



# Scotland England Green Link 1 / Eastern Link 1 - Marine Scheme

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Environmental Appraisal Report  
Volume 3

Appendix 8.2 - Habitat Regulations Assessment Report

**nationalgrid**  **SP TRANSMISSION**

National Grid Electricity Transmission and Scottish Power Transmission

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Prepared for:

National Grid Electricity Transmission and  
Scottish Power Transmission

Prepared by:

AECOM Limited  
Aldgate Tower, 2 Leman Street  
London, E1 8FA  
United Kingdom

T: +44 20 7061 7000  
aecom.com

In association with:

Xodus Group (Shipping and Navigation);  
Wessex Archaeology (Marine Archaeology); and  
Brown and May Marine Ltd (Commercial Fisheries).

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# Table of Contents

1.	Introduction .....	1
1.1	Overview .....	1
1.2	The Project .....	1
2.	Legislative Framework .....	2
2.1	Special Areas of Conservation .....	2
2.2	Special Protection Areas .....	3
2.3	Ramsar .....	3
2.4	Statutory Requirements for Assessment of European sites .....	3
3.	Assessment Methodology .....	5
3.1	Introduction .....	5
3.2	HRA Stage 1 – Screening for Likely Significant Effects .....	6
3.3	The Rochdale Envelope .....	7
4.	Baseline Evidence Gathering .....	8
4.1	Scope of the HRA .....	8
4.2	Relevant European Sites .....	8
4.3	In-combination Scope .....	27
5.	Test of Likely Significant Effects .....	28
5.1	Introduction .....	28
5.2	Impact Pathways .....	28
5.3	Installation Period of Marine Scheme .....	32
5.4	Operation Period of Marine Scheme .....	40
5.5	Maintenance and Cable Repair of Marine Scheme .....	41
5.6	Decommissioning of Marine Scheme .....	41
6.	In-combination Effects .....	42
6.1	Introduction .....	42
7.	Conclusions .....	47
8.	References .....	48
	Appendix A European Sites Background .....	51
	Moray Firth SAC (Scotland) .....	51
	River Teith SAC .....	52
	River Tay SAC .....	53
	River South Esk SAC .....	54
	River Dee SAC (Aberdeenshire) .....	55
	Outer Firth of Forth and St. Andrews Bay Complex SPA (Scotland) .....	56
	St. Abb's Head to Fast Castle SPA (including its marine extension, Scotland) .....	58
	St Abb's Head to Fast Castle SAC (Scotland) .....	59
	Berwickshire and North Northumberland Coast SAC (Scotland / England) .....	59
	Tweed Estuary SAC (England) .....	60
	River Tweed SAC (England) .....	61
	Northumberland Marine SPA (England) .....	62
	Lindisfarne SPA / Ramsar (England) .....	64
	Northumbria Coast SPA/Ramsar (England) .....	66
	Durham Coast SAC (England) .....	67
	Farne Islands SPA (England) .....	68
	Coquet Island SPA (England) .....	69
	Southern North Sea SAC (England) .....	70
	Dogger Bank SAC (England) .....	71

Figures

Figure 3-1: Four Stage Approach to Habitats Regulations Assessments of Projects..... 6

Figure 4-1: Relevant European Sites ..... 10

Tables

Table 4-1: Summary of the European designated sites considered ..... 11

Table 4-2: Indicative breeding season foraging ranges for qualifying bird species designated for their breeding population..... 21

Table 4-3: Presence and seasonal distribution of seabirds associated with designated sites within the Marine Scheme during the breeding season ..... 22

Table 4-4: Summary of the presence and distribution of ornithological receptors within the study area during the non-breeding season ..... 25

Table 5-1: Likely impact pathways associated with the installation and operation of the Marine Scheme ..... 29

# 1. Introduction

## 1.1 Overview

This Habitats Regulations Assessment (HRA) Report has been prepared on behalf of National Grid Electricity Transmission (NGET) and Scottish Power Transmission (SPT) (hereafter referred to as 'the Applicant'). It forms part of the Environmental Appraisal Report (EAR) prepared to support the Marine Licence Applications to the Marine Scotland Licensing Operations Team (MS-LOT) and to the Marine Management Organisation (MMO).

The Applicant is applying for Marine Licences for the construction, operation (including maintenance and repair) and decommissioning of the subsea High Voltage Direct Current (HVDC) elements of a reinforcement project that connects substations at Torness in East Lothian to Hawthorn Pit in County Durham.

This HRA should be read in conjunction with the following EAR Volume 2 chapters:

- Chapter 8: Benthic Ecology (to which this report forms Appendix 8.2);
- Chapter 9: Fish and Shellfish Ecology;
- Chapter 10: Marine Mammals; and
- Chapter 11: Ornithology.

## 1.2 The Project

Scotland to England Green Link 1 (SEGL1), also known as Eastern Link 1 (EL1), which extends between Torness, East Lothian, and Hawthorn Pit, County Durham (hereafter referred to as the 'Project'), is a major reinforcement of the electricity transmission system which will provide additional north-south transmission capacity between southern Scotland and northern England. This reinforcement is essential to ensure an efficient network that can facilitate the UK Government's legally binding commitment to achieve net-zero by 2050.

The Project comprises following components:

- **Scottish Onshore Scheme:** A converter station located in the Torness area, to the east of the Dunbar Energy Recovery Centre and a new 400kV substation at Branxton in East Lothian, Scotland, with approximately 7.5 km of buried HVDC cable to a landfall south-east of Thorntonloch Beach. The substation at Branxton was part of a separate planning application (reference 21/01569/PM). The converter station and substation will be connected by approximately 5 km of High Voltage Alternating Current (HVAC) cable. The substation connects the Project to the existing transmission system. The scope of the Scottish Onshore Scheme ends at MLWS and a separate consent application has been made to East Lothian District Council;
- **Marine Scheme:** Commencing at MHWS at Thorntonloch Beach, East Lothian, approximately 176 km of subsea HVDC cable, comprising 37.5 km in Scottish waters and 138.5 km in English waters, will extend to MHWS at Seaham, County Durham. This is subject to MLAs to MS-LOT and the MMO, which this EAR supports; and
- **English Onshore Scheme:** Commencing at MLWS approximately 10 km of underground HVDC cable will be laid from the landfall north of Seaham, west along the Sunderland City/County Durham administrative boundary and then south-west through County Durham, to a converter station at Hawthorn Pit. The converter station will be connected to a new 400 kV substation by approximately 1 km of HVAC cable. The new 400 kV substation will connect the Project to the existing 275 kV Hawthorn Pit substation and the existing electricity transmission system. This is subject to a separate consent application which has been made to Durham County Council.

## 2. Legislative Framework

Protection of sites of nature conservation importance at a European level originated when the UK was part of the European Union (EU) and was required to enact EU laws into its domestic laws. The EU legislation relevant to such sites were the European Directive 92/43/EEC on the 'Conservation of Natural Habitats and Wild Fauna and Flora', referred to as the 'Habitats Directive', and Council Directive 2009/147/EC (Birds Directive) the Conservation of Wild Birds (the codified version of Council Directive 79/409/EEC on the conservation of wild birds) referred to as the 'Wild Birds Directive'. Sites falling under the definitions provided in these Directives are referred to as European sites and reflect the fact that these sites are of a European level of importance.

