review of the changes caused to sediment temperatures by the HVDC cable is provided in Chapter 18: EMF and Sediment Heating, and the sensitivity of the relevant fish species to this heating is provided in Appendix E.1. If bundled, and placed at a depth of lowering of 0.5m below the seabed, as a worst-case for soft substrates, the temperature rise at the seabed immediately above the cable will be 1^{o}C above background levels, and will rapidly decrease away from this.

15.5.3.2.1 Designated Sites (for Fish and Shellfish Species)

Given the separation achieved between the consenting corridor and designated sites for fish and shellfish species, then no change in sediment temperature will occur in these sites, and the magnitude of impact upon designated sites for fish and shellfish species is assessed as **No Change.**

15.5.3.2.2 Marine Demersal Fish Species

As the marine demersal fish species are highly mobile, then they are unlikely to be exposed to increased sediment temperatures (and any associated increased water temperatures) for a period of time that may cause any adverse behavioural or physiological effects. They are likely to be actively foraging in the area and so may move in and out of the areas with increased sediment temperature (and any associated increased water temperatures), but no adverse effect is anticipated. Impacts upon demersal spawners and eggs are assessed separately in Section 15.5.3.2.5 below. The magnitude of impact upon demersal fish species is therefore assessed as **No Change**.

15.5.3.2.3 Crustaceans

Exposure to increased sediment temperatures (and any associated increased water temperatures) may displace or attract some individuals to inhabit the areas immediately above the cable, but this will only occur for a very limited distance from the cable. This effect may also be masked by any

changes in behaviour or physiology associated with the EMF produced by the cables, and so the magnitude of impact upon crustaceans is assessed as **No Change**.

15.5.3.2.4 Molluscs

Exposure to increased sediment and water temperatures may displace or attract some individuals to inhabit the areas immediately above the cable, and may increase or decrease the mortality rates of individuals, but this will only occur for a very limited distance from the cable. This effect may also be masked by any changes in abundance, colonisation or physiology associated with the EMF produced by the cables, and so the magnitude of impact upon crustaceans is assessed as **No Change**.

15.5.3.2.5 Spawning and Nursery Grounds

Given that Atlantic herring from the Buchan / Shetland stock spawn in August and September, then the baseline water / sediment temperature is likely to be between 8-12^{o}C depending upon water depth (Berx and Hughes, 2008). If these eggs were exposed to a 1^{o}C temperature increase for the whole lifestage then it would result in a reduced survivorship from 23.8-33.2% to 21.6-30.8% (see Appendix E.1). As this small reduction in survivorship from a 1^{o}C temperature increase would occur on less than 0.0001% of the spawning habitat for the Buchan / Shetland stock in the local herring spawning ground, then the overall magnitude of impact on the population is assessed as **Negligible**.

Given that sandeel spawn in December and January, then the baseline water / sediment temperature is likely to be around 4-8^{o}C depending upon water depth (Berx and Hughes, 2008). If these eggs were exposed to a 1^{o}C temperature increase for the whole lifestage then it would result in a reduced survivorship from 33.2-42.9% to 30.8-40.5% (see Appendix E.1). As this small reduction in survivorship from a 1^{o}C temperature increase would occur on only 0.0001% of the local spawning ground for the sandeel spawning stock unit in the North Sea, then the overall magnitude of impact on the population is assessed as **Negligible**.

15.5.3.3 Electro-magnetic Fields (EMFs)

When operational, the HVDC will emit a magnetic field. As it is a direct current cable then no electric induced fields will be created, and any electric fields will be contained within the cable armouring. An assessment of the EMFs created by the project is provided in Chapter 18: Electro Magnetic Fields, and a literature review of the sensitivity of the relevant fish species to these EMFs is provided in Appendix E.1, from which the data and references for the assessment detailed below are sourced. At worst-case burial depths of 0.4m in hard substrates and 0.5m in soft substrates, then the magnetic field at the seabed would be at most 640µT, and would reduce to <300µT within 2m of the seabed at both worst-case and best case separation distances.

15.5.3.3.1 Designated Sites (for Fish and Shellfish Species)

Given the separation achieved between the consenting corridor and designated sites for fish and shellfish species, then no change in EMFs will occur in these sites, and the magnitude of impact upon designated sites for fish and shellfish species is therefore assessed as **No Change.**

15.5.3.3.2 Diadromous Fish Species

No behavioural change has been shown in Atlantic salmon or sea trout in magnetic fields below 600µT, with documented behavioural changes at 1000 µT. At very low level magnetic fields (<50µT), improvements in growth and performance have been shown for trout species, but deterioration in egg quality has been shown at magnetic fields of >2000µT. As these species are pelagic and likely to be swimming near the surface during migration, then they will not be at risk of encountering a

magnetic field that could cause a behavioural change. The magnitude of impact upon Atlantic salmon and sea trout is therefore assessed as **No Change**.

European eels have shown to temporarily divert their migration because of magnetic fields as low as 5µT above background levels. They have also been shown to orientate towards a magnetic field at 200µT above background levels. Given their wide distribution through the water column during migrations, and exhibition of diurnal vertical migrations (Righton *et al.*, 2016), they may encounter the magnetic field from the project and be at risk of temporary diversions in their migration. As this will be only for a short distance and beyond the magnetic field, they will return to their original course, then the temporary diversion will only slightly delay migration and have no discernible effect upon glass eel migration success (given that these individuals are highly reliant on currents to migrate) or silver eel escapement success. The magnitude of impact upon European eels is therefore assessed as **Negligible**.

No studies are available to assess the sensitivity of lamprey species to magnetic fields, though it is likely that they may find some level of magnetic field undesirable. If this magnetic field level is below 640µT then they may show a response to this field. Whilst lampreys are feeding on a host then their movement is dependent upon that host. They may drop off their host if they encounter a magnetic field level that is undesirable to them, but will be able to swim away from the field in this case. As they are not natal spawners, and rely on pheromones of other lampreys to indicate suitable rivers to spawn in, then they do not migrate to a specific destination and so any changes or delays in migration will not result in an adverse impact upon these species. The magnitude of impact upon sea lamprey and river lamprey is therefore assessed as **No Change**.

15.5.3.3.3 Elasmobranch Species

The sharks, skate and rays present within the consenting corridor will be highly sensitive to electromagnetic frequencies (Gill *et al.*, 2009). Elasmobranch species are sensitive to electric fields and rely on electric sense in detecting prey and predators, orientating to ocean currents and sensing their magnetic compass headings. The ampullae of Lorenzini, their electro-sensory organs, can result in increased electro sensitivity 1,000 to 10,000 times greater than other marine fish.

Elasmobranchs have the ability to detect very low-level magnetic fields and have shown behavioural responses to fields as low as 25µT above background levels. Some elasmobranch species, such as rays and skates, are demersal and inhabit the lower sections of the water column and can feed on the seabed. These species would likely be able to detect even the very smallest perturbations in the earth's natural magnetic field, given their biology and presence of ampullae of Lorenzini, but behavioural changes have only been detected at magnetic fields of over 25µT. There may therefore be some behavioural avoidance shown by these species to the magnetic field produced by the project but given the mobile nature of the species they can either forage elsewhere outside of the magnetic field or navigate swiftly through it (or over it) if necessary. No effects upon the population levels are therefore anticipated. The magnitude of impact upon the common skate, sandy ray, Portuguese dogfish, spiny dogfish, spotted ray and thornback ray is therefore assessed as **Negligible**.

For the remaining pelagic elasmobranchs, they may also show behavioural avoidance of the field but as they occupy a much wider vertical range within the water column, they will be able to easily navigate over it. The magnitude of impact upon all other elasmobranchs is therefore assessed as **No Change**.

15.5.3.3.4 Marine Demersal Fish Species

Low-level magnetic fields may induce behavioural change in marine demersal species, but empirical evidence on this is limited. No physiological changes to these species have been found below 3,700µT. While marine demersal species will be seabed orientated, given their mobile nature and swimming capacities they would have the ability to swim higher into the water column above the magnetic field to avoid it should they have the propensity to do so. However, no negative physiological effects have been identified at magnetic fields below 3,700µT, should they not show this avoidance behaviour. The magnitude of impact upon marine demersal fish species is therefore assessed as **Negligible**.

15.5.3.3.5 Marine Pelagic Fish Species

Low-level magnetic fields may induce behavioural change in marine pelagic species, but empirical evidence on this is limited. No physiological changes to these species have been found below 3,700µT. As pelagic species will be widely distributed through the water column, given their mobile nature and swimming capacities they would have the ability to swim higher into the water column above the magnetic field to avoid it. However, no negative physiological effects have been identified at magnetic fields below 3,700µT, should they not show this avoidance behaviour. The magnitude of impact upon marine pelagic fish species is therefore assessed as **Negligible**.

15.5.3.3.6 Cephalopods

No studies are available to assess the sensitivity of cephalopod species to magnetic fields, though on a precautionary basis they may find some level of magnetic field undesirable. If this magnetic field level is below 640µT then they may show a response to this field but as they are mobile species then they could navigate away from the field. To reflect the potential for individuals to exhibit a response to the magnetic field generated by the project, on a precautionary basis, the magnitude of impact upon cephalopods is therefore assessed as **Negligible**.

15.5.3.3.7 Crustaceans

Crustacean species inhabit the seabed and so may be in close proximity to the cable, and thus be subjected higher magnetic fields than species in the water column. Behavioural changes of crab and lobster species have been observed between 314 and 1,103µT. No behavioural or physiological changes have, however, been identified in shellfish species below 300 µT. Given their significantly lower ability to move vertically into the water column than elasmobranch and marine demersal species, they would have less ability to avoid the magnetic fields if exposed to them, but they are likely to be able to move beyond the range of the field at which physiological effects could occur (c.2m), and therefore physiological effects upon these species will be limited. Given the geographical extent of the EMF from the project, these species will be capable of utilising their swimming capacity to move through the EMF quickly, in a matter of seconds. For example, langoustine have been reported to reach speeds of $0.8ms^{-1}$ (Stentiford et al., 2000). Also, many of these species will release larvae into the water column during reproduction, which is pelagic and carried by oceanic currents (Wilson, 1999), therefore, the presence of a small EMF will not affect the distribution of the species or present barriers to population range or growth. The magnitude of impact is therefore assessed as **Negligible**.

15.5.3.3.8 Molluscs

Mollusc species inhabit the seabed and so would be in closer proximity to the cable and thus higher magnetic fields. Changes in shapes of immunocytes, the cells that create antibodies, have been observed in Mediterranean mussels at 300µT. No behavioural or physiological changes have been identified to shellfish species below 300µT. Given their inability to move vertically into the water column, these species would be unable to avoid the magnetic fields if exposed to them, though would

only be potentially exposed to an effect at field levels of above 300µT. As this will occur at a maximum distance of 2m either side of the seabed for each cable, then an overall area of 180ha is potentially affected. Given that the cable installation is likely to have disturbed a greater width of seabed along the consenting corridor, and therefore removed the molluscs present, then no direct mortalities are expected from the magnetic field. The effect will be limited to displacement of individuals from future colonisation of this area, or potentially reduced survival and/or fecundity of individuals that do recolonise this area. As many mollusc species release eggs into the water column for fertilisation (Galtsoff, 1961), which are then carried by oceanic currents, then the presence of a small EMF will not affect the distribution of the species or present barriers to population range or growth. As the extent of the potential effects is very limited considering the wider areas of production of these species within the North Sea, then the magnitude of impact is assessed as **Negligible**.

15.5.3.3.9 Spawning and Nursery Grounds

No physiological changes from magnetic fields have been shown upon marine pelagic or demersal fish species below 3,700µT and, therefore, any herring or sandeel eggs spawned in these areas are unlikely to be subject to any physiological effects. There may be some behavioural avoidance shown by these species prior to spawning, but this will be over a very limited area and with significant areas of available spawning grounds either side. The magnitude of impact upon spawning and nursery grounds is therefore assessed as **Negligible**.

15.5.3.4 Introduction of Invasive Non-native Species

Vessels to be used for repairs have the potential to carry INNS via their ballast waters and hulls, depending upon the origin of the vessels or previous ports, which if released and are mobile in nature could compete with fish and shellfish populations within the designated sites.

Any released INNS by the vessels to be used for installation could colonise existing designated sites for fish and shellfish species and compete with them for resources, causing a potential decline in population abundance. The disturbance of the seabed and introduction of rock will create uncolonised seabed surfaces which will be at risk of inhabitation by INNS during the first years of operation.

Whilst this is possible it is considered to be unlikely given the extent of shipping activity and habitat disturbance which currently exists within the North Sea and given that the BWM Convention has been ratified and all vessels will be fully IMO compliant. The magnitude of impact upon all fish and shellfish receptors is assessed as **Negligible**.