These directives were most recently transposed into domestic law by the Conservation of Habitats and Species Regulations 2017 (England and Wales) (as amended) (referred hereinafter as 'the 2017 Habitats Regulations (as amended)') and by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) in Scotland. Regulation 2(2)(k) of the Conservation of Habitats and Species Regulations 2017 makes clear that the 2017 Regs will apply to Scotland in relation to HRA. As such, it is not necessary to carry out a separate assessment under the Scottish regulations.

The UK left the EU on 31 January 2020 under the terms set out in the European Union (Withdrawal Agreement) Act 2020 ("the Withdrawal Act"), this established a transition period, which ended on 31 December 2020. The Withdrawal Act retains the body of existing EU-derived law within UK domestic law. The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (the Conservation of Habitats and Species (EU Exit) (Scotland) (Amendment) Regulations 2019 in Scotland) amended the 2017 Habitat Regulations to decouple the 2017 Habitats Regulations from the EU Directives, whilst maintaining the protection and processes related to European sites.

The 2017 Habitats Regulations (as amended) enable the protection of sites that host habitats and species of European Importance. These sites are listed below and are collectively referred to as European sites. They include Ramsar sites which are not formally covered by the Regulations but are included in the process as a result of guidance in the National Planning Policy Framework.

- Special Area of Conservation (SAC);
- Special Protection Area (SPA); and
- Ramsar Sites.

The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 amended the Habitats Regulations through:

- the creation of a national site network within the UK territory comprising the protected sites already designated under the Nature Directives, and any further sites designated under these Regulations;
- the establishment of management objectives for the national site network (the 'network objectives');
- a duty for appropriate authorities to manage and where necessary adapt the national site network as a whole to achieve the network objectives;
- an amended process for the designation of SACs;
- arrangements for reporting on the implementation of the Regulations, given that the UK no longer provides reports to the European Commission;
- arrangements replacing the European Commission's functions with regard to the imperative reasons of overriding public interest (IROPI) test where a plan or project affects a priority habitat or species; and
- arrangements for amending the schedules to the Regulations and the annexes to the Nature Directives that apply to the UK.

### 2.1 Special Areas of Conservation

SACs are protected areas in the UK designated under:



- the Conservation of Habitats and Species Regulations 2017 (as amended) (the 2017 Regulations) in England and Wales (including the adjacent territorial sea) and to a limited extent in Scotland (reserved matters) and Northern Ireland (excepted matters);
- the Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (the 1994 Regulations) in Scotland;
- the Conservation (Natural Habitats, &c) Regulations (Northern Ireland) 1995 (as amended) in Northern Ireland; and
- the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) in the UK offshore area.

## 2.2 Special Protection Areas

SPAs are protected areas for birds in the UK classified under:

- the Wildlife & Countryside Act 1981 (as amended) and the Conservation (Natural Habitats, &c.) Regulations 2010 (as amended) in England, Scotland and Wales;
- the Wildlife (Northern Ireland) Order 1985; the Nature Conservation and Amenity Lands (Northern Ireland) Order 1985; the Conservation (Natural Habitats, &c.) (Northern Ireland) Regulations 1995 (as amended) in Northern Ireland;
- the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) in the UK offshore area; and
- other legislation related to the uses of land and sea.

## 2.3 Ramsar

Ramsar sites are wetlands of international importance that have been designated under the Ramsar Convention (1971). Sites are selected for their international significance relating to all ecology, botany, zoology, limnology or hydrology wetland components. The designation recognises the importance of wetlands as economic, social and environmental entities and the need to conserve them.

While there is no dedicated legislation for the protection of Ramsar sites in the UK, all Ramsar sites in England and Scotland are either SPAs, SACs or Sites of Special Scientific Interest (SSSIs) and are protected under the relevant statutory regimes and accordingly, receive statutory protection under the Wildlife & Countryside Act 1981 (as amended) and the Nature Conservation (Scotland) Act 2004 (as amended). Although Ramsar sites are not part of the network of designated sites, paragraph 176 of the National Planning Policy Framework in England and paragraph 211 of the National Planning Framework in Scotland, extends Ramsar sites the same level of protection as SPAs and SACs. As such, any reference to the European Sites below should be considered to also include such sites.

## 2.4 Statutory Requirements for Assessment of European sites

Regulation 63 of the 2017 Regulations provides that:

*“A competent authority, before deciding to ... give any consent for a plan or project which is likely to have a significant effect on a European site ... must make an appropriate assessment of the implications for the plan or project in view of that site’s conservation objectives...”*

*The competent authority may agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site.”*

Although Appropriate Assessment itself is undertaken by the competent authority, Regulation 63 (2) of the 2017 Regulations requires that:

*“A person applying for any such consent, permission or other authorisation must provide such information as the competent authority may reasonably require for the purposes of the assessment or to enable it to determine whether an appropriate assessment is required.”*

The first stage therefore requires an applicant to provide sufficient information to allow the competent authority to decide if Appropriate Assessment is necessary. It is this 'first stage' of assessment that has been conducted and reported in this document.

Should the first stage conclude that significant effects are likely, the applicant must provide sufficient assessment information to allow the competent authority to undertake an Appropriate Assessment.

Ordinarily, consent may only be given for the proposed scheme if, following Appropriate Assessment, it is established that it will not adversely affect the integrity of the European site. Regulation 63 (5) of the 2017 Regulations provides that:

*“In the light of the conclusions of the assessment, and subject to regulation 64, the competent authority may agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site or the European offshore marine site (as the case may be)”*

If adverse effects on integrity are identified, alternatives must be considered to avoid those effects. However, where no alternatives exist, and so an adverse effect on integrity remains, a further assessment is made, under Regulation 64, as to whether the scheme is required for imperative reasons of overriding public interest (IROPI). If the scheme meets that IROPI test, compensatory measures will be required to maintain the overall national site network.

The overall process set out in the 2017 Regulations is typically referred to as 'Habitats Regulations Assessment' (HRA). This has arisen to distinguish the overall process from the individual stage of 'Appropriate Assessment', which is carried out by the competent authority. Throughout this Report the term HRA is used for the overall process and restricts the use of Appropriate Assessment to the specific stage of that name.



## 3. Assessment Methodology

### 3.1 Introduction

The HRA has been carried out with reference to the general EC guidance on HRA (European Commission, 2001), general guidance on HRA published by the UK government in February 2021 (Department for Environment, Food & Rural Affairs, Natural England, Welsh Government, and Natural Resources Wales, 2021). The assessment also considers guidance from the MMO<sup>1</sup>. Although the Marine Scheme is not subject to the Planning Act 2008 and will not be consented through a Development Consent Order the stages set out in the Planning Inspectorate (PINS) Advice Note 10 (The Planning Inspectorate, 2017) can be applied to any project. This is followed voluntarily to help inform the process but is by no means mandatory / statutory; in the absence of any other appropriate / similar guidance, it is appropriate to follow.

This assessment of likely significant effects (LSEs) takes account of relevant EU case law (for instance, the Holohan and People over Wind cases, discussed below).

Figure 3-1 below outlines the stages of HRA according to Planning Inspectorate's Advice Note Ten: Habitats Regulations Assessment relevant to nationally significant infrastructure projects. Note that while Figure 3-1 shows all the stages of the HRA process, this document only discusses stage 1 in further detail.

Whilst the need for Appropriate Assessment must be determined by the competent authority (for the purposes of the Marine Scheme this is the MMO and MS-LOT), the information needed to allow the competent authority to make this determination must be provided by the applicant. The information needed for the competent authority to establish whether there are any LSEs from the Proposed Development is therefore provided in this Report.

The approach to this HRA was provided for review and feedback during non-statutory Scoping in Spring 2021.

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<sup>1</sup> <https://www.gov.uk/guidance/marine-licensing-impact-assessments#habitats-regulations-assessment>

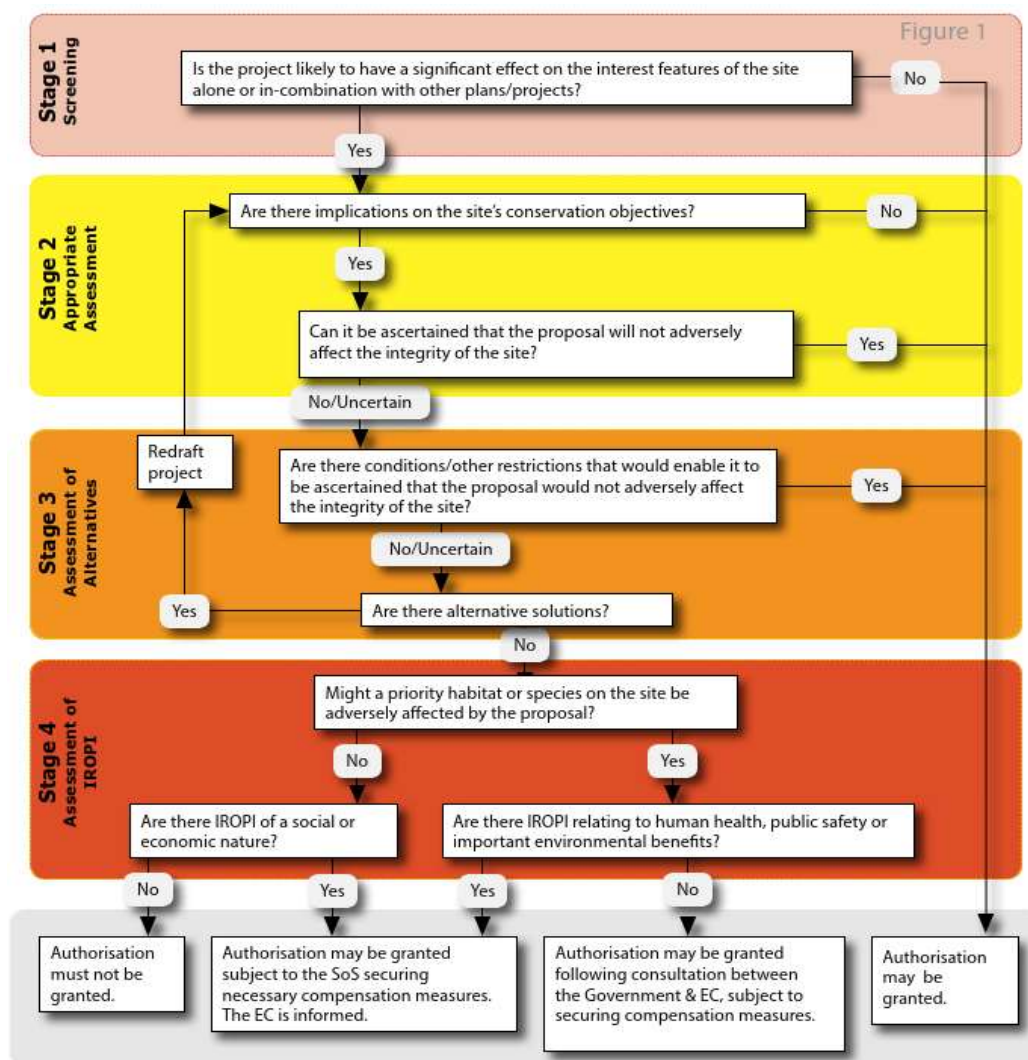


Figure 3-1: Four Stage Approach to Habitats Regulations Assessments of Projects

## 3.2 HRA Stage 1 – Screening for Likely Significant Effects

The objective of the LSE test is to 'screen out' those aspects of a project and / or the European sites where it can, without any detailed appraisal, be reasonably concluded that significant adverse effects upon European sites are unlikely, usually because there is no mechanism for an adverse interaction (i.e., a pathway) with European sites. The remaining aspects, if any, are then taken forward to Appropriate Assessment. The assessment must consider the potential for effects 'in-combination' with other plans and projects.

This report has been prepared having regard to all relevant case law relating to the 2017 Regulations, the Habitats Directive and Wild Birds Directive (2019). This includes the ruling by the Court of Justice of the European Union (CJEU) in the case of *People Over Wind, Peter Sweetman v Coillte Teoranta* (C-323/17).

This case held that; *"it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site"* (paragraph 40). This establishes that 'mitigation measures' specifically included to address effects on European sites rather than due to other legislative drivers cannot be taken into account at the screening stage, but they can be taken into account in an Appropriate Assessment.

In 2018 the Holohan ruling was handed down by the European Court of Justice. Among other provisions paragraph 39 of the ruling states that “*As regards other habitat types or species, which are present on the site, but for which that site has not been listed, and with respect to habitat types and species located outside that site, ... typical habitats or species must be included in the appropriate assessment, if they are necessary to the conservation of the habitat types and species listed for the protected area*”. This ruling has been considered in relation to the Proposed Development and European sites that are linked to the proposal via an impact pathway, such as consideration of impacts on qualifying features for European sites using habitat outside those sites.

### 3.3 The Rochdale Envelope

In July 2018, the Planning Inspectorate published Advice Note Nine: Rochdale Envelope (The Planning Inspectorate, 2018), explaining how the principles of the Rochdale Envelope should be used by planning applications for the Environmental Impact Assessment (EIA) process, though it is equally applicable to non-statutory Environmental Appraisal.

The Rochdale Envelope<sup>2</sup> is applicable where some of the details of a proposed development cannot be confirmed when an application is submitted, and flexibility is needed to address uncertainty. Notwithstanding, all significant potential effects of a proposed development must be properly addressed.

It encompasses three key principles:

- The assessment should use a cautious worst-case approach;
- The level of information assessed should be sufficient to enable the LSE of a Proposed Development to be assessed; and
- The allowance for flexibility should not be abused to provide inadequate descriptions of projects.

This HRA has given due consideration to the use of a Rochdale Envelope approach. The worst-case (i.e., the potentially most impactful) construction / decommissioning and operational scenarios have been assessed in relation to impact pathways.

Throughout this HRA construction impacts and decommissioning impacts on European sites are likely to be very similar in type, magnitude and effect. As such they are treated together.

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<sup>2</sup> The Rochdale Envelope arises from two cases: R. v Rochdale MBC ex parte Milne (No.1) and R. v Rochdale MBC ex parte Tew [1999], which are cases that dealt with outline planning applications for a proposed business park in Rochdale.

## 4. Baseline Evidence Gathering

### 4.1 Scope of the HRA

There is no guidance that dictates the scope of an HRA and the study area for this HRA is largely dictated by the linkages between impact pathways and European site designations. Thus, the study area for this HRA extends to those European sites that are included in the Test of Likely Significant Effects. The scope of the assessment is primarily guided by the identified impact pathways (the source-pathway-receptor model) for the receptors assessed, detailed in the relevant EAR chapters. It should also be noted that the Marine Scheme was scoped in consultation with the MMO and MS-LOT in Spring 2021, and the feedback from this has been fed into the assessment.