15.5.3.5 Physical Disturbance During Inspection and Repair

To conduct repairs on the cables, they must be brought to the surface and then re-laid which will disturb the seabed along the consenting corridor for a distance of twice the water depth, which within 12nm is a distance of ~200m, and between 12nm to the UK EEZ limit is a distance of ~300m. One repair every three years is assumed as a worst-case based on previous project experiences, and so over the lifetime of the project (40 years), repairs could occur 13times, disturbing a total of a maximum 4.2ha of seabed assuming the repair disturbs a 10m wide strip of the seabed around the consenting corridor. This area of disturbance, even if it wholly occurs in the sensitive herring and sandeel suitable spawning habitat would represent a tiny fraction of the available habitat and spawning ground. The magnitude of impact upon these spawning grounds is therefore assessed as **Negligible**. The magnitude of impact upon all other species is assessed as **No Change**.

15.5.4 Decommissioning Phase Impacts

Impacts during the decommissioning phase associated with the removal of the cable (if required), are anticipated to be of a similar or lesser magnitude than for cable installation. On a precautionary basis for the following decommissioning phase impacts, the magnitude of impact is assessed to be the same as for the installation phase:

- Habitat loss;
- Changes to water quality (resuspension of sediments and increased sediment loading);
- Changes to water quality (release of hazardous substances);
- Underwater noise and vibration (cable removal); and
- Introduction of invasive non-native species.

No other impacts are anticipated during decommissioning.

15.5.5 Impact Assessment Summary

A summary table of the impact assessment for fish and shellfish receptors is presented in Tables 15.13a-c, which also considers the overall significance of effect from the assigned receptor value/sensitivity and magnitude of impact, and the confidence in the assessment. No impacts are assessed as being significant under the provisions of the EIA regulations.