Impact pathways are routes by which the construction, operation (including maintenance and repair) or decommissioning of a project can lead to an effect upon a receptor, the receptor for HRA being a European designated site. An example of an impact pathway is visual and noise disturbance arising during any phase of the project assessed from installation through operation, to decommissioning. If there are ecological receptors sensitive to visual disturbance within a nearby European site (for example, non-breeding overwintering birds), visual disturbance could alter their foraging and roosting behaviour, with potential to affect the integrity of the European site. In this example, the pathway is line of sight, and the potential zone of influence and magnitude of an impact can be considered on that basis. For other impact pathways (for example, air pollution) there may be guidance that sets out appropriate distance-based zones of influence for assessment. For other pathways of impact and receptors, a professional judgment must be made based on the best available evidence.

### 4.2 Relevant European Sites

The Project will comprise three key components, as identified in Section 1.2 above. This includes the onshore works at Torness, East Lothian (Scotland), the marine works in Scottish and English waters (the 'Marine Scheme') and the onshore works at County Durham (England).

There may be linkages and overlaps of impact pathways between different components of the Project. Since any HRA must be 'in-combination' with other plans and projects, the HRA for the Project will need to consider both marine/coastal and fully inland European sites.

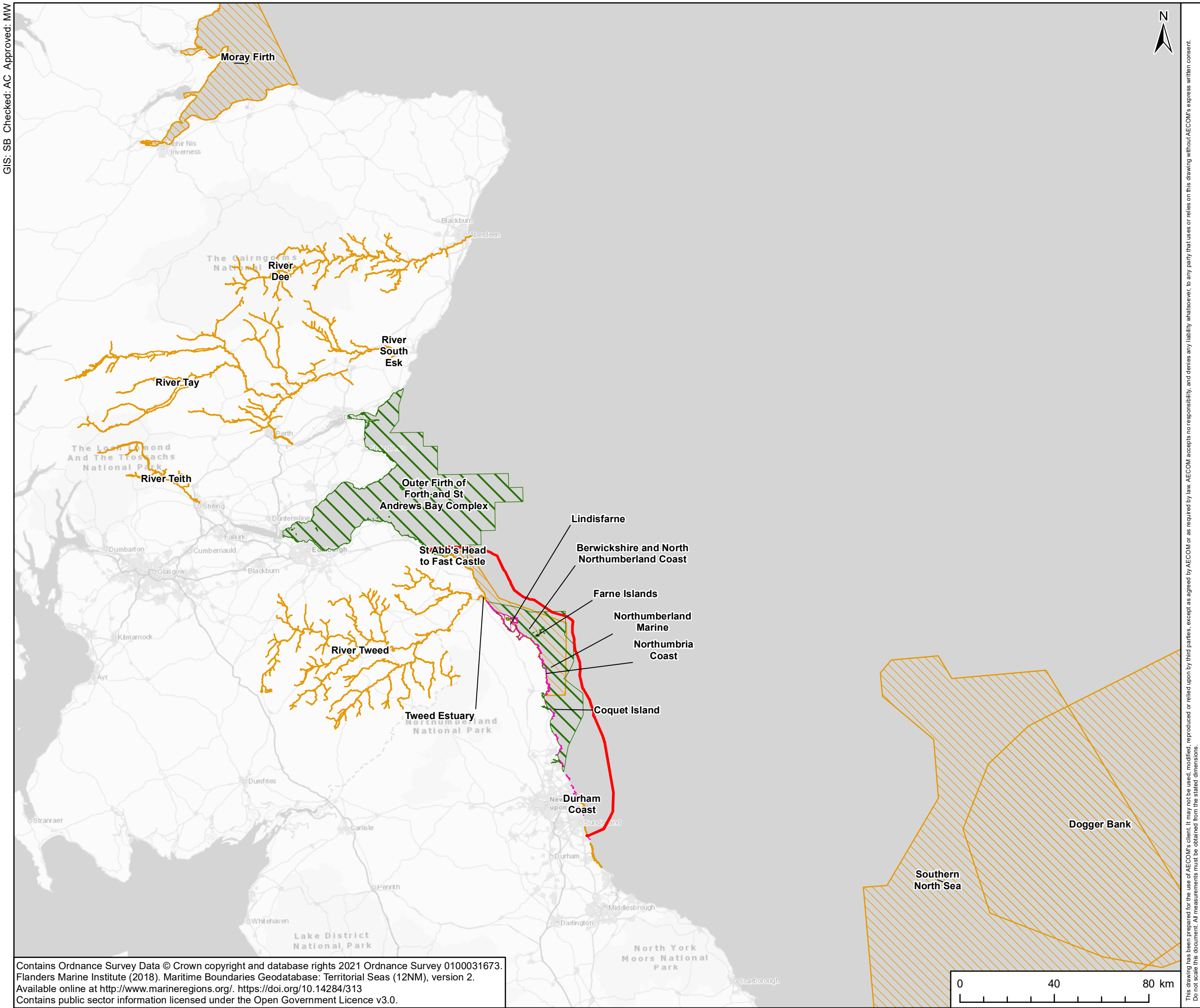
Schemes that cross European sites may pose disproportionate threats to the Conservation Objectives of these sites, given their proximity to ecological interest features. The Marine Scheme passes directly through two European sites: The Outer Firth of Forth & St Andrews Bay Complex SPA as it leaves the Scottish landfall (KP 1 – KP 17) and a small section of the Northumberland Marine SPA as it heads past Holy Island (KP 66 – KP 72), south of Berwick-upon-Tweed. Further details about these sites are provided below:

- **Outer Firth of Forth and St Andrews Bay Complex SPA (Scotland)** – This is an extensive site (2,720.68 km<sup>2</sup>) off the south-east coast of Scotland, harbouring one of the most abundant and diverse marine bird assemblages in Scotland. It is designated for 21 seabird and waterbird species, including both breeding and overwintering species. The site harbours particularly large proportions of the GB populations for common eider *Somateria mollissima mollissima* (35.9%), long-tailed duck *Clangula hyemalis* (17.7%), velvet scoter *Melanitta fusca* (23.2%), common tern *Sterna hirundo* (8.8%, breeding) and Atlantic puffin *Fratercula arctica* (5.3%). A seabird assemblage of 40,000 seabirds also forms a qualifying feature of the site. Importantly, the SPA also includes marine foraging grounds for breeding common tern, Arctic tern, and European shag nesting in SPA colonies within the Outer Firth of Forth and St Andrews Bay Complex SPA. The marine installation corridor runs through the SPA for approximately 17.2 km.
- **Northumberland Marine SPA (England)** - This SPA is designated for a range of breeding birds, including Arctic tern *Sterna paradisaea*, common tern, guillemot *Uria aalge*, Little tern *Sternula albifrons*, puffin, roseate tern *Sterna dougallii* and sandwich tern *Thalasseus sandvicensis*. A wider seabird assemblage (breeding) also forms part of the designation. The marine installation corridor runs through the SPA for a distance of approximately 6.3 km and elsewhere, the marine installation corridor is parallel to the eastern boundary of the SPA (approximately 600 m at the closest points which are east of Seahouses and Amble on the Northumberland coast).