Table 15.13a Fish and Shellfish Impact Assessment Summary for Installation Phase

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Habitat loss	Designated sites	River Dee SAC	Very High	No Change	No Change		High	Non-significant
		River South Esk SAC	Very High	No Change	No Change		High	Non-significant
		River Tay SAC	Very High	No Change	No Change		High	Non-significant
		River Teith SAC	Very High	No Change	No Change		High	Non-significant
		River Tweed SAC	Very High	No Change	No Change		High	Non-significant
		Turbot Bank MPA	High	No Change	No Change		High	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	No Change	No Change		High	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Common lobster *Homarus gammarus*	High	Negligible	Minor	Adverse	High	Non-significant
		European spiny lobster *Palinurus elephas*	High	Negligible	Minor	Adverse	High	Non-significant
		Squat lobster *Munida rugosa*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Edible crabs *Cancer pagurus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Velvet swimming crab *Necora puber*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Shore crab *Carcinus maenas*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	High	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	Negligible	Minor	Adverse	High	Non-significant
		Common cockle *Cerastoderma edule*	Low	Minor	Minor	Adverse	High	Non-significant
		King scallop *Pecten maximus*	Medium	Minor	Minor	Adverse	High	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	Minor	Minor	Adverse	High	Non-significant
		Razorfish Ensis spp.	Low	Minor	Minor	Adverse	High	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant
		Sandeel spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant
Habitat creation	Designated sites	River Dee SAC	Very High	No Change	No Change		High	Non-significant
		River South Esk SAC	Very High	No Change	No Change		High	Non-significant
		River Tay SAC	Very High	No Change	No Change		High	Non-significant
		River Teith SAC	Very High	No Change	No Change		High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Habitat creation	Designated sites	River Tweed SAC	Very High	No Change	No Change		High	Non-significant
		Turbot Bank MPA	High	No Change	No Change		High	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	No Change	No Change		High	Non-significant
	Marine demersal fish species	Anglerfish / sea monkfish *Lophius piscatorius*	High	No Change	No Change		High	Non-significant
		Atlantic cod *Gadus morhua*	High	No Change	Minor	Beneficial	Beneficial	Non-significant
		Atlantic halibut *Hippoglossus hippoglossus*	Very High	No Change	No Change		High	Non-significant
		Blue ling *Molva dypterygia*	High	No Change	No Change		High	Non-significant
		Common goby *Pomatoschitus microps*	High	No Change	No Change		High	Non-significant
		Common sole *Solea solea*	High	No Change	No Change		High	Non-significant
		European hake *Merluccius merluccius*	High	No Change	No Change		High	Non-significant
		European plaice *Pleuronectes platessa*	High	No Change	No Change		High	Non-significant
		Greenland halibut *Reinhardtius hippoglossoides*	High	No Change	No Change		High	Non-significant
		Haddock *Melanogrammus aeglefinus*	High	No Change	No Change		High	Non-significant
		Lemon sole *Microstomus kitt*	High	No Change	No Change		High	Non-significant
		Ling *Molva molva*	High	Negligible	Minor	Beneficial	Medium	Non-significant
		Norway pout *Trisopterus esmarkii*	High	No Change	No Change		High	Non-significant
		Saithe *Pollachius virens*	High	Negligible	Minor	Beneficial	Medium	Non-significant
		Sand goby *Pomatoschitus minutus*	High	No Change	No Change		High	Non-significant
		Sandeel *Ammodytes spp.*	High	No Change	No Change		High	Non-significant
		Whiting *Merlangius merlangus*	High	Negligible	Minor	Beneficial	Medium	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	No Change	No Change		High	Non-significant
		Common lobster *Homarus gammarus*	High	No Change	No Change		High	Non-significant
		European spiny lobster *Palinurus elephas*	High	No Change	No Change		High	Non-significant
		Squat lobster *Munida rugosa*	Low	No Change	No Change		High	Non-significant
		Edible crabs *Cancer pagurus*	Medium	No Change	No Change		High	Non-significant
		Velvet swimming crab *Necora puber*	Medium	No Change	No Change		High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Habitat creation	Crustaceans	Shore crab *Carcinus maenas*	Low	No Change	No Change		High	Non-significant
		Crayfish *Palunirus elegans*	Low	No Change	No Change		High	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	No Change	No Change		High	Non-significant
		Common cockle *Cerastoderma edule*	Low	No Change	No Change		High	Non-significant
		King scallop *Pecten maximus*	Medium	No Change	No Change		High	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	No Change	No Change		High	Non-significant
		Razorfish Ensis spp.	Low	No Change	No Change		High	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	No Change	No Change		High	Non-significant
		Sandeel spawning and nursery grounds	High	No Change	No Change		High	Non-significant
Changes to water quality (resuspension of sediments and increased sediment loading)	Designated sites	River Dee SAC	Very High	No Change	No Change		High	Non-significant
		River South Esk SAC	Very High	No Change	No Change		High	Non-significant
		River Tay SAC	Very High	No Change	No Change		High	Non-significant
		River Teith SAC	Very High	No Change	No Change		High	Non-significant
		River Tweed SAC	Very High	No Change	No Change		High	Non-significant
		Turbot Bank MPA	High	No Change	No Change		High	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	No Change	No Change		High	Non-significant
	Diadromous fish species	Atlantic salmon *Salmo salar*	Very High	No Change	No Change		High	Non-significant
		Sea trout *Salmo trutta*	High	No Change	No Change		High	Non-significant
		European eel *Anguilla anguilla*	Very High	No Change	No Change		High	Non-significant
		Sea lamprey *Petromyzon marinus*	Very High	No Change	No Change		High	Non-significant
		River lamprey *Lampetra fluviatilis*	Very High	No Change	No Change		High	Non-significant
	Elasmobranchs	Angel Shark *Squatina squatina*	Very High	No Change	No Change		High	Non-significant
		Basking Shark *Cetorhinus maximus*	Very High	No Change	No Change		High	Non-significant
		Blue Shark *Prionace glauca*	High	No Change	No Change		High	Non-significant
		Common Skate *Dipturus batis*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Gulper Shark *Centrophorus granulosus*	High	No Change	No Change		High	Non-significant
		Kitefin Shark *Dalatias licha*	High	No Change	No Change		High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Changes to water quality (resuspension of sediments and increased sediment loading)	Elasmobranchs	Leafscale gulper shark *Centrophorus squamosus*	High	No Change	No Change		High	Non-significant
		Porbeagle Shark *Lamna nasus*	High	No Change	No Change		High	Non-significant
		Portuguese Dogfish *Centroscymnus coelolepis*	High	Negligible	Minor	Adverse	High	Non-significant
		Sandy Ray *Leucoraja circularis*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Spurdog or Spiny Dogfish *Squalus acanthias*	High	Negligible	Minor	Adverse	High	Non-significant
		Tope Shark *Galeorhinus galeus*	High	No Change	No Change		High	Non-significant
		Other elasmobranch species (e.g. spotted ray Raja montagui, thornback ray *Raja clavata*)	Medium	Negligible	Negligible	Adverse	High	Non-significant
	Marine demersal fish species	Anglerfish / sea monkfish *Lophius piscatorius*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic cod *Gadus morhua*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic halibut *Hippoglossus hippoglossus*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Blue ling *Molva dypterygia*	High	Negligible	Minor	Adverse	High	Non-significant
		Common goby *Pomatoschitus microps*	High	Negligible	Minor	Adverse	High	Non-significant
		Common sole *Solea solea*	High	Negligible	Minor	Adverse	High	Non-significant
		European hake *Merluccius merluccius*	High	Negligible	Minor	Adverse	High	Non-significant
		European plaice *Pleuronectes platessa*	High	Negligible	Minor	Adverse	High	Non-significant
		Greenland halibut *Reinhardtius hippoglossoides*	High	Negligible	Minor	Adverse	High	Non-significant
		Haddock *Melanogrammus aeglefinus*	High	Negligible	Minor	Adverse	High	Non-significant
		Lemon sole *Microstomus kitt*	High	Negligible	Minor	Adverse	High	Non-significant
		Ling *Molva molva*	High	Negligible	Minor	Adverse	High	Non-significant
		Norway pout *Trisopterus esmarkii*	High	Negligible	Minor	Adverse	High	Non-significant
		Saithe *Pollachius virens*	High	Negligible	Minor	Adverse	High	Non-significant
		Sand goby *Pomatoschitus minutus*	High	Negligible	Minor	Adverse	High	Non-significant
		Sandeel *Ammodytes spp.*	High	Negligible	Minor	Adverse	High	Non-significant
		Whiting *Merlangius merlangus*	High	Negligible	Minor	Adverse	High	Non-significant
	Marine pelagic fish species	Atlantic bluefin tuna *Thunnus thynnus*	High	No Change	No Change		High	Non-significant
		Atlantic herring *Clupea harengus*	High	No Change	No Change		High	Non-significant
		Atlantic mackerel *Scomber scombrus*	High	No Change	No Change		High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Changes to water quality (resuspension of sediments and increased sediment loading)	Marine pelagic fish species	Black scabbardfish *Aphanopus carbo*	High	No Change	No Change		High	Non-significant
		Blue whiting *Micromesistius poutassou*	High	No Change	No Change		High	Non-significant
		European sprat *Sprattus sprattus*	High	No Change	No Change		High	Non-significant
		Horse mackerel *Trachurus trachurus*	High	No Change	No Change		High	Non-significant
		Orange roughy *Hoplostethus atlanticus*	High	No Change	No Change		High	Non-significant
		Roundnose grenadier *Coryphaenoides rupestris*	Very High	No Change	No Change		High	Non-significant
	Cephalopods	Long-finned (loliginid) squids *Loligo forbesi* and *Loligo vulgari*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Short-finned (ommastrephid) squids *Todarodes sagittatus, Todaropsis eblanae* and *Illex coindetii*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Cuttlefish *Sepia officinalis*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Octopuses *Octopus vulgaris and Eledone cirrhosa*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	High	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Common lobster *Homarus gammarus*	High	Negligible	Minor	Adverse	High	Non-significant
		European spiny lobster *Palinurus elephas*	High	Negligible	Minor	Adverse	High	Non-significant
		Squat lobster *Munida rugosa*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Edible crabs *Cancer pagurus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Velvet swimming crab *Necora puber*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Shore crab *Carcinus maenas*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	High	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	Negligible	Minor	Adverse	High	Non-significant
		Common cockle *Cerastoderma edule*	Low	Negligible	Negligible	Adverse	High	Non-significant
		King scallop *Pecten maximus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Razorfish Ensis spp.	Low	Negligible	Negligible	Adverse	High	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant
		Sandeel spawning and nursery grounds	High	No Change	No Change		High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Changes to water quality (release of hazardous substances)	Designated sites	River Dee SAC	Very High	No Change	No Change		Medium	Non-significant
		River South Esk SAC	Very High	No Change	No Change		Medium	Non-significant
		River Tay SAC	Very High	No Change	No Change		Medium	Non-significant
		River Teith SAC	Very High	No Change	No Change		Medium	Non-significant
		River Tweed SAC	Very High	No Change	No Change		Medium	Non-significant
		Turbot Bank MPA	High	No Change	No Change		Medium	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	No Change	No Change		Medium	Non-significant
	Diadromous fish species	Atlantic salmon *Salmo salar*	Very High	No Change	No Change		Medium	Non-significant
		Sea trout *Salmo trutta*	High	No Change	No Change		Medium	Non-significant
		European eel *Anguilla anguilla*	Very High	No Change	No Change		Medium	Non-significant
		Sea lamprey *Petromyzon marinus*	Very High	No Change	No Change		Medium	Non-significant
		River lamprey *Lampetra fluviatilis*	Very High	No Change	No Change		Medium	Non-significant
	Elasmobranchs	Angel Shark *Squatina squatina*	Very High	No Change	No Change		Medium	Non-significant
		Basking Shark *Cetorhinus maximus*	Very High	No Change	No Change		Medium	Non-significant
		Blue Shark *Prionace glauca*	High	No Change	No Change		Medium	Non-significant
		Common Skate *Dipturus batis*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Gulper Shark *Centrophorus granulosus*	High	No Change	No Change		Medium	Non-significant
		Kitefin Shark *Dalatias licha*	High	No Change	No Change		Medium	Non-significant
		Leafscale gulper shark *Centrophorus squamosus*	High	No Change	No Change		Medium	Non-significant
		Porbeagle Shark *Lamna nasus*	High	No Change	No Change		Medium	Non-significant
		Portuguese Dogfish *Centroscymnus coelolepis*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sandy Ray *Leucoraja circularis*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Spurdog or Spiny Dogfish *Squalus acanthias*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Tope Shark *Galeorhinus galeus*	High	No Change	No Change		Medium	Non-significant
		Other elasmobranch species (e.g. spotted ray Raja montagui, thornback ray *Raja clavata*)	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
	Marine demersal fish species	Anglerfish / sea monkfish *Lophius piscatorius*	High	Negligible	Minor	Adverse	Medium	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Changes to water quality (release of hazardous substances)	Marine demersal fish species	Atlantic cod *Gadus morhua*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Atlantic halibut *Hippoglossus hippoglossus*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Blue ling *Molva dypterygia*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common goby *Pomatoschitus microps*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common sole *Solea solea*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European hake *Merluccius merluccius*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European plaice *Pleuronectes platessa*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Greenland halibut *Reinhardtius hippoglossoides*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Haddock *Melanogrammus aeglefinus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Lemon sole *Microstomus kitt*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Ling *Molva molva*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Norway pout *Trisopterus esmarkii*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Saithe *Pollachius virens*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sand goby *Pomatoschitus minutus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sandeel *Ammodytes spp.*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Whiting *Merlangius merlangus*	High	Negligible	Minor	Adverse	Medium	Non-significant
	Marine pelagic fish species	Atlantic bluefin tuna *Thunnus thynnus*	High	No Change	No Change		Medium	Non-significant
		Atlantic herring *Clupea harengus*	High	No Change	No Change		Medium	Non-significant
		Atlantic mackerel *Scomber scombrus*	High	No Change	No Change		Medium	Non-significant
		Black scabbardfish *Aphanopus carbo*	High	No Change	No Change		Medium	Non-significant
		Blue whiting *Micromesistius poutassou*	High	No Change	No Change		Medium	Non-significant
		European sprat *Sprattus sprattus*	High	No Change	No Change		Medium	Non-significant
		Horse mackerel *Trachurus trachurus*	High	No Change	No Change		Medium	Non-significant
		Orange roughy *Hoplostethus atlanticus*	High	No Change	No Change		Medium	Non-significant
		Roundnose grenadier *Coryphaenoides rupestris*	Very High	No Change	No Change		Medium	Non-significant
	Cephalopods	Long-finned (loliginid) squids *Loligo forbesi* and *Loligo vulgari*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Short-finned (ommastrephid) squids *Todarodes sagittatus, Todaropsis eblanae* and *Illex coindetii*	Low	Negligible	Negligible	Adverse	Medium	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Changes to water quality (release of hazardous substances)	Cephalopods	Cuttlefish *Sepia officinalis*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Octopuses *Octopus vulgaris and Eledone cirrhosa*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Common lobster *Homarus gammarus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European spiny lobster *Palinurus elephas*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Squat lobster *Munida rugosa*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Edible crabs *Cancer pagurus*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Velvet swimming crab *Necora puber*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Shore crab *Carcinus maenas*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common cockle *Cerastoderma edule*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		King scallop *Pecten maximus*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Razorfish Ensis spp.	Low	Negligible	Negligible	Adverse	Medium	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	No Change	No Change		Medium	Non-significant
		Sandeel spawning and nursery grounds	High	Negligible	Minor	Adverse	Medium	Non-significant
Underwater noise and vibration	Designated sites	River Dee SAC	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		River South Esk SAC	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		River Tay SAC	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		River Teith SAC	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		River Tweed SAC	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Turbot Bank MPA	High	Negligible	Minor	Adverse	Medium	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	Negligible	Minor	Adverse	Medium	Non-significant
	Diadromous fish species	Atlantic salmon *Salmo salar*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Sea trout *Salmo trutta*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European eel *Anguilla anguilla*	Very High	Negligible	Minor	Adverse	Medium	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Underwater noise and vibration	Diadromous fish species	Sea lamprey *Petromyzon marinus*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		River lamprey *Lampetra fluviatilis*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
	Elasmobranchs	Angel Shark *Squatina squatina*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Basking Shark *Cetorhinus maximus*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Blue Shark *Prionace glauca*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common Skate *Dipturus batis*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Gulper Shark *Centrophorus granulosus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Kitefin Shark *Dalatias licha*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Leafscale gulper shark *Centrophorus squamosus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Porbeagle Shark *Lamna nasus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Portuguese Dogfish *Centroscymnus coelolepis*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sandy Ray *Leucoraja circularis*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Spurdog or Spiny Dogfish *Squalus acanthias*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Tope Shark *Galeorhinus galeus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Other elasmobranch species (e.g. spotted ray Raja montagui, thornback ray *Raja clavata*)	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
	Marine demersal fish species	Anglerfish / sea monkfish *Lophius piscatorius*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Atlantic cod *Gadus morhua*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Atlantic halibut *Hippoglossus hippoglossus*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Blue ling *Molva dypterygia*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common goby *Pomatoschitus microps*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common sole *Solea solea*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European hake *Merluccius merluccius*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European plaice *Pleuronectes platessa*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Greenland halibut *Reinhardtius hippoglossoides*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Haddock *Melanogrammus aeglefinus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Lemon sole *Microstomus kitt*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Ling *Molva molva*	High	Negligible	Minor	Adverse	Medium	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Underwater noise and vibration	Marine demersal fish species	Norway pout *Trisopterus esmarkii*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Saithe *Pollachius virens*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sand goby *Pomatoschitus minutus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sandeel *Ammodytes spp.*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Whiting *Merlangius merlangus*	High	Negligible	Minor	Adverse	Medium	Non-significant
	Marine pelagic fish species	Atlantic bluefin tuna *Thunnus thynnus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Atlantic herring *Clupea harengus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Atlantic mackerel *Scomber scombrus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Black scabbardfish *Aphanopus carbo*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Blue whiting *Micromesistius poutassou*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European sprat *Sprattus sprattus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Horse mackerel *Trachurus trachurus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Orange roughy *Hoplostethus atlanticus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Roundnose grenadier *Coryphaenoides rupestris*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
	Cephalopods	Long-finned (loliginid) squids *Loligo forbesi* and *Loligo vulgari*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Short-finned (ommastrephid) squids *Todarodes sagittatus, Todaropsis eblanae* and *Illex coindetii*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Cuttlefish *Sepia officinalis*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Octopuses *Octopus vulgaris and Eledone cirrhosa*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Common lobster *Homarus gammarus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European spiny lobster *Palinurus elephas*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Squat lobster *Munida rugosa*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Edible crabs *Cancer pagurus*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Velvet swimming crab *Necora puber*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Shore crab *Carcinus maenas*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	Medium	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Underwater noise and vibration	Molluscs	Ocean quahog *Artica Islandica*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common cockle *Cerastoderma edule*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		King scallop *Pecten maximus*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Razorfish Ensis spp.	Low	Negligible	Negligible	Adverse	Medium	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sandeel spawning and nursery grounds	High	Negligible	Minor	Adverse	Medium	Non-significant
Changes to water quality (Release of drilling fluids)	Designated sites	River Dee SAC	Very High	No Change	No Change		High	Non-significant
		River South Esk SAC	Very High	No Change	No Change		High	Non-significant
		River Tay SAC	Very High	No Change	No Change		High	Non-significant
		River Teith SAC	Very High	No Change	No Change		High	Non-significant
		River Tweed SAC	Very High	No Change	No Change		High	Non-significant
		Turbot Bank MPA	High	No Change	No Change		High	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	No Change	No Change		High	Non-significant
	Diadromous fish species	Atlantic salmon *Salmo salar*	Very High	No Change	No Change		High	Non-significant
		Sea trout *Salmo trutta*	High	No Change	No Change		High	Non-significant
		European eel *Anguilla anguilla*	Very High	No Change	No Change		High	Non-significant
		Sea lamprey *Petromyzon marinus*	Very High	No Change	No Change		High	Non-significant
		River lamprey *Lampetra fluviatilis*	Very High	No Change	No Change		High	Non-significant
	Elasmobranchs	Angel Shark *Squatina squatina*	Very High	No Change	No Change		High	Non-significant
		Basking Shark *Cetorhinus maximus*	Very High	No Change	No Change		High	Non-significant
		Blue Shark *Prionace glauca*	High	No Change	No Change		High	Non-significant
		Common Skate *Dipturus batis*	Very High	No Change	No Change		High	Non-significant
		Gulper Shark *Centrophorus granulosus*	High	No Change	No Change		High	Non-significant
		Kitefin Shark *Dalatias licha*	High	No Change	No Change		High	Non-significant
		Leafscale gulper shark *Centrophorus squamosus*	High	No Change	No Change		High	Non-significant
		Porbeagle Shark *Lamna nasus*	High	No Change	No Change		High	Non-significant
		Portuguese Dogfish *Centroscymnus coelolepis*	High	No Change	No Change		High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Changes to water quality (Release of drilling fluids)	Elasmobranchs	Sandy Ray *Leucoraja circularis*	Very High	No Change	No Change		High	Non-significant
		Spurdog or Spiny Dogfish *Squalus acanthias*	High	No Change	No Change		High	Non-significant
		Tope Shark *Galeorhinus galeus*	High	No Change	No Change		High	Non-significant
		Other elasmobranch species (e.g. spotted ray Raja montagui, thornback ray *Raja clavata*)	Medium	No Change	No Change		High	Non-significant
	Marine demersal fish species	Anglerfish / sea monkfish *Lophius piscatorius*	High	No Change	No Change		High	Non-significant
		Atlantic cod *Gadus morhua*	High	No Change	No Change		High	Non-significant
		Atlantic halibut *Hippoglossus hippoglossus*	Very High	No Change	No Change		High	Non-significant
		Blue ling *Molva dypterygia*	High	No Change	No Change		High	Non-significant
		Common goby *Pomatoschitus microps*	High	No Change	No Change		High	Non-significant
		Common sole *Solea solea*	High	No Change	No Change		High	Non-significant
		European hake *Merluccius merluccius*	High	No Change	No Change		High	Non-significant
		European plaice *Pleuronectes platessa*	High	No Change	No Change		High	Non-significant
		Greenland halibut *Reinhardtius hippoglossoides*	High	No Change	No Change		High	Non-significant
		Haddock *Melanogrammus aeglefinus*	High	No Change	No Change		High	Non-significant
		Lemon sole *Microstomus kitt*	High	No Change	No Change		High	Non-significant
		Ling *Molva molva*	High	No Change	No Change		High	Non-significant
		Norway pout *Trisopterus esmarkii*	High	No Change	No Change		High	Non-significant
		Saithe *Pollachius virens*	High	No Change	No Change		High	Non-significant
		Sand goby *Pomatoschitus minutus*	High	No Change	No Change		High	Non-significant
		Sandeel *Ammodytes spp.*	High	No Change	No Change		High	Non-significant
		Whiting *Merlangius merlangus*	High	No Change	No Change		High	Non-significant
	Marine pelagic fish species	Atlantic bluefin tuna *Thunnus thynnus*	High	No Change	No Change		High	Non-significant
		Atlantic herring *Clupea harengus*	High	No Change	No Change		High	Non-significant
		Atlantic mackerel *Scomber scombrus*	High	No Change	No Change		High	Non-significant
		Black scabbardfish *Aphanopus carbo*	High	No Change	No Change		High	Non-significant
		Blue whiting *Micromesistius poutassou*	High	No Change	No Change		High	Non-significant
		European sprat *Sprattus sprattus*	High	No Change	No Change		High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Changes to water quality (Release of drilling fluids)	Marine pelagic fish species	Horse mackerel *Trachurus trachurus*	High	No Change	No Change		High	Non-significant
		Orange roughy *Hoplostethus atlanticus*	High	No Change	No Change		High	Non-significant
		Roundnose grenadier *Coryphaenoides rupestris*	Very High	No Change	No Change		High	Non-significant
	Cephalopods	Long-finned (loliginid) squids *Loligo forbesi* and *Loligo vulgari*	Low	No Change	No Change		High	Non-significant
		Short-finned (ommastrephid) squids *Todarodes sagittatus, Todaropsis eblanae* and *Illex coindetii*	Low	No Change	No Change		High	Non-significant
		Cuttlefish *Sepia officinalis*	Low	No Change	No Change		High	Non-significant
		Octopuses *Octopus vulgaris and Eledone cirrhosa*	Low	No Change	No Change		High	Non-significant
		Crayfish *Palunirus elegans*	Low	No Change	No Change		High	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Common lobster *Homarus gammarus*	High	Negligible	Minor	Adverse	High	Non-significant
		European spiny lobster *Palinurus elephas*	High	Negligible	Minor	Adverse	High	Non-significant
		Squat lobster *Munida rugosa*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Edible crabs *Cancer pagurus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Velvet swimming crab *Necora puber*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Shore crab *Carcinus maenas*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	High	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	Negligible	Minor	Adverse	High	Non-significant
		Common cockle *Cerastoderma edule*	Low	Negligible	Negligible	Adverse	High	Non-significant
		King scallop *Pecten maximus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Razorfish Ensis spp.	Low	Negligible	Negligible	Adverse	High	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	No Change	No Change		High	Non-significant
		Sandeel spawning and nursery grounds	High	No Change	No Change		High	Non-significant
Introduction of invasive non-native species	Designated sites	River Dee SAC	Very High	Negligible	Minor	Adverse	High	Non-significant
		River South Esk SAC	Very High	Negligible	Minor	Adverse	High	Non-significant
		River Tay SAC	Very High	Negligible	Minor	Adverse	High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Introduction of invasive non-native species	Designated sites	River Teith SAC	Very High	Negligible	Minor	Adverse	High	Non-significant
		River Tweed SAC	Very High	Negligible	Minor	Adverse	High	Non-significant
		Turbot Bank MPA	High	Negligible	Minor	Adverse	High	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	Negligible	Minor	Adverse	High	Non-significant
	Diadromous fish species	Atlantic salmon *Salmo salar*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Sea trout *Salmo trutta*	High	Negligible	Minor	Adverse	High	Non-significant
		European eel *Anguilla anguilla*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Sea lamprey *Petromyzon marinus*	Very High	Negligible	Minor	Adverse	High	Non-significant
		River lamprey *Lampetra fluviatilis*	Very High	Negligible	Minor	Adverse	High	Non-significant
	Elasmobranchs	Angel Shark *Squatina squatina*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Basking Shark *Cetorhinus maximus*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Blue Shark *Prionace glauca*	High	Negligible	Minor	Adverse	High	Non-significant
		Common Skate *Dipturus batis*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Gulper Shark *Centrophorus granulosus*	High	Negligible	Minor	Adverse	High	Non-significant
		Kitefin Shark *Dalatias licha*	High	Negligible	Minor	Adverse	High	Non-significant
		Leafscale gulper shark *Centrophorus squamosus*	High	Negligible	Minor	Adverse	High	Non-significant
		Porbeagle Shark *Lamna nasus*	High	Negligible	Minor	Adverse	High	Non-significant
		Portuguese Dogfish *Centroscymnus coelolepis*	High	Negligible	Minor	Adverse	High	Non-significant
		Sandy Ray *Leucoraja circularis*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Spurdog or Spiny Dogfish *Squalus acanthias*	High	Negligible	Minor	Adverse	High	Non-significant
		Tope Shark *Galeorhinus galeus*	High	Negligible	Minor	Adverse	High	Non-significant
		Other elasmobranch species (e.g. spotted ray Raja montagui, thornback ray *Raja clavata*)	Medium	Negligible	Negligible	Adverse	High	Non-significant
	Marine demersal fish species	Anglerfish / sea monkfish *Lophius piscatorius*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic cod *Gadus morhua*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic halibut *Hippoglossus hippoglossus*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Blue ling *Molva dypterygia*	High	Negligible	Minor	Adverse	High	Non-significant
		Common goby *Pomatoschitus microps*	High	Negligible	Minor	Adverse	High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Introduction of invasive non-native species	Marine demersal fish species	Common sole *Solea solea*	High	Negligible	Minor	Adverse	High	Non-significant
		European hake *Merluccius merluccius*	High	Negligible	Minor	Adverse	High	Non-significant
		European plaice *Pleuronectes platessa*	High	Negligible	Minor	Adverse	High	Non-significant
		Greenland halibut *Reinhardtius hippoglossoides*	High	Negligible	Minor	Adverse	High	Non-significant
		Haddock *Melanogrammus aeglefinus*	High	Negligible	Minor	Adverse	High	Non-significant
		Lemon sole *Microstomus kitt*	High	Negligible	Minor	Adverse	High	Non-significant
		Ling *Molva molva*	High	Negligible	Minor	Adverse	High	Non-significant
		Norway pout *Trisopterus esmarkii*	High	Negligible	Minor	Adverse	High	Non-significant
		Saithe *Pollachius virens*	High	Negligible	Minor	Adverse	High	Non-significant
		Sand goby *Pomatoschitus minutus*	High	Negligible	Minor	Adverse	High	Non-significant
		Sandeel *Ammodytes spp.*	High	Negligible	Minor	Adverse	High	Non-significant
		Whiting *Merlangius merlangus*	High	Negligible	Minor	Adverse	High	Non-significant
	Marine pelagic fish species	Atlantic bluefin tuna *Thunnus thynnus*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic herring *Clupea harengus*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic mackerel *Scomber scombrus*	High	Negligible	Minor	Adverse	High	Non-significant
		Black scabbardfish *Aphanopus carbo*	High	Negligible	Minor	Adverse	High	Non-significant
		Blue whiting *Micromesistius poutassou*	High	Negligible	Minor	Adverse	High	Non-significant
		European sprat *Sprattus sprattus*	High	Negligible	Minor	Adverse	High	Non-significant
		Horse mackerel *Trachurus trachurus*	High	Negligible	Minor	Adverse	High	Non-significant
		Orange roughy *Hoplostethus atlanticus*	High	Negligible	Minor	Adverse	High	Non-significant
		Roundnose grenadier *Coryphaenoides rupestris*	Very High	Negligible	Minor	Adverse	High	Non-significant
	Cephalopods	Long-finned (loliginid) squids *Loligo forbesi* and *Loligo vulgari*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Short-finned (ommastrephid) squids *Todarodes sagittatus, Todaropsis eblanae* and *Illex coindetii*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Cuttlefish *Sepia officinalis*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Octopuses *Octopus vulgaris and Eledone cirrhosa*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Beneficial	Confidence	Effect significant in terms of the EIA Regulations
Introduction of invasive non-native species	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Common lobster *Homarus gammarus*	High	Negligible	Minor	Adverse	High	Non-significant
		European spiny lobster *Palinurus elephas*	High	Negligible	Minor	Adverse	High	Non-significant
		Squat lobster *Munida rugosa*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Edible crabs *Cancer pagurus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Velvet swimming crab *Necora puber*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Shore crab *Carcinus maenas*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	High	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	Negligible	Minor	Adverse	High	Non-significant
		Common cockle *Cerastoderma edule*	Low	Negligible	Negligible	Adverse	High	Non-significant
		King scallop *Pecten maximus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Razorfish Ensis spp.	Low	Negligible	Negligible	Adverse	High	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant
		Sandeel spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant

Table 15.13b Fish and Shellfish Impact Assessment Summary for the Operational Phase

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse of Beneficial	Confidence	EIA Regulations Significance
Change in hydro dynamic regime (scour and accretion)	Designated sites	River Dee SAC	Very High	No Change	No Change		High	Non-significant
		River South Esk SAC	Very High	No Change	No Change		High	Non-significant
		River Tay SAC	Very High	No Change	No Change		High	Non-significant
		River Teith SAC	Very High	No Change	No Change		High	Non-significant
		River Tweed SAC	Very High	No Change	No Change		High	Non-significant
		Turbot Bank MPA	High	No Change	No Change		High	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	No Change	No Change		High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse of Beneficial	Confidence	EIA Regulations Significance
Change in hydro dynamic regime (scour and accretion)	Marine demersal fish species	Anglerfish / sea monkfish *Lophius piscatorius*	High	No Change	No Change		High	Non-significant
		Atlantic cod *Gadus morhua*	High	No Change	No Change		High	Non-significant
		Atlantic halibut *Hippoglossus hippoglossus*	Very High	No Change	No Change		High	Non-significant
		Blue ling *Molva dypterygia*	High	No Change	No Change		High	Non-significant
		Common goby *Pomatoschitus microps*	High	No Change	No Change		High	Non-significant
		Common sole *Solea solea*	High	No Change	No Change		High	Non-significant
		European hake *Merluccius merluccius*	High	No Change	No Change		High	Non-significant
		European plaice *Pleuronectes platessa*	High	No Change	No Change		High	Non-significant
		Greenland halibut *Reinhardtius hippoglossoides*	High	No Change	No Change		High	Non-significant
		Haddock *Melanogrammus aeglefinus*	High	No Change	No Change		High	Non-significant
		Lemon sole *Microstomus kitt*	High	No Change	No Change		High	Non-significant
		Ling *Molva molva*	High	No Change	No Change		High	Non-significant
		Norway pout *Trisopterus esmarkii*	High	No Change	No Change		High	Non-significant
		Saithe *Pollachius virens*	High	No Change	No Change		High	Non-significant
		Sand goby *Pomatoschitus minutus*	High	No Change	No Change		High	Non-significant
		Sandeel *Ammodytes spp.*	High	No Change	No Change		High	Non-significant
		Whiting *Merlangius merlangus*	High	No Change	No Change		High	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Common lobster *Homarus gammarus*	High	Negligible	Minor	Adverse	High	Non-significant
		European spiny lobster *Palinurus elephas*	High	Negligible	Minor	Adverse	High	Non-significant
		Squat lobster *Munida rugosa*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Edible crabs *Cancer pagurus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Velvet swimming crab *Necora puber*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Shore crab *Carcinus maenas*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	High	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	Negligible	Minor	Adverse	High	Non-significant
		Common cockle *Cerastoderma edule*	Low	Negligible	Negligible	Adverse	High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse of Beneficial	Confidence	EIA Regulations Significance
Change in hydro dynamic regime (scour and accretion)	Molluscs	King scallop *Pecten maximus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Razorfish Ensis spp.	Low	Negligible	Negligible	Adverse	High	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	No Change	No Change		High	Non-significant
		Sandeel spawning and nursery grounds	High	No Change	No Change		High	Non-significant
Sediment heating	Designated sites	River Dee SAC	Very High	No Change	No Change		Medium	Non-significant
		River South Esk SAC	Very High	No Change	No Change		Medium	Non-significant
		River Tay SAC	Very High	No Change	No Change		Medium	Non-significant
		River Teith SAC	Very High	No Change	No Change		Medium	Non-significant
		River Tweed SAC	Very High	No Change	No Change		Medium	Non-significant
		Turbot Bank MPA	High	No Change	No Change		Medium	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	No Change	No Change		Medium	Non-significant
	Marine demersal fish species	Anglerfish / sea monkfish *Lophius piscatorius*	High	No Change	No Change		Medium	Non-significant
		Atlantic cod *Gadus morhua*	High	No Change	No Change		Medium	Non-significant
		Atlantic halibut *Hippoglossus hippoglossus*	Very High	No Change	No Change		Medium	Non-significant
		Blue ling *Molva dypterygia*	High	No Change	No Change		Medium	Non-significant
		Common goby *Pomatoschitus microps*	High	No Change	No Change		Medium	Non-significant
		Common sole *Solea solea*	High	No Change	No Change		Medium	Non-significant
		European hake *Merluccius merluccius*	High	No Change	No Change		Medium	Non-significant
		European plaice *Pleuronectes platessa*	High	No Change	No Change		Medium	Non-significant
		Greenland halibut *Reinhardtius hippoglossoides*	High	No Change	No Change		Medium	Non-significant
		Haddock *Melanogrammus aeglefinus*	High	No Change	No Change		Medium	Non-significant
		Lemon sole *Microstomus kitt*	High	No Change	No Change		Medium	Non-significant
		Ling *Molva molva*	High	No Change	No Change		Medium	Non-significant
		Norway pout *Trisopterus esmarkii*	High	No Change	No Change		Medium	Non-significant
		Saithe *Pollachius virens*	High	No Change	No Change		Medium	Non-significant
		Sand goby *Pomatoschitus minutus*	High	No Change	No Change		Medium	Non-significant
		Sandeel *Ammodytes spp.*	High	No Change	No Change		Medium	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse of Beneficial	Confidence	EIA Regulations Significance
Sediment heating	Marine demersal fish species	Whiting *Merlangius merlangus*	High	No Change	No Change		Medium	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	No Change	No Change		Medium	Non-significant
		Common lobster *Homarus gammarus*	High	No Change	No Change		Medium	Non-significant
		European spiny lobster *Palinurus elephas*	High	No Change	No Change		Medium	Non-significant
		Squat lobster *Munida rugosa*	Low	No Change	No Change		Medium	Non-significant
		Edible crabs *Cancer pagurus*	Medium	No Change	No Change		Medium	Non-significant
		Velvet swimming crab *Necora puber*	Medium	No Change	No Change		Medium	Non-significant
		Shore crab *Carcinus maenas*	Low	No Change	No Change		Medium	Non-significant
		Crayfish *Palunirus elegans*	Low	No Change	No Change		Medium	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	No Change	No Change		Medium	Non-significant
		Common cockle Cerastoderma edule	Low	No Change	No Change		Medium	Non-significant
		King scallop *Pecten maximus*	Medium	No Change	No Change		Medium	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	No Change	No Change		Medium	Non-significant
		Razorfish Ensis spp.	Low	No Change	No Change		Medium	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant
		Sandeel spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant
Magnetic fields	Designated sites	River Dee SAC	Very High	No Change	No Change		Medium	Non-significant
		River South Esk SAC	Very High	No Change	No Change		Medium	Non-significant
		River Tay SAC	Very High	No Change	No Change		Medium	Non-significant
		River Teith SAC	Very High	No Change	No Change		Medium	Non-significant
		River Tweed SAC	Very High	No Change	No Change		Medium	Non-significant
		Turbot Bank MPA	High	No Change	No Change		Medium	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	No Change	No Change		Medium	Non-significant
	Diadromous fish species	Atlantic salmon *Salmo salar*	Very High	No Change	No Change		Medium	Non-significant
		Sea trout *Salmo trutta*	High	No Change	No Change		Medium	Non-significant
		European eel *Anguilla anguilla*	Very High	Negligible	Minor	Adverse	Medium	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse of Beneficial	Confidence	EIA Regulations Significance
Magnetic fields	Diadromous fish species	Sea lamprey *Petromyzon marinus*	Very High	No Change	No Change		Medium	Non-significant
		River lamprey *Lampetra fluviatilis*	Very High	No Change	No Change		Medium	Non-significant
	Elasmobranchs	Angel Shark *Squatina squatina*	Very High	No Change	No change		Medium	Non-significant
		Basking Shark *Cetorhinus maximus*	Very High	No Change	No Change		Medium	Non-significant
		Blue Shark *Prionace glauca*	High	No Change	No Change		Medium	Non-significant
		Common Skate *Dipturus batis*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Gulper Shark *Centrophorus granulosus*	High	No Change	No Change		Medium	Non-significant
		Kitefin Shark *Dalatias licha*	High	No Change	No Change		Medium	Non-significant
		Leafscale gulper shark *Centrophorus squamosus*	High	No Change	No Change		Medium	Non-significant
		Porbeagle Shark *Lamna nasus*	High	No Change	No Change		Medium	Non-significant
		Portuguese Dogfish *Centroscymnus coelolepis*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sandy Ray *Leucoraja circularis*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Spurdog or Spiny Dogfish *Squalus acanthias*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Tope Shark *Galeorhinus galeus*	High	No Change	No Change		Medium	Non-significant
		Other elasmobranch species (e.g. spotted ray Raja montagui, thornback ray *Raja clavata*)	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
	Marine demersal fish species	Anglerfish / sea monkfish *Lophius piscatorius*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Atlantic cod *Gadus morhua*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Atlantic halibut *Hippoglossus hippoglossus*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Blue ling *Molva dypterygia*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common goby *Pomatoschitus microps*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common sole *Solea solea*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European hake *Merluccius merluccius*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European plaice *Pleuronectes platessa*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Greenland halibut *Reinhardtius hippoglossoides*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Haddock *Melanogrammus aeglefinus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Lemon sole *Microstomus kitt*	High	Negligible	Minor	Adverse	Medium	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse of Beneficial	Confidence	EIA Regulations Significance
Magnetic fields	Marine demersal fish species	Ling *Molva molva*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Norway pout *Trisopterus esmarkii*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Saithe *Pollachius virens*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sand goby *Pomatoschitus minutus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sandeel *Ammodytes spp.*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Whiting *Merlangius merlangus*	High	Negligible	Minor	Adverse	Medium	Non-significant
	Marine pelagic fish species	Atlantic bluefin tuna *Thunnus thynnus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Atlantic herring *Clupea harengus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Atlantic mackerel *Scomber scombrus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Black scabbardfish *Aphanopus carbo*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Blue whiting *Micromesistius poutassou*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European sprat *Sprattus sprattus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Horse mackerel *Trachurus trachurus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Orange roughy *Hoplostethus atlanticus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Roundnose grenadier *Coryphaenoides rupestris*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
	Cephalopods	Long-finned (loliginid) squids *Loligo forbesi* and *Loligo vulgari*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Short-finned (ommastrephid) squids *Todarodes sagittatus, Todaropsis eblanae* and *Illex coindetii*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Cuttlefish *Sepia officinalis*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Octopuses *Octopus vulgaris and Eledone cirrhosa*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Common lobster *Homarus gammarus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European spiny lobster *Palinurus elephas*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Squat lobster *Munida rugosa*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Edible crabs *Cancer pagurus*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Velvet swimming crab *Necora puber*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse of Beneficial	Confidence	EIA Regulations Significance
Magnetic fields	Crustaceans	Shore crab *Carcinus maenas*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common cockle *Cerastoderma edule*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		King scallop *Pecten maximus*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Razorfish Ensis spp.	Low	Negligible	Negligible	Adverse	Medium	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sandeel spawning and nursery grounds	High	Negligible	Minor	Adverse	Medium	Non-significant