Various other European sites (listed in Table 4-1) lie outside the anticipated Marine Scheme development footprint but may nonetheless be impacted by the activities within the marine installation corridor. For example, this could be because these sites harbour mobile bird, fish or mammal species for which European sites are designated and which potentially frequent the scheme area, or due to impact pathways extending some distance beyond the marine installation corridor. The list of sites included in this assessment was agreed with stakeholders during the EAR Scoping stage (See EAR Volume 2 Chapter 6: Consultation and Stakeholder Engagement).





A map of relevant European sites is presented in Figure 4-1.





PROJECT  
**Scotland England Green Link 1 /  
Eastern Link 1**

KEY

-  Marine Installation Corridor  
 Special Area of Conservation (SAC)  
 Special Protection Area (SPA)  
 RAMSAR



TITLE
<b>Figure 4-1</b> <b>Relevant European Sites</b>

REFERENCE

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SHEET NUMBER 1 of 1 DATE 07/04/2022

**Table 4-1: Summary of the European designated sites considered**

European site (Country)	Approx. distance from marine installation corridor	Qualifying species/habitats	Threats and pressures to site integrity	Likely connection to impact pathways from Eastern Link 1	Included or Excluded for assessment (test of likely significant effects)
Moray Firth SAC	202.58 km north of the marine installation corridor	<ul style="list-style-type: none"> <li>Bottlenose dolphin <i>Tursiops truncatus</i></li> <li>Sandbanks which are slightly covered by sea water all the time</li> </ul>	<ul style="list-style-type: none"> <li>Physical disturbance</li> <li>Invasive species</li> <li>Water quality</li> <li>Fisheries</li> <li>Other fishing</li> <li>Underwater noise</li> <li>Coastal development</li> <li>Cables and pipelines</li> <li>Commercial shipping, ferries, personal leisure craft, wildlife tour boats and tidal turbines (death or injury by collision)</li> </ul>	<p>Yes (SAC Species) – bottlenose dolphin present within the SAC, likely also using marine waters around the marine installation corridor.</p> <p>No (SAC Habitats) – unlikely to be affected due to the distance to the marine installation corridor.</p>	Included
River Teith SAC	98 km from the marine installation corridor	<ul style="list-style-type: none"> <li>Sea lamprey <i>Petromyzon marinus</i></li> <li>Brook lamprey <i>Lampetra planeri</i></li> <li>River lamprey <i>Lampetra fluviatilis</i></li> <li>Atlantic salmon <i>Salmo salar</i></li> </ul>	<ul style="list-style-type: none"> <li>Forestry operations</li> <li>Invasive species</li> <li>Water quality</li> </ul>	<p>The qualifying species of this SAC are migratory fish species. Migration routes to this river are diffuse for all species and therefore, the potential for the Marine Scheme to have a significant effect on migrating individuals is negligible. The alignment of the marine installation corridor will not constrain any specific migratory routes. Given the distance of the SAC boundary from the activities which will occur in the marine installation corridor (98 km), there will be no significant effects from underwater sound during construction. Brook lamprey is a freshwater species, and not sea-going. River lamprey, sea lamprey and</p>	Excluded



European site (Country)	Approx. distance from marine installation corridor	Qualifying species/habitats	Threats and pressures to site integrity	Likely connection to impact pathways from Eastern Link 1	Included or Excluded for assessment (test of likely significant effects)
				Atlantic salmon are all sea-going species at some stage in their lifecycle. However, these are not demersal species and as such, can easily avoid the effects of EMF during cable operation.	
River Tay SAC	72 km from the marine installation corridor	<ul style="list-style-type: none"> <li>Atlantic salmon <i>Salmo salar</i></li> <li>Sea lamprey <i>Petromyzon marinus</i></li> <li>Brook lamprey <i>Lampetra planeri</i></li> <li>River lamprey <i>Lampetra fluviatilis</i></li> <li>European Otter <i>Lutra lutra</i></li> </ul>	<ul style="list-style-type: none"> <li>Extraction</li> <li>Game/ fisheries management</li> <li>Invasive species</li> <li>Water management</li> <li>Water quality</li> <li>Development</li> <li>Agricultural operations</li> <li>Recreation/disturbance</li> </ul>	<p>The qualifying species of this SAC include migratory fish species. Migration routes to this river are diffuse for all species and therefore, the potential for the Marine Scheme to have a significant effect on migrating individuals is negligible.</p> <p>Given the distance of the SAC boundary from the activities which will occur in the marine installation corridor (72 km), there will be no significant effects from underwater sound during construction or EMF during cable operation.</p> <p>The European Otter feeds mainly on fish (particularly eels and salmonids). As per Chapter 9: Fish and Shellfish Ecology of the EAR, it has been concluded that impacts on fish would be insignificant, and thus fish as a food source for this qualifying feature is not anticipated to be affected by the Marine Scheme. Given the distance from the marine installation corridor, otter will not be exposed to any direct disturbance because of the activities.</p>	Excluded

European site (Country)	Approx. distance from marine installation corridor	Qualifying species/habitats	Threats and pressures to site integrity	Likely connection to impact pathways from Eastern Link 1	Included or Excluded for assessment (test of likely significant effects)
River South Esk SAC	82 km from the marine installation corridor	<ul style="list-style-type: none"> <li>Atlantic salmon <i>Salmo salar</i></li> <li>Freshwater pearl mussel <i>Margaritifera margaritifera</i></li> </ul>	<ul style="list-style-type: none"> <li>Agricultural operations</li> <li>Climate Change</li> <li>Forestry operations</li> <li>Invasive species</li> <li>Over grazing</li> <li>Water management</li> <li>Water quality</li> <li>Wildlife crime</li> </ul>	<p>The qualifying species of this SAC include Atlantic salmon, a migratory fish species. Migration routes to this river are diffuse for all species and therefore, the potential for the Marine Scheme to have a significant effect on migrating individuals is negligible. Given the distance of the SAC boundary from the activities which will occur in the marine installation corridor (82 km), there will be no significant effects from underwater sound during construction or EMF during cable operation.</p> <p>Furthermore, the distance between the SAC and the marine installation corridor means there will be no direct impact of disturbance on the freshwater pearl mussel.</p>	Excluded
River Dee SAC (Aberdeenshire)	110 km from the marine installation corridor	<ul style="list-style-type: none"> <li>Atlantic salmon <i>Salmo salar</i></li> <li>Freshwater pearl mussel <i>Margaritifera margaritifera</i></li> <li>Otter <i>Lutra lutra</i></li> </ul>	<ul style="list-style-type: none"> <li>Agricultural operations</li> <li>Invasive species</li> <li>Water management</li> <li>Water quality</li> <li>Development</li> <li>Over grazing</li> </ul>	<p>Atlantic salmon, the only qualifying species of this SAC, is migratory. Migration routes to this river are diffuse for all species and therefore, the potential for the Marine Scheme to have a significant effect on migrating individuals is negligible. Given the distance of the SAC boundary from the activities which will occur in the marine installation corridor (110 km), there will be no significant effects from underwater sound during</p>	Excluded

European site (Country)	Approx. distance from marine installation corridor	Qualifying species/habitats	Threats and pressures to site integrity	Likely connection to impact pathways from Eastern Link 1	Included or Excluded for assessment (test of likely significant effects)
				construction or EMF during cable operation.	
Outer Firth of Forth and St Andrews Bay Complex SPA (Scotland)	The cable runs through this marine SPA for a distance of approx. 17.2 km	<ul style="list-style-type: none"> <li>Red-throated diver <i>Gavia stellata</i></li> <li>Slavonian grebe <i>Podiceps auratus</i></li> <li>Common eider <i>Somateria mollissima</i></li> <li>Long-tailed duck <i>Clangula hyemalis</i></li> <li>Common scoter <i>Melanitta nigra</i></li> <li>Velvet scoter <i>Melanitta fusca</i></li> <li>Common goldeneye <i>Bucephala clangula</i></li> <li>Red-breasted merganser <i>Mergus serrator</i></li> <li>Common tern <i>Sterna hirundo</i></li> <li>Arctic tern <i>Sterna paradisaea</i></li> <li>European shag <i>Phalacrocorax aristotelis</i></li> <li>Northern gannet <i>Morus bassanus</i></li> <li>Atlantic puffin <i>Fratercula arctica</i></li> <li>Black-legged kittiwake <i>Rissa tridactyla</i></li> <li>Manx shearwater <i>Puffinus puffinus</i></li> <li>Common guillemot <i>Uria aalge</i></li> <li>Razorbill <i>Alca torda</i></li> <li>Herring gull <i>Larus argentatus</i></li> <li>Little gull <i>Larus minutus</i></li> </ul>	<ul style="list-style-type: none"> <li>Recreational disturbance</li> <li>Visual and noise disturbance</li> <li>Marine consents and permits</li> <li>Fisheries: Commercial marine and estuarine</li> <li>Water pollution</li> </ul>	<p>Yes – bird species present throughout the year, likely foraging, preening or loafing in marine waters around the marine installation corridor.</p> <p>Seabirds can travel very long distances to forage from their colonies. Gannet, puffin and kittiwake can routinely travel 200-500 km to forage depending on species. For seabirds Joint Nature Conservation Committee (JNCC) advises that the mean maximum foraging range + 1 standard deviation should be applied for the purposes of defining functional linkage.</p>	Included

European site (Country)	Approx. distance from marine installation corridor	Qualifying species/habitats	Threats and pressures to site integrity	Likely connection to impact pathways from Eastern Link 1	Included or Excluded for assessment (test of likely significant effects)
		<ul style="list-style-type: none"> <li>Black-headed gull <i>Chroicocephalus ridibundus</i></li> <li>Common gull <i>Larus canus</i></li> <li>Seabird assemblage</li> <li>Waterfowl assemblage</li> </ul>			
St Abb's Head to Fast Castle SPA (including its marine extension; Scotland)	2 km to the south-west	<ul style="list-style-type: none"> <li>Razorbill <i>Alca torda</i></li> <li>Common guillemot <i>Uria aalge</i></li> <li>Black-legged kittiwake <i>Rissa tridactyla</i></li> <li>Herring gull <i>Larus argentatus</i></li> <li>European shag <i>Phalacrocorax aristotelis</i></li> <li>Seabird assemblage</li> </ul>	<ul style="list-style-type: none"> <li>Recreational disturbance</li> <li>Visual and noise disturbance</li> <li>Marine consents and permits</li> <li>Fisheries: Commercial marine and estuarine</li> <li>Water pollution</li> </ul>	<p>Yes –bird species present throughout the year, likely foraging, preening or loafing in marine waters around the marine installation corridor.</p> <p>Seabirds can travel very long distances to forage from their colonies. Kittiwake can routinely travel over 100 km from their colonies to forage. For seabirds JNCC advises that the mean maximum foraging range + 1 standard deviation should be applied for the purposes of defining functional linkage.</p>	Included
St Abb's Head to Fast Castle SAC	2 km to the south-west	<ul style="list-style-type: none"> <li>Vegetated sea cliffs of the Atlantic &amp; Baltic coasts</li> </ul>	<ul style="list-style-type: none"> <li>Trampling damage</li> <li>Air quality</li> </ul>	No – no connection to the Project	Excluded
Berwickshire and North Northumberland Coast SAC (Scotland / England)	563 m to the south-west	<ul style="list-style-type: none"> <li>Mudflats and sandflats not covered by seawater at low tide</li> <li>Large shallow inlets and bays</li> <li>Reefs</li> <li>Submerged or partially submerged sea caves</li> <li>Grey seal <i>Halichoerus grypus</i></li> </ul>	<ul style="list-style-type: none"> <li>Abrasion to reefs and other SAC habitats</li> <li>Sediment displacement and increased turbidity</li> <li>Public access / disturbance</li> <li>Water pollution</li> <li>Changes in species distributions</li> <li>Coastal squeeze</li> <li>Transportation and service corridors</li> </ul>	<p>Yes (SAC Species) – mobile grey seal present within the SAC, likely using waters around the marine installation corridor as these overlap with the marine mammal Management Unit in which the SAC lies.</p> <p>No (SAC Habitats) – No connection to the Project</p>	Included

European site (Country)	Approx. distance from marine installation corridor	Qualifying species/habitats	Threats and pressures to site integrity	Likely connection to impact pathways from Eastern Link 1	Included or Excluded for assessment (test of likely significant effects)
			<ul style="list-style-type: none"> <li>Air pollution: Risk of atmospheric nitrogen deposition</li> <li>Fisheries: Commercial marine and estuarine</li> </ul>		
Tweed Estuary SAC (England)	12 km to the west	<ul style="list-style-type: none"> <li>Estuaries</li> <li>Mudflats and sandflats not covered by seawater at low tide</li> <li>Sea lamprey <i>Petromyzon marinus</i></li> <li>River lamprey <i>Lampetra fluviatilis</i></li> </ul>	<ul style="list-style-type: none"> <li>Abrasion to reefs and other SAC habitats</li> <li>Sediment displacement and increased turbidity</li> <li>Public access / disturbance</li> <li>Water pollution</li> <li>Changes in species distributions</li> <li>Coastal squeeze</li> <li>Transportation and service corridors</li> <li>Air pollution: Risk of atmospheric nitrogen deposition</li> <li>Fisheries: Commercial marine and estuarine</li> </ul>	<p>Yes (SAC Species) – migratory sea lamprey and Atlantic salmon present within the SAC, likely also using marine waters around the marine installation corridor.</p> <p>No (SAC Habitats) – unlikely to be affected due to the distance to the marine installation corridor.</p>	Included
River Tweed SAC (England)	9 km from the marine installation corridor	<ul style="list-style-type: none"> <li>Watercourses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation</li> <li>Atlantic salmon <i>Salmo salar</i></li> <li>Sea lamprey <i>Petromyzon marinus</i></li> <li>River lamprey <i>Lampetra fluviatilis</i></li> <li>Brook lamprey <i>Lampetra planeri</i></li> </ul>	<ul style="list-style-type: none"> <li>Sediment displacement and increased turbidity</li> <li>Water pollution</li> <li>Changes in species distributions</li> <li>Fisheries: Commercial marine and estuarine</li> </ul>	No (SAC Habitats) – unlikely to be affected due to the distance to the marine installation corridor.	Included