Introduction of invasive non-native species during inspection and repair	Designated sites	River Dee SAC	Very High	Negligible	Minor	Adverse	High	Non-significant
		River South Esk SAC	Very High	Negligible	Minor	Adverse	High	Non-significant
		River Tay SAC	Very High	Negligible	Minor	Adverse	High	Non-significant
		River Teith SAC	Very High	Negligible	Minor	Adverse	High	Non-significant
		River Tweed SAC	Very High	Negligible	Minor	Adverse	High	Non-significant
		Turbot Bank MPA	High	Negligible	Minor	Adverse	High	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	Negligible	Minor	Adverse	High	Non-significant
	Diadromous fish species	Atlantic salmon *Salmo salar*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Sea trout *Salmo trutta*	High	Negligible	Minor	Adverse	High	Non-significant
		European eel *Anguilla anguilla*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Sea lamprey *Petromyzon marinus*	Very High	Negligible	Minor	Adverse	High	Non-significant
		River lamprey *Lampetra fluviatilis*	Very High	Negligible	Minor	Adverse	High	Non-significant
	Elasmobranchs	Angel Shark *Squatina squatina*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Basking Shark *Cetorhinus maximus*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Blue Shark *Prionace glauca*	High	Negligible	Minor	Adverse	High	Non-significant
		Common Skate *Dipturus batis*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Gulper Shark *Centrophorus granulosus*	High	Negligible	Minor	Adverse	High	Non-significant
		Kitefin Shark *Dalatias licha*	High	Negligible	Minor	Adverse	High	Non-significant
		Leafscale gulper shark *Centrophorus squamosus*	High	Negligible	Minor	Adverse	High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse of Beneficial	Confidence	EIA Regulations Significance
Introduction of invasive non-native species during inspection and repair	Elasmobranchs	Porbeagle Shark *Lamna nasus*	High	Negligible	Minor	Adverse	High	Non-significant
		Portuguese Dogfish *Centroscymnus coelolepis*	High	Negligible	Minor	Adverse	High	Non-significant
		Sandy Ray *Leucoraja circularis*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Spurdog or Spiny Dogfish *Squalus acanthias*	High	Negligible	Minor	Adverse	High	Non-significant
		Tope Shark *Galeorhinus galeus*	High	Negligible	Minor	Adverse	High	Non-significant
		Other elasmobranch species (e.g. spotted ray Raja montagui, thornback ray *Raja clavata*)	Medium	Negligible	Negligible	Adverse	High	Non-significant
	Marine demersal fish species	Anglerfish / sea monkfish *Lophius piscatorius*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic cod *Gadus morhua*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic halibut *Hippoglossus hippoglossus*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Blue ling *Molva dypterygia*	High	Negligible	Minor	Adverse	High	Non-significant
		Common goby *Pomatoschitus microps*	High	Negligible	Minor	Adverse	High	Non-significant
		Common sole *Solea solea*	High	Negligible	Minor	Adverse	High	Non-significant
		European hake *Merluccius merluccius*	High	Negligible	Minor	Adverse	High	Non-significant
		European plaice *Pleuronectes platessa*	High	Negligible	Minor	Adverse	High	Non-significant
		Greenland halibut *Reinhardtius hippoglossoides*	High	Negligible	Minor	Adverse	High	Non-significant
		Haddock *Melanogrammus aeglefinus*	High	Negligible	Minor	Adverse	High	Non-significant
		Lemon sole *Microstomus kitt*	High	Negligible	Minor	Adverse	High	Non-significant
		Ling *Molva molva*	High	Negligible	Minor	Adverse	High	Non-significant
		Norway pout *Trisopterus esmarkii*	High	Negligible	Minor	Adverse	High	Non-significant
		Saithe *Pollachius virens*	High	Negligible	Minor	Adverse	High	Non-significant
		Sand goby *Pomatoschitus minutus*	High	Negligible	Minor	Adverse	High	Non-significant
		Sandeel *Ammodytes spp.*	High	Negligible	Minor	Adverse	High	Non-significant
		Whiting *Merlangius merlangus*	High	Negligible	Minor	Adverse	High	Non-significant
	Marine pelagic fish species	Atlantic bluefin tuna *Thunnus thynnus*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic herring *Clupea harengus*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic mackerel *Scomber scombrus*	High	Negligible	Minor	Adverse	High	Non-significant
		Black scabbardfish *Aphanopus carbo*	High	Negligible	Minor	Adverse	High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse of Beneficial	Confidence	EIA Regulations Significance
Introduction of invasive non-native species during inspection and repair	Marine pelagic fish species	Blue whiting *Micromesistius poutassou*	High	Negligible	Minor	Adverse	High	Non-significant
		European sprat *Sprattus sprattus*	High	Negligible	Minor	Adverse	High	Non-significant
		Horse mackerel *Trachurus trachurus*	High	Negligible	Minor	Adverse	High	Non-significant
		Orange roughy *Hoplostethus atlanticus*	High	Negligible	Minor	Adverse	High	Non-significant
		Roundnose grenadier *Coryphaenoides rupestris*	Very High	Negligible	Minor	Adverse	High	Non-significant
	Cephalopods	Long-finned (loliginid) squids *Loligo forbesi* and *Loligo vulgari*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Short-finned (ommastrephid) squids *Todarodes sagittatus, Todaropsis eblanae* and *Illex coindetii*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Cuttlefish *Sepia officinalis*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Octopuses *Octopus vulgaris and Eledone cirrhosa*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	High	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Common lobster *Homarus gammarus*	High	Negligible	Minor	Adverse	High	Non-significant
		European spiny lobster *Palinurus elephas*	High	Negligible	Minor	Adverse	High	Non-significant
		Squat lobster *Munida rugosa*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Edible crabs *Cancer pagurus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Velvet swimming crab *Necora puber*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Shore crab *Carcinus maenas*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	High	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	Negligible	Minor	Adverse	High	Non-significant
		Common cockle *Cerastoderma edule*	Low	Negligible	Negligible	Adverse	High	Non-significant
		King scallop *Pecten maximus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Razorfish Ensis spp.	Low	Negligible	Negligible	Adverse	High	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant
		Sandeel spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse of Beneficial	Confidence	EIA Regulations Significance
Physical disturbance during inspection and repair	Designated sites	River Dee SAC	Very High	No Change	No Change		High	Non-significant
		River South Esk SAC	Very High	No Change	No Change		High	Non-significant
		River Tay SAC	Very High	No Change	No Change		High	Non-significant
		River Teith SAC	Very High	No Change	No Change		High	Non-significant
		River Tweed SAC	Very High	No Change	No Change		High	Non-significant
		Turbot Bank MPA	High	No Change	No Change		High	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	No Change	No Change		High	Non-significant
	Diadromous fish species	Atlantic salmon *Salmo salar*	Very High	No Change	No Change		High	Non-significant
		Sea trout *Salmo trutta*	High	No Change	No Change		High	Non-significant
		European eel *Anguilla anguilla*	Very High	No Change	No Change		High	Non-significant
		Sea lamprey *Petromyzon marinus*	Very High	No Change	No Change		High	Non-significant
		River lamprey *Lampetra fluviatilis*	Very High	No Change	No Change		High	Non-significant
	Elasmobranchs	Angel Shark *Squatina squatina*	Very High	No Change	No Change		High	Non-significant
		Basking Shark *Cetorhinus maximus*	Very High	No Change	No Change		High	Non-significant
		Blue Shark *Prionace glauca*	High	No Change	No Change		High	Non-significant
		Common Skate *Dipturus batis*	Very High	No Change	No Change		High	Non-significant
		Gulper Shark *Centrophorus granulosus*	High	No Change	No Change		High	Non-significant
		Kitefin Shark *Dalatias licha*	High	No Change	No Change		High	Non-significant
		Leafscale gulper shark *Centrophorus squamosus*	High	No Change	No Change		High	Non-significant
		Porbeagle Shark *Lamna nasus*	High	No Change	No Change		High	Non-significant
		Portuguese Dogfish *Centroscymnus coelolepis*	High	No Change	No Change		High	Non-significant
		Sandy Ray *Leucoraja circularis*	Very High	No Change	No Change		High	Non-significant
		Spurdog or Spiny Dogfish *Squalus acanthias*	High	No Change	No Change		High	Non-significant
		Tope Shark *Galeorhinus galeus*	High	No Change	No Change		High	Non-significant
		Other elasmobranch species (e.g. spotted ray Raja montagui, thornback ray *Raja clavata*)	Medium	No Change	No Change		High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse of Beneficial	Confidence	EIA Regulations Significance
Physical disturbance during inspection and repair	Marine demersal fish species	Anglerfish / sea monkfish *Lophius piscatorius*	High	No Change	No Change		High	Non-significant
	Marine demersal fish species	Atlantic cod *Gadus morhua*	High	No Change	No Change		High	Non-significant
		Atlantic halibut *Hippoglossus hippoglossus*	Very High	No Change	No Change		High	Non-significant
		Blue ling *Molva dypterygia*	High	No Change	No Change		High	Non-significant
		Common goby *Pomatoschitus microps*	High	No Change	No Change		High	Non-significant
		Common sole *Solea solea*	High	No Change	No Change		High	Non-significant
		European hake *Merluccius merluccius*	High	No Change	No Change		High	Non-significant
		European plaice *Pleuronectes platessa*	High	No Change	No Change		High	Non-significant
		Greenland halibut *Reinhardtius hippoglossoides*	High	No Change	No Change		High	Non-significant
		Haddock *Melanogrammus aeglefinus*	High	No Change	No Change		High	Non-significant
		Lemon sole *Microstomus kitt*	High	No Change	No Change		High	Non-significant
		Ling *Molva molva*	High	No Change	No Change		High	Non-significant
		Norway pout *Trisopterus esmarkii*	High	No Change	No Change		High	Non-significant
		Saithe *Pollachius virens*	High	No Change	No Change		High	Non-significant
		Sand goby *Pomatoschitus minutus*	High	No Change	No Change		High	Non-significant
		Sandeel *Ammodytes spp.*	High	No Change	No Change		High	Non-significant
		Whiting *Merlangius merlangus*	High	No Change	No Change		High	Non-significant
	Marine pelagic fish species	Atlantic bluefin tuna *Thunnus thynnus*	High	No Change	No Change		High	Non-significant
		Atlantic herring *Clupea harengus*	High	No Change	No Change		High	Non-significant
		Atlantic mackerel *Scomber scombrus*	High	No Change	No Change		High	Non-significant
		Black scabbardfish *Aphanopus carbo*	High	No Change	No Change		High	Non-significant
		Blue whiting *Micromesistius poutassou*	High	No Change	No Change		High	Non-significant
		European sprat *Sprattus sprattus*	High	No Change	No Change		High	Non-significant
		Horse mackerel *Trachurus trachurus*	High	No Change	No Change		High	Non-significant
		Orange roughy *Hoplostethus atlanticus*	High	No Change	No Change		High	Non-significant
		Roundnose grenadier *Coryphaenoides rupestris*	Very High	No Change	No Change		High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse of Beneficial	Confidence	EIA Regulations Significance
Physical disturbance during inspection and repair	Cephalopods	Long-finned (loliginid) squids *Loligo forbesi* and *Loligo vulgari*	Low	No Change	No Change		High	Non-significant
		Short-finned (ommastrephid) squids *Todarodes sagittatus, Todaropsis eblanae* and *Illex coindetii*	Low	No Change	No Change		High	Non-significant
		Cuttlefish *Sepia officinalis*	Low	No Change	No Change		High	Non-significant
		Octopuses *Octopus vulgaris and Eledone cirrhosa*	Low	No Change	No Change		High	Non-significant
		Crayfish *Palunirus elegans*	Low	No Change	No Change		High	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	No Change	No Change		High	Non-significant
		Common lobster *Homarus gammarus*	High	No Change	No Change		High	Non-significant
		European spiny lobster *Palinurus elephas*	High	No Change	No Change		High	Non-significant
		Squat lobster *Munida rugosa*	Low	No Change	No Change		High	Non-significant
		Edible crabs *Cancer pagurus*	Medium	No Change	No Change		High	Non-significant
		Velvet swimming crab *Necora puber*	Medium	No Change	No Change		High	Non-significant
		Shore crab *Carcinus maenas*	Low	No Change	No Change		High	Non-significant
		Crayfish *Palunirus elegans*	Low	No Change	No Change		High	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	No Change	No Change		High	Non-significant
		Common cockle *Cerastoderma edule*	Low	No Change	No Change		High	Non-significant
		King scallop *Pecten maximus*	Medium	No Change	No Change		High	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	No Change	No Change		High	Non-significant
		Razorfish Ensis spp.	Low	No Change	No Change		High	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant
		Sandeel spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant

Table 15.13c Fish and Shellfish Impact Assessment Summary for the Decommissioning Phase.

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Benficial	Confidence	EIA Regulations Significance
Habitat loss	Designated sites	River Dee SAC	Very High	No Change	No Change		High	Non-significant
		River South Esk SAC	Very High	No Change	No Change		High	Non-significant
		River Tay SAC	Very High	No Change	No Change		High	Non-significant
		River Teith SAC	Very High	No Change	No Change		High	Non-significant
		River Tweed SAC	Very High	No Change	No Change		High	Non-significant
		Turbot Bank MPA	High	No Change	No Change		High	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	No Change	No Change		High	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Common lobster *Homarus gammarus*	High	Negligible	Minor	Adverse	High	Non-significant
		European spiny lobster *Palinurus elephas*	High	Negligible	Minor	Adverse	High	Non-significant
		Squat lobster *Munida rugosa*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Edible crabs *Cancer pagurus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Velvet swimming crab *Necora puber*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Shore crab *Carcinus maenas*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	High	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	Negligible	Minor	Adverse	High	Non-significant
		Common cockle *Cerastoderma edule*	Low	Minor	Minor	Adverse	High	Non-significant
		King scallop *Pecten maximus*	Medium	Minor	Minor	Adverse	High	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	Minor	Minor	Adverse	High	Non-significant
		Razorfish Ensis spp.	Low	Minor	Minor	Adverse	High	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant
		Sandeel spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant
Changes to water quality (resuspension of sediments)	Designated sites	River Dee SAC	Very High	No Change	No Change		High	Non-significant
		River South Esk SAC	Very High	No Change	No Change		High	Non-significant
		River Tay SAC	Very High	No Change	No Change		High	Non-significant
		River Teith SAC	Very High	No Change	No Change		High	Non-significant
		River Tweed SAC	Very High	No Change	No Change		High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Benficial	Confidence	EIA Regulations Significance
Changes to water quality (resuspension of sediments)	Designated sites	Turbot Bank MPA	High	No Change	No Change		High	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	No Change	No Change		High	Non-significant
	Diadromous fish species	Atlantic salmon *Salmo salar*	Very High	No Change	No Change		High	Non-significant
		Sea trout *Salmo trutta*	High	No Change	No Change		High	Non-significant
		European eel *Anguilla anguilla*	Very High	No Change	No Change		High	Non-significant
		Sea lamprey *Petromyzon marinus*	Very High	No Change	No Change		High	Non-significant
		River lamprey *Lampetra fluviatilis*	Very High	No Change	No Change		High	Non-significant
	Elasmobranchs	Angel Shark *Squatina squatina*	Very High	No Change	No Change		High	Non-significant
		Basking Shark *Cetorhinus maximus*	Very High	No Change	No Change		High	Non-significant
		Blue Shark *Prionace glauca*	High	No Change	No Change		High	Non-significant
		Common Skate *Dipturus batis*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Gulper Shark *Centrophorus granulosus*	High	No Change	No Change		High	Non-significant
		Kitefin Shark *Dalatias licha*	High	No Change	No Change		High	Non-significant
		Leafscale gulper shark *Centrophorus squamosus*	High	No Change	No Change		High	Non-significant
		Porbeagle Shark *Lamna nasus*	High	No Change	No Change		High	Non-significant
		Portuguese Dogfish *Centroscymnus coelolepis*	High	Negligible	Minor	Adverse	High	Non-significant
		Sandy Ray *Leucoraja circularis*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Spurdog or Spiny Dogfish *Squalus acanthias*	High	Negligible	Minor	Adverse	High	Non-significant
		Tope Shark *Galeorhinus galeus*	High	No Change	No Change		High	Non-significant
		Other elasmobranch species (e.g. spotted ray Raja montagui, thornback ray *Raja clavata*)	Medium	Negligible	Negligible	Adverse	High	Non-significant
	Marine demersal fish species	Anglerfish / sea monkfish *Lophius piscatorius*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic cod *Gadus morhua*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic halibut *Hippoglossus hippoglossus*	Very High	Negligible	Minor	Adverse	High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Benficial	Confidence	EIA Regulations Significance
Changes to water quality (resuspension of sediments)	Marine demersal fish species	Blue ling *Molva dypterygia*	High	Negligible	Minor	Adverse	High	Non-significant
		Common goby *Pomatoschitus microps*	High	Negligible	Minor	Adverse	High	Non-significant
		Common sole *Solea solea*	High	Negligible	Minor	Adverse	High	Non-significant
		European hake *Merluccius merluccius*	High	Negligible	Minor	Adverse	High	Non-significant
		European plaice *Pleuronectes platessa*	High	Negligible	Minor	Adverse	High	Non-significant
		Greenland halibut *Reinhardtius hippoglossoides*	High	Negligible	Minor	Adverse	High	Non-significant
		Haddock *Melanogrammus aeglefinus*	High	Negligible	Minor	Adverse	High	Non-significant
		Lemon sole *Microstomus kitt*	High	Negligible	Minor	Adverse	High	Non-significant
		Ling *Molva molva*	High	Negligible	Minor	Adverse	High	Non-significant
		Norway pout *Trisopterus esmarkii*	High	Negligible	Minor	Adverse	High	Non-significant
		Saithe *Pollachius virens*	High	Negligible	Minor	Adverse	High	Non-significant
		Sand goby *Pomatoschitus minutus*	High	Negligible	Minor	Adverse	High	Non-significant
		Sandeel *Ammodytes spp.*	High	Negligible	Minor	Adverse	High	Non-significant
		Whiting *Merlangius merlangus*	High	Negligible	Minor	Adverse	High	Non-significant
	Marine pelagic fish species	Atlantic bluefin tuna *Thunnus thynnus*	High	No Change	No Change		High	Non-significant
		Atlantic herring *Clupea harengus*	High	No Change	No Change		High	Non-significant
		Atlantic mackerel *Scomber scombrus*	High	No Change	No Change		High	Non-significant
		Black scabbardfish *Aphanopus carbo*	High	No Change	No Change		High	Non-significant
		Blue whiting *Micromesistius poutassou*	High	No Change	No Change		High	Non-significant
		European sprat *Sprattus sprattus*	High	No Change	No Change		High	Non-significant
		Horse mackerel *Trachurus trachurus*	High	No Change	No Change		High	Non-significant
		Orange roughy *Hoplostethus atlanticus*	High	No Change	No Change		High	Non-significant
		Roundnose grenadier *Coryphaenoides rupestris*	Very High	No Change	No Change		High	Non-significant
	Cephalopods	Long-finned (loliginid) squids *Loligo forbesi* and *Loligo vulgari*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Short-finned (ommastrephid) squids *Todarodes sagittatus, Todaropsis eblanae* and *Illex coindetii*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Cuttlefish *Sepia officinalis*	Low	Negligible	Negligible	Adverse	High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Benficial	Confidence	EIA Regulations Significance
Changes to water quality (resuspension of sediments)	Cephalopods	Octopuses *Octopus vulgaris and Eledone cirrhosa*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	High	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Common lobster *Homarus gammarus*	High	Negligible	Minor	Adverse	High	Non-significant
		European spiny lobster *Palinurus elephas*	High	Negligible	Minor	Adverse	High	Non-significant
		Squat lobster *Munida rugosa*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Edible crabs *Cancer pagurus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Velvet swimming crab *Necora puber*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Shore crab *Carcinus maenas*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	High	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	Negligible	Minor	Adverse	High	Non-significant
		Common cockle *Cerastoderma edule*	Low	Negligible	Negligible	Adverse	High	Non-significant
		King scallop *Pecten maximus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Razorfish Ensis spp.	Low	Negligible	Negligible	Adverse	High	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant
		Sandeel spawning and nursery grounds	High	No Change	No Change		High	Non-significant
Changes to water quality ((Increased sediment loading and release of hazardous substances)	Designated sites	River Dee SAC	Very High	No Change	No Change		Medium	Non-significant
		River South Esk SAC	Very High	No Change	No Change		Medium	Non-significant
		River Tay SAC	Very High	No Change	No Change		Medium	Non-significant
		River Teith SAC	Very High	No Change	No Change		Medium	Non-significant
		River Tweed SAC	Very High	No Change	No Change		Medium	Non-significant
		Turbot Bank MPA	High	No Change	No Change		Medium	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	No Change	No Change		Medium	Non-significant
	Diadromous fish species	Atlantic salmon *Salmo salar*	Very High	No Change	No Change		Medium	Non-significant
		Sea trout *Salmo trutta*	High	No Change	No Change		Medium	Non-significant
		European eel *Anguilla anguilla*	Very High	No Change	No Change		Medium	Non-significant
		Sea lamprey *Petromyzon marinus*	Very High	No Change	No Change		Medium	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Benficial	Confidence	EIA Regulations Significance
Changes to water quality ((Increased sediment loading and release of hazardous substances)	Diadromous fish species	River lamprey *Lampetra fluviatilis*	Very High	No Change	No Change		Medium	Non-significant
	Elasmobranchs	Angel Shark *Squatina squatina*	Very High	No Change	No Change		Medium	Non-significant
		Basking Shark *Cetorhinus maximus*	Very High	No Change	No Change		Medium	Non-significant
		Blue Shark *Prionace glauca*	High	No Change	No Change		Medium	Non-significant
		Common Skate *Dipturus batis*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Gulper Shark *Centrophorus granulosus*	High	No Change	No Change		Medium	Non-significant
		Kitefin Shark *Dalatias licha*	High	No Change	No Change		Medium	Non-significant
		Leafscale gulper shark *Centrophorus squamosus*	High	No Change	No Change		Medium	Non-significant
		Porbeagle Shark *Lamna nasus*	High	No Change	No Change		Medium	Non-significant
		Portuguese Dogfish *Centroscymnus coelolepis*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sandy Ray *Leucoraja circularis*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Spurdog or Spiny Dogfish *Squalus acanthias*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Tope Shark *Galeorhinus galeus*	High	No Change	No Change		Medium	Non-significant
		Other elasmobranch species (e.g. spotted ray Raja montagui, thornback ray *Raja clavata*)	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
	Marine demersal fish species	Anglerfish / sea monkfish *Lophius piscatorius*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Atlantic cod *Gadus morhua*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Atlantic halibut *Hippoglossus hippoglossus*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Blue ling *Molva dypterygia*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common goby *Pomatoschitus microps*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common sole *Solea solea*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European hake *Merluccius merluccius*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European plaice *Pleuronectes platessa*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Greenland halibut *Reinhardtius hippoglossoides*	High	Negligible	Minor	Adverse	Medium	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Benficial	Confidence	EIA Regulations Significance
Changes to water quality ((Increased sediment loading and release of hazardous substances)	Marine demersal fish species	Haddock *Melanogrammus aeglefinus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Lemon sole *Microstomus kitt*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Ling *Molva molva*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Norway pout *Trisopterus esmarkii*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Saithe *Pollachius virens*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sand goby *Pomatoschitus minutus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sandeel *Ammodytes spp.*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Whiting *Merlangius merlangus*	High	Negligible	Minor	Adverse	Medium	Non-significant
	Marine pelagic fish species	Atlantic bluefin tuna *Thunnus thynnus*	High	No Change	No Change		Medium	Non-significant
		Atlantic herring *Clupea harengus*	High	No Change	No Change		Medium	Non-significant
		Atlantic mackerel *Scomber scombrus*	High	No Change	No Change		Medium	Non-significant
		Black scabbardfish *Aphanopus carbo*	High	No Change	No Change		Medium	Non-significant
		Blue whiting *Micromesistius poutassou*	High	No Change	No Change		Medium	Non-significant
		European sprat *Sprattus sprattus*	High	No Change	No Change		Medium	Non-significant
		Horse mackerel *Trachurus trachurus*	High	No Change	No Change		Medium	Non-significant
		Orange roughy *Hoplostethus atlanticus*	High	No Change	No Change		Medium	Non-significant
		Roundnose grenadier *Coryphaenoides rupestris*	Very High	No Change	No Change		Medium	Non-significant
	Cephalopods	Long-finned (loliginid) squids *Loligo forbesi* and *Loligo vulgari*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Short-finned (ommastrephid) squids *Todarodes sagittatus, Todaropsis eblanae* and *Illex coindetii*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Cuttlefish *Sepia officinalis*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Octopuses *Octopus vulgaris and Eledone cirrhosa*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Common lobster *Homarus gammarus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European spiny lobster *Palinurus elephas*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Squat lobster *Munida rugosa*	Low	Negligible	Negligible	Adverse	Medium	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Benficial	Confidence	EIA Regulations Significance
Changes to water quality ((Increased sediment loading and release of hazardous substances)	Crustaceans	Edible crabs *Cancer pagurus*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Velvet swimming crab *Necora puber*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Shore crab *Carcinus maenas*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common cockle *Cerastoderma edule*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		King scallop *Pecten maximus*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Razorfish Ensis spp.	Low	Negligible	Negligible	Adverse	Medium	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	No Change	No Change		Medium	Non-significant
		Sandeel spawning and nursery grounds	High	Negligible	Minor	Adverse	Medium	Non-significant
Underwater noise and vibration	Designated sites	River Dee SAC	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		River South Esk SAC	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		River Tay SAC	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		River Teith SAC	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		River Tweed SAC	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Turbot Bank MPA	High	Negligible	Minor	Adverse	Medium	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	Negligible	Minor	Adverse	Medium	Non-significant
	Diadromous fish species	Atlantic salmon *Salmo salar*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Sea trout *Salmo trutta*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European eel *Anguilla anguilla*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Sea lamprey *Petromyzon marinus*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		River lamprey *Lampetra fluviatilis*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
	Elasmobranchs	Angel Shark *Squatina squatina*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Basking Shark *Cetorhinus maximus*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Blue Shark *Prionace glauca*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common Skate *Dipturus batis*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Gulper Shark *Centrophorus granulosus*	High	Negligible	Minor	Adverse	Medium	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Benficial	Confidence	EIA Regulations Significance
Underwater noise and vibration	Elasmobranchs	Kitefin Shark *Dalatias licha*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Leafscale gulper shark *Centrophorus squamosus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Porbeagle Shark *Lamna nasus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Portuguese Dogfish *Centroscymnus coelolepis*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sandy Ray *Leucoraja circularis*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Spurdog or Spiny Dogfish *Squalus acanthias*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Tope Shark *Galeorhinus galeus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Other elasmobranch species (e.g. spotted ray Raja montagui, thornback ray *Raja clavata*)	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
	Marine demersal fish species	Anglerfish / sea monkfish *Lophius piscatorius*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Atlantic cod *Gadus morhua*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Atlantic halibut *Hippoglossus hippoglossus*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
		Blue ling *Molva dypterygia*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common goby *Pomatoschitus microps*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common sole *Solea solea*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European hake *Merluccius merluccius*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European plaice *Pleuronectes platessa*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Greenland halibut *Reinhardtius hippoglossoides*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Haddock *Melanogrammus aeglefinus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Lemon sole *Microstomus kitt*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Ling *Molva molva*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Norway pout *Trisopterus esmarkii*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Saithe *Pollachius virens*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sand goby *Pomatoschitus minutus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sandeel *Ammodytes spp.*	High	Negligible	Minor	Adverse	Medium	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Benficial	Confidence	EIA Regulations Significance
Underwater noise and vibration	Marine demersal fish species	Whiting *Merlangius merlangus*	High	Negligible	Minor	Adverse	Medium	Non-significant
	Marine pelagic fish species	Atlantic bluefin tuna *Thunnus thynnus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Atlantic herring *Clupea harengus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Atlantic mackerel *Scomber scombrus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Black scabbardfish *Aphanopus carbo*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Blue whiting *Micromesistius poutassou*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European sprat *Sprattus sprattus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Horse mackerel *Trachurus trachurus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Orange roughy *Hoplostethus atlanticus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Roundnose grenadier *Coryphaenoides rupestris*	Very High	Negligible	Minor	Adverse	Medium	Non-significant
	Cephalopods	Long-finned (loliginid) squids *Loligo forbesi* and *Loligo vulgari*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Short-finned (ommastrephid) squids *Todarodes sagittatus, Todaropsis eblanae* and *Illex coindetii*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Cuttlefish *Sepia officinalis*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Octopuses *Octopus vulgaris and Eledone cirrhosa*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Common lobster *Homarus gammarus*	High	Negligible	Minor	Adverse	Medium	Non-significant
		European spiny lobster *Palinurus elephas*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Squat lobster *Munida rugosa*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Edible crabs *Cancer pagurus*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Velvet swimming crab *Necora puber*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Shore crab *Carcinus maenas*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	Negligible	Minor	Adverse	Medium	Non-significant
		Common cockle *Cerastoderma edule*	Low	Negligible	Negligible	Adverse	Medium	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Benficial	Confidence	EIA Regulations Significance
Underwater noise and vibration	Molluscs	King scallop *Pecten maximus*	Medium	Negligible	Negligible	Adverse	Medium	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	Negligible	Negligible	Adverse	Medium	Non-significant
		Razorfish Ensis spp.	Low	Negligible	Negligible	Adverse	Medium	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	Negligible	Minor	Adverse	Medium	Non-significant
		Sandeel spawning and nursery grounds	High	Negligible	Minor	Adverse	Medium	Non-significant
Introduction of invasive non-native species	Designated sites	River Dee SAC	Very High	Negligible	Minor	Adverse	High	Non-significant
		River South Esk SAC	Very High	Negligible	Minor	Adverse	High	Non-significant
		River Tay SAC	Very High	Negligible	Minor	Adverse	High	Non-significant
		River Teith SAC	Very High	Negligible	Minor	Adverse	High	Non-significant
		River Tweed SAC	Very High	Negligible	Minor	Adverse	High	Non-significant
		Turbot Bank MPA	High	Negligible	Minor	Adverse	High	Non-significant
		Norwegian Boundary Sediment Plain MPA	High	Negligible	Minor	Adverse	High	Non-significant
	Diadromous fish species	Atlantic salmon *Salmo salar*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Sea trout *Salmo trutta*	High	Negligible	Minor	Adverse	High	Non-significant
		European eel *Anguilla anguilla*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Sea lamprey *Petromyzon marinus*	Very High	Negligible	Minor	Adverse	High	Non-significant
		River lamprey *Lampetra fluviatilis*	Very High	Negligible	Minor	Adverse	High	Non-significant
	Elasmobranchs	Angel Shark *Squatina squatina*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Basking Shark *Cetorhinus maximus*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Blue Shark *Prionace glauca*	High	Negligible	Minor	Adverse	High	Non-significant
		Common Skate *Dipturus batis*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Gulper Shark *Centrophorus granulosus*	High	Negligible	Minor	Adverse	High	Non-significant
		Kitefin Shark *Dalatias licha*	High	Negligible	Minor	Adverse	High	Non-significant
		Leafscale gulper shark *Centrophorus squamosus*	High	Negligible	Minor	Adverse	High	Non-significant
		Porbeagle Shark *Lamna nasus*	High	Negligible	Minor	Adverse	High	Non-significant
		Portuguese Dogfish *Centroscymnus coelolepis*	High	Negligible	Minor	Adverse	High	Non-significant
		Sandy Ray *Leucoraja circularis*	Very High	Negligible	Minor	Adverse	High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Benficial	Confidence	EIA Regulations Significance
Introduction of invasive non-native species	Elasmobranchs	Spurdog or Spiny Dogfish *Squalus acanthias*	High	Negligible	Minor	Adverse	High	Non-significant
		Tope Shark *Galeorhinus galeus*	High	Negligible	Minor	Adverse	High	Non-significant
		Other elasmobranch species (e.g. spotted ray Raja montagui, thornback ray *Raja clavata*)	Medium	Negligible	Negligible	Adverse	High	Non-significant
	Marine demersal fish species	Anglerfish / sea monkfish *Lophius piscatorius*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic cod *Gadus morhua*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic halibut *Hippoglossus hippoglossus*	Very High	Negligible	Minor	Adverse	High	Non-significant
		Blue ling *Molva dypterygia*	High	Negligible	Minor	Adverse	High	Non-significant
		Common goby *Pomatoschitus microps*	High	Negligible	Minor	Adverse	High	Non-significant
		Common sole *Solea solea*	High	Negligible	Minor	Adverse	High	Non-significant
		European hake *Merluccius merluccius*	High	Negligible	Minor	Adverse	High	Non-significant
		European plaice *Pleuronectes platessa*	High	Negligible	Minor	Adverse	High	Non-significant
		Greenland halibut *Reinhardtius hippoglossoides*	High	Negligible	Minor	Adverse	High	Non-significant
		Haddock *Melanogrammus aeglefinus*	High	Negligible	Minor	Adverse	High	Non-significant
		Lemon sole *Microstomus kitt*	High	Negligible	Minor	Adverse	High	Non-significant
		Ling *Molva molva*	High	Negligible	Minor	Adverse	High	Non-significant
		Norway pout *Trisopterus esmarkii*	High	Negligible	Minor	Adverse	High	Non-significant
		Saithe *Pollachius virens*	High	Negligible	Minor	Adverse	High	Non-significant
		Sand goby *Pomatoschitus minutus*	High	Negligible	Minor	Adverse	High	Non-significant
		Sandeel *Ammodytes spp.*	High	Negligible	Minor	Adverse	High	Non-significant
		Whiting *Merlangius merlangus*	High	Negligible	Minor	Adverse	High	Non-significant
	Marine pelagic fish species	Atlantic bluefin tuna *Thunnus thynnus*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic herring *Clupea harengus*	High	Negligible	Minor	Adverse	High	Non-significant
		Atlantic mackerel *Scomber scombrus*	High	Negligible	Minor	Adverse	High	Non-significant
		Black scabbardfish *Aphanopus carbo*	High	Negligible	Minor	Adverse	High	Non-significant
		Blue whiting *Micromesistius poutassou*	High	Negligible	Minor	Adverse	High	Non-significant