European site (Country)	Approx. distance from marine installation corridor	Qualifying species/habitats	Threats and pressures to site integrity	Likely connection to impact pathways from Eastern Link 1	Included or Excluded for assessment (test of likely significant effects)
Northumberland Marine SPA (England)	The cable runs through this marine SPA for a distance of approx. 6.3 km	<ul style="list-style-type: none"> <li>Arctic tern <i>Sterna paradisaea</i></li> <li>Common tern <i>Sterna hirundo</i></li> <li>Guillemot <i>Uria aalge</i></li> <li>Little tern <i>Sternula albifrons</i></li> <li>Atlantic puffin <i>Fratercula arctica</i></li> <li>Roseate tern <i>Sterna dougallii</i></li> <li>Sandwich tern <i>Sterna sandvicensis</i></li> <li>Seabird assemblage</li> </ul>	<ul style="list-style-type: none"> <li>Recreational disturbance</li> <li>Visual and noise disturbance</li> <li>Marine consents and permits</li> <li>Fisheries: Commercial marine and estuarine</li> <li>Water pollution</li> </ul>	<p>Yes – mobile bird species present during the breeding season, likely foraging, preening or loafing in marine waters around the marine installation corridor.</p> <p>Seabirds can travel very long distances to forage from their colonies. Puffin can routinely travel over 200 km to forage. For seabirds JNCC advises that the mean maximum foraging range + 1 standard deviation should be applied for the purposes of defining functional linkage.</p>	Included
Lindisfarne SPA / Ramsar (England)	9.2 km to the south-east	<ul style="list-style-type: none"> <li>Bar-tailed godwit <i>Limosa lapponica</i></li> <li>Common scoter <i>Melanitta nigra</i></li> <li>Dunlin <i>Calidris alpina alpina</i></li> <li>Eider <i>Somateria mollissima</i></li> <li>Golden plover <i>Pluvialis apricaria</i></li> <li>Grey plover <i>Pluvialis squatarola</i></li> <li>Greylag goose <i>Anser anser</i></li> <li>Light-bellied brent goose <i>Branta bernicla hrota</i></li> <li>Little tern <i>Sternula albifrons</i></li> <li>Long-tailed duck <i>Clangula hyemalis</i></li> <li>Red-breasted merganser <i>Mergus serrator</i></li> <li>Redshank <i>Tringa totanus</i></li> <li>Ringed plover <i>Charadrius hiaticula</i></li> </ul>	<ul style="list-style-type: none"> <li>Sediment displacement and increased turbidity</li> <li>Public access / disturbance</li> <li>Water pollution</li> <li>Changes in species distributions</li> <li>Coastal squeeze</li> <li>Transportation and service corridors</li> <li>Air pollution: Risk of atmospheric nitrogen deposition</li> <li>Fisheries: Commercial marine and estuarine</li> </ul>	<p>Yes – some of the qualifying bird species (present throughout the year) forage in the marine water column; some sea ducks will utilise marine waters far from the SPA / Ramsar.</p>	Included

European site (Country)	Approx. distance from marine installation corridor	Qualifying species/habitats	Threats and pressures to site integrity	Likely connection to impact pathways from Eastern Link 1	Included or Excluded for assessment (test of likely significant effects)
		<ul style="list-style-type: none"> <li>Roseate tern <i>Sterna dougallii</i></li> <li>Sanderling <i>Calidris alba</i></li> <li>Shelduck <i>Tadorna tadorna</i></li> <li>Whooper swan <i>Cygnus cygnus</i></li> <li>Wigeon <i>Anas penelope</i></li> <li>Pink-footed goose <i>Anser brachyrhynchus</i></li> <li>Seabird assemblage</li> <li>Extensive intertidal flats, large area of saltmarsh and a major sand dune system</li> </ul>			
Northumbria Coast SPA / Ramsar (England)	421 m to the north of the proposed landfall site near Seaham	<ul style="list-style-type: none"> <li>Arctic tern <i>Sterna paradisaea</i></li> <li>Little tern <i>Sterna albibrons</i></li> <li>Purple sandpiper <i>Calidris maritima</i></li> <li>Turnstone <i>Arenaria interpres</i></li> </ul>	<ul style="list-style-type: none"> <li>Sediment displacement and increased turbidity</li> <li>Public access / disturbance</li> <li>Water pollution</li> <li>Changes in species distributions</li> <li>Coastal squeeze</li> <li>Transportation and service corridors</li> <li>Air pollution: Risk of atmospheric nitrogen deposition</li> <li>Fisheries: Commercial marine and estuarine</li> </ul>	Yes – mobile bird species present during the breeding season (terns) and the overwintering period. While the little tern and Arctic tern are restricted to known breeding locations (Long Nanny), parts of the SPA / Ramsar lie near the proposed landfall site north of Seaham (potential disturbance to foraging purple sandpiper and turnstone)	Included
Durham Coast SAC	421 m to the north of the English landfall	<ul style="list-style-type: none"> <li>Vegetated sea cliffs</li> </ul>	<ul style="list-style-type: none"> <li>Air pollution: Risk of atmospheric nitrogen deposition</li> <li>Recreational trampling</li> </ul>	No – No connection to the Project	Excluded
Farne Islands SPA (England)	Closest island (Knivestone) 7.1 km to the south-west	<ul style="list-style-type: none"> <li>Arctic tern <i>Sterna paradisaea</i></li> <li>Common tern <i>Sterna hirundo</i></li> <li>Guillemot <i>Uria aalge</i></li> </ul>	<ul style="list-style-type: none"> <li>Sediment displacement and increased turbidity</li> <li>Public access / disturbance</li> </ul>	Yes – mobile bird species present during the breeding season, likely foraging, preening or loafing in marine	Included



European site (Country)	Approx. distance from marine installation corridor	Qualifying species/habitats	Threats and pressures to site integrity	Likely connection to impact pathways from Eastern Link 1	Included or Excluded for assessment (test of likely significant effects)
		<ul style="list-style-type: none"> <li>Roseate tern <i>Sterna dougallii</i></li> <li>Sandwich tern <i>Sterna sandvicensis</i></li> <li>Seabird assemblage</li> </ul>	<ul style="list-style-type: none"> <li>Water pollution</li> <li>Changes in species distributions</li> <li>Coastal squeeze</li> <li>Transportation and service corridors</li> <li>Air pollution: Risk of atmospheric nitrogen deposition</li> <li>Fisheries: Commercial marine and estuarine</li> </ul>	<p>waters around the marine installation corridor.</p> <p>Seabirds like guillemot can routinely travel over 100 km to forage from their colonies depending on species. For seabirds JNCC advises that the mean maximum foraging range + 1 standard deviation should be applied for the purposes of defining functional linkage.</p>	
Coquet Island SPA (England)	14.6 km to the west	<ul style="list-style-type: none"> <li>Arctic tern <i>Sterna paradis</i></li> <li>Common tern <i>Sterna hirundo</i></li> <li>Roseate tern <i>Sterna dougallii</i></li> <li>Sandwich tern <i>Sterna sandvicensis</i></li> <li>Seabird assemblage</li> </ul>	<ul style="list-style-type: none"> <li>Sediment displacement and increased turbidity</li> <li>Public access / disturbance</li> <li>Water pollution</li> <li>Changes in species distributions</li> <li>Coastal squeeze</li> <li>Transportation and service corridors</li> <li>Air pollution: Risk of atmospheric nitrogen deposition</li> <li>Fisheries: Commercial marine and estuarine</li> </ul>	Yes – mobile bird species present during the breeding season, likely foraging, preening or loafing in marine waters around the marine installation corridor.	Included
Southern North Sea SAC (England)	>100 km to the east	<ul style="list-style-type: none"> <li>Harbour porpoise <i>Phocoena phocoena</i></li> </ul>	<ul style="list-style-type: none"> <li>Visual and noise disturbance</li> <li>Marine consents and permits</li> <li>Fisheries: Commercial marine and estuarine</li> <li>Water pollution</li> </ul>	Yes – harbour porpoise are mobile cetaceans that may use the marine waters around the marine installation corridor for foraging as the SAC and potential Marine Working Area are in the same marine mammal Management Unit. Moreover, works can affect marine mammals at significant distances. JNCC advises	Included