Impact	Receptor Group	Receptor	Value	Magnitude of impact	Significance of effect	Adverse or Benficial	Confidence	EIA Regulations Significance
Introduction of invasive non-native species	Marine pelagic fish species	European sprat *Sprattus sprattus*	High	Negligible	Minor	Adverse	High	Non-significant
		Horse mackerel *Trachurus trachurus*	High	Negligible	Minor	Adverse	High	Non-significant
		Orange roughy *Hoplostethus atlanticus*	High	Negligible	Minor	Adverse	High	Non-significant
		Roundnose grenadier *Coryphaenoides rupestris*	Very High	Negligible	Minor	Adverse	High	Non-significant
	Cephalopods	Long-finned (loliginid) squids *Loligo forbesi* and *Loligo vulgari*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Short-finned (ommastrephid) squids *Todarodes sagittatus, Todaropsis eblanae* and *Illex coindetii*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Cuttlefish *Sepia officinalis*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Octopuses *Octopus vulgaris and Eledone cirrhosa*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	High	Non-significant
	Crustaceans	Langoustine *Nephrops norvegicus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Common lobster *Homarus gammarus*	High	Negligible	Minor	Adverse	High	Non-significant
		European spiny lobster *Palinurus elephas*	High	Negligible	Minor	Adverse	High	Non-significant
		Squat lobster *Munida rugosa*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Edible crabs *Cancer pagurus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Velvet swimming crab *Necora puber*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Shore crab *Carcinus maenas*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Crayfish *Palunirus elegans*	Low	Negligible	Negligible	Adverse	High	Non-significant
	Molluscs	Ocean quahog *Artica Islandica*	High	Negligible	Minor	Adverse	High	Non-significant
		Common cockle *Cerastoderma edule*	Low	Negligible	Negligible	Adverse	High	Non-significant
		King scallop *Pecten maximus*	Medium	Negligible	Negligible	Adverse	High	Non-significant
		Queen scallop *Aequipecten opercularis*	Low	Negligible	Negligible	Adverse	High	Non-significant
		Razorfish Ensis spp.	Low	Negligible	Negligible	Adverse	High	Non-significant
	Spawning and nursery grounds	Herring spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant
		Sandeel spawning and nursery grounds	High	Negligible	Minor	Adverse	High	Non-significant

15.6 Mitigation Measures

As no effects were considered to be significant under the provisions of the EIA Regulations, then no secondary mitigation is required to be implemented.

15.7 Residual Effects

No effects were assessed to be of moderate or greater significance. As such, no mitigation measures were required and there was no reduction in the residual significance of effects.

15.8 Cumulative Effects

Fish species are largely mobile species which range widely throughout the region, either during foraging or migration activities. Cumulative impacts on fish and shellfish receptors may arise from impacts originating from the installation, operation or decommissioning of the project as assessed in Sections 15.5-15.7 above, with impacts from other planned or consented projects upon the same receptor populations.

No cumulative assessment is conducted for existing operations or built projects as this forms part of the baseline environment that the assessment in Sections 15.5-15.7 was conducted on. Furthermore, the potential for synergistic impacts from the project, where one impact may cause another impact, have been assessed in Section 15.5 above (for example an impact upon water quality leading to an impact upon fish receptors).

A list of cumulative projects requiring assessment within the Environmental Statement has been agreed with Marine Scotland and further detail is provided in Chapter 6: Cumulative Assessment. The relevant marine projects are considered individually below.

15.8.1 Moray East/West Offshore Windfarm Development

Given the distance between the project and the Moray East/West Offshore wind farm, 100km to the north west of the project, there is likely to be limited overlap between populations of the less mobile fish and shellfish species (e.g. cephalopods, crustaceans, molluscs). For mobile species, the likelihood of individuals encountering both projects is low, and being affected by both projects is even lower. The adverse impacts of offshore wind farms upon fish species are generally associated with their installation and physical presence causing disturbance and habitat loss, as well as through the cabling causing EMF and sediment heating. The NorthConnect project's impacts of this nature are no greater than Negligible in their magnitude, therefore, causing at most an imperceptible change within the population, and the project is not predicted to cause any impacts that are '*likely to have a significant effect on the environment'* (as termed in the EIA Regulations). No cumulative impacts with this project are therefore anticipated that would be *'likely to have a significant effect on the environment'* (as termed in the EIA Regulations).

15.8.2 Inch Cape Offshore Windfarm

Given the distance between the project and the Inch cape offshore wind farm, 110km to the south of the project, there is likely to be limited overlap between populations of the less mobile fish and shellfish species (e.g. cephalopods, crustaceans, molluscs). For mobile species, the likelihood of individuals encountering both projects is low, and being affected by both projects is even lower. The adverse impacts of offshore wind farms upon fish species are generally associated with their installation and physical presence causing disturbance and habitat loss, as well as through the cabling causing EMF and sediment heating. The NorthConnect project's impacts of this nature are no greater

than Negligible in their magnitude, therefore, causing at most an imperceptible change within the population, and the project is not predicted to cause any impacts that are '*likely to have a significant effect on the environment'* (as termed in the EIA Regulations). No cumulative impacts with this project are therefore anticipated that would be *'likely to have a significant effect on the environment'* (as termed in the EIA Regulations).

15.8.3 Neartna Gaoithe Offshore Windfarm

Given the distance between the project and the Neartna Gaoithe offshore wind farm, 130km to the south of the project, there is likely to be limited overlap between populations of the less mobile fish and shellfish species (e.g. cephalopods, crustaceans, molluscs). For mobile species, the likelihood of individuals encountering both projects is low, and being affected by both projects is even lower. The adverse impacts of offshore wind farms upon fish species are generally associated with their installation and physical presence causing disturbance and habitat loss, as well as through the cabling causing EMF and sediment heating. The NorthConnect project's impacts of this nature are no greater than Negligible in their magnitude, therefore, causing at most an imperceptible change within the population, and the project is not predicted to cause any impacts that are '*likely to have a significant effect on the environment*' (as termed in the EIA Regulations). No cumulative impacts with this project are therefore anticipated that would be *'likely to have a significant effect on the environment'* (as termed in the EIA Regulations).

15.8.4 Seagreen Phase 1 Wind Farm

Given the distance between the project and the Seagreen Phase 1 offshore wind farm, 110km to the south of the project, there is likely to be limited overlap between populations of the less mobile fish and shellfish species (e.g. cephalopods, crustaceans, molluscs). For mobile species, the likelihood of individuals encountering both projects is low, and being affected by both projects is even lower. The adverse impacts of offshore wind farms upon fish species are generally associated with their installation and physical presence causing disturbance and habitat loss, as well as through the cabling causing EMF and sediment heating. The NorthConnect project's impacts of this nature are no greater than Negligible in their magnitude, therefore, causing at most an imperceptible change within the population, and the project is not predicted to cause any impacts that are '*likely to have a significant effect on the environment*' (as termed in the EIA Regulations). No cumulative impacts with this project are therefore anticipated that would be *'likely to have a significant effect on the environment'* (as termed in the EIA Regulations).

15.8.5 Beatrice Offshore Windfarm

Given the distance between the project and the Beatrice offshore wind farm, 100km to the north west of the project, there is likely to be limited overlap between populations of the less mobile fish and shellfish species (e.g. cephalopods, crustaceans, molluscs). For mobile species, the likelihood of individuals encountering both projects is low, and being affected by both projects is even lower. The adverse impacts of offshore wind farms upon fish species are generally associated with their installation and physical presence causing disturbance and habitat loss, as well as through the cabling causing EMF and sediment heating. The NorthConnect project's impacts of this nature are no greater than Negligible in their magnitude, therefore, causing at most an imperceptible change within the population, and the project is not predicted to cause any impacts that are '*likely to have a significant*

effect on the environment' (as termed in the EIA Regulations). No cumulative impacts with this project are therefore anticipated that would be *'likely to have a significant effect on the environment'* (as termed in the EIA Regulations).

15.8.6 European Offshore Wind Development Centre (EOWDC), Aberdeen Bay

The European offshore wind deployment centre is situated 40km to the south of the project. As this project is currently being constructed then no cumulative effects during installation are anticipated given there is no programme overlap. The adverse impacts of offshore wind farms upon fish species during operation are generally associated with their physical presence causing habitat loss and through the cabling causing EMF and sediment heating. The NorthConnect project's impacts of this nature are no greater than Negligible in their magnitude, therefore, causing at most an imperceptible change within the population, and the project is not predicted to cause any impacts that are '*likely to have a significant effect on the environment'* (as termed in the EIA Regulations). No cumulative impacts with this project are therefore anticipated that would be *'likely to have a significant effect on the environment'* (as termed in the EIA Regulations).

15.8.7 Hywind Scotland Pilot Park Offshore Wind Farm

The Hywind Scotland pilot park offshore wind farm is situated 20km to the north of the project and is currently operational so has been considered as part of the baseline against which the project has been assessed.

15.8.8 Kincardine Offshore Wind Farm, 8 6MW Floating Turbines

The Kincardine offshore wind farm is situated 50km to the south of the project. The adverse impacts of offshore wind farms upon fish species are generally associated with their installation and physical presence causing disturbance and habitat loss, as well as through the cabling causing EMF and sediment heating. The NorthConnect project's impacts of this nature are no greater than Negligible in their magnitude, therefore, causing at most an imperceptible change within the population, and the project is not predicted to cause any impacts that are '*likely to have a significant effect on the environment*' (as termed in the EIA Regulations). No cumulative impacts with this project are therefore anticipated that would be *'likely to have a significant effect on the environment'* (as termed in the EIA Regulations).

15.8.9 Aberdeen Harbour Dredge and Harbour Extension Project

The Aberdeen harbour dredge and harbour extension project is situated 40km to the south of the project. As this project is currently being constructed then no cumulative effects during installation are anticipated, given there is no programme overlap. Given the separation between the project and the Aberdeen harbour dredge and harbour extension project, the coastal nature of the works conducted for the Aberdeen harbour dredge and harbour extension project, and the lack of any EMF or sediment heating effects cause, then no cumulative impacts with this project are therefore anticipated that would be *'likely to have a significant effect on the environment'* (as termed in the EIA Regulations).

15.8.10 Peterhead Port Authority Harbour Masterplan

The Peterhead Port Authority Harbour Masterplan is limited in extent to within the existing breakwaters and existing harbours of Peterhead Port, 3km to the north of the project. No cumulative impacts with this project are therefore anticipated that would be *'likely to have a significant effect on the environment'* (as termed in the EIA Regulations).

15.8.11 North Sea Network Link Interconnector Cable

The North Sea Network (NSN) Link Interconnector cable project is situated 130km to the south of the project. Given the distance between the project and the NSN Link Interconnector cable project, 130km to the south of the project, there is likely to be limited overlap between populations of the less mobile fish and shellfish species (e.g. cephalopods, crustaceans, molluscs). Similarly to the project, the NSN Link Interconnector cable project did not predict any impacts would be *'likely to have a significant effect on the environment'* (as termed in the EIA Regulations), and therefore, no cumulative impacts with this project are anticipated that would be *'likely to have a significant effect on the environment'* (as termed in the EIA Regulations).

15.8.12 NorthConnect HVDC Subsea Cable (Rest of the North Sea: from UK Median Line-Start of Norwegian Fjord)

The remaining section of the NorthConnect HVDC subsea cable, not assessed within this EIAR as it is situated within Norwegian waters, is anticipated to have similar effects to the project given that installation will occur from the Norwegian coast to the UK median line utilising similar installation methodologies and equipment, and operation will be transmitting the same electricity along the same wires so sediment heating and EMF levels will be the same. Whilst installation will be occurring at the same time as the project, impacts will not be synergistic given the distance occurring between the installation activities. Similarly, for operation, impacts will be occurring at the same magnitude along the length of the cable route, rather than being cumulatively greater than the individual impacts. Assuming similar mitigation as applied for the UK section of the project will be applied in Norwegian waters, then no cumulative impacts with this project are therefore anticipated that would be *'likely to have a significant effect on the environment'* (as termed in the EIA Regulations).

15.9 Summary

A summary of the potential effects of the project, alone, is presented in Tables 15.13a-c at the end of Section 15.5. There are not predicted to be any residual significance of effects from the project alone that are considered to be an *'impact likely to have a significant effect on the environment'* (as termed in the EIA Regulations). Section 15.8 then assesses the project cumulatively with other proposed plans or projects and there are not predicted to be any cumulative impacts that are considered to be an *'impact likely to have a significant effect on the environment'* (as termed in the EIA Regulations).

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