European site (Country)	Approx. distance from marine installation corridor	Qualifying species/habitats	Threats and pressures to site integrity	Likely connection to impact pathways from Eastern Link 1	Included or Excluded for assessment (test of likely significant effects)
				that underwater noise can cause significant effects up to 50km distant.	
Dogger Bank SAC (England)	>100 km to the east	<ul style="list-style-type: none"> <li>Sandbanks which are slightly covered by sea water all the time</li> </ul>	<ul style="list-style-type: none"> <li>Abrasion to sandbanks</li> <li>Sediment displacement and increased turbidity</li> <li>Transportation and service corridors</li> </ul>	No – the SAC lies over 100 km from the marine installation corridor and is not designated for mobile qualifying species	Excluded

## 4.2.1 Breeding seabirds associated with European sites

### 4.2.1.1 Foraging distances

The Marine Scheme is in waters that may be used by foraging seabirds from the designated sites listed above and shown in Table 4-1. The mean maximum breeding season foraging ranges of seabirds that are qualifying features of these designated sites are presented in Table 4-2 (Woodward, et al., 2019). JNCC advise (e.g. MMO, (2020)) that the mean maximum foraging distance plus one standard deviation should be used e.g. 57.5 km for Sandwich tern, when defining functionally linked habitat for seabirds.

**Table 4-2: Indicative breeding season foraging ranges for qualifying bird species designated for their breeding population.**

Qualifying Bird Species	Mean Maximum Foraging Range (km $\pm$ SD) (Woodward, et al., 2019)
Arctic tern	25.7 $\pm$ 14.8
Puffin	137.1 $\pm$ 128.3
Black-headed gull	18.5
Kittiwake	156.1 $\pm$ 144.5
Guillemot	73.2 $\pm$ 80.5
Common gull	50
Common tern	18.0 $\pm$ 8.9
Shag	13.2 $\pm$ 10.5
Herring gull	58.8 $\pm$ 26.8
Little tern	5
Manx shearwater	1,346.8 $\pm$ 1,018.7
Gannet	315.2 $\pm$ 194.2
Razorbill	88.7 $\pm$ 75.9
Roseate tern	12.6 $\pm$ 10.6
Sandwich tern	34.3 $\pm$ 23.2

It is recognised that seabirds from other SPA colonies may also occur in the footprint of the Marine Scheme, particularly those with extensive foraging ranges, e.g., Manx shearwater and gannet, or out with the breeding period. However, it is not possible to determine which designated sites these birds may originate from and evidence from studies suggest foraging densities of Manx shearwater to be low in the North Sea (Stone, et al., 1994) and overall, foraging density of gannet declines with distance from the colony (Camphuysen, 2011).

### 4.2.1.2 Breeding ecology

The breeding season for seabirds varies between species but broadly extends between April and August, with the core breeding period between May and July, during which time their distribution offshore is constrained by the requirement to return to their breeding sites. Following breeding, seabirds disperse away from their colonies to their wintering areas; for example, they may travel west into the Atlantic or east into the North Sea. Some species such as guillemot and razorbill disperse from the colonies during July and August forming rafts. Adults become flightless during their post-breeding moult

and the males are accompanied by flightless chicks. The highest numbers of flightless birds initially occur near the breeding colonies during July and early August.

#### 4.2.1.3 Relevant European Sites and qualifying seabird species

The Outer Firth of Forth and St Andrews Bay Complex SPA has the largest concentration of common tern in Scotland and during the breeding season it provides feeding grounds for a large assemblage of over 100,000 seabirds, including common tern and Arctic tern. Within the Outer Firth of Forth and St Andrews Bay Complex SPA breeding colonies for Arctic tern and common tern exist on the Isle of May (for Arctic Tern) and Long Craig (for both Arctic tern and common tern). Foraging areas for the breeding colony of these species were modelled to inform the extension of the SPA boundary in marine areas to protect key foraging areas (Wilson, et al., 2014). The predicted usage was greatest in the vicinity of the common tern and Arctic tern colonies, with usage predicted to decrease with distance offshore. However, the study area overlaps the outer extents of the potential foraging range for both Arctic and common tern associated with the Outer Firth of Forth and St Andrews Bay Complex SPA (see EAR Volume 2 Chapter 11: Ornithology for further details).

The Northumberland Marine SPA supports important foraging areas for breeding populations of Arctic tern, common tern, little tern, roseate tern and Sandwich tern associated with the Lindisfarne SPA, Farne Islands SPA and Croquet Island SPA. The overall boundary of the Northumberland Marine SPA encompasses these existing SPAs.

Foraging areas for the breeding colony of Arctic tern, common tern and Sandwich tern were modelled to inform the extension of the Farne Islands SPA boundary in marine areas to protect key foraging areas. The predicted usage for Arctic tern, common tern and Sandwich tern was greatest in the vicinity of the colony, with usage predicted to decrease with distance offshore (Wilson, et al., 2014), however, the Marine Scheme does overlap with the extremities of the predicted foraging areas of Arctic tern, common tern and Sandwich tern associated with the Farne Islands SPA, and subsequently the Northumberland Marine SPA.

Shore-based surveys of little tern SPA colonies within several SPAs along the Northumbria coast including the Northumbria Coast SPA and Lindisfarne SPA, were undertaken to inform the extension of these SPAs to protect tern foraging areas. A specific foraging extent for the Northumberland Marine SPA as a whole is not currently available however, the alongshore and seaward foraging extents and values for Northumbria Coast SPA and Lindisfarne SPA show that they do not extend to the Marine Scheme.

A summary of foraging seabirds associated with the European sites identified in Table 4-2 and likely to be present within the Marine Scheme during the breeding season is provided in Table 4-3 below.

**Table 4-3: Presence and seasonal distribution of seabirds associated with designated sites within the Marine Scheme during the breeding season**

Qualifying species	Summary of qualifying species	Presence in the Marine Scheme
Puffin	Within the Firth of Forth the species is concentrated around the Isle of May, with foraging extending west into the Firth of Forth, north to St Andrews Bay and east into the North Sea (SNH & JNCC, 2016). The largest puffin colony in England is on the Farne Islands and while the Coquet Island SPA is not designated for puffin, this island now holds the second largest colony in England. Puffin feed primarily on small pelagic fish around 2 to 6 inches long (e.g., sandeel <i>Ammodytidae</i> , sprat <i>Sprattus sprattus</i> , and herring <i>Clupea harengus</i> ). During the breeding season, they forage in shallow waters close to the breeding colony.	The marine installation corridor does not represent key foraging areas for puffin, although the foraging distances for the species could potentially mean that the species does occur, particularly where the marine installation corridor overlaps with the Outer Firth of Forth and St Andrews Bay Complex SPA and Northumberland Marine SPA. However, numbers are likely to be low and occurrence sporadic. The breeding season is between April and late July with the peak breeding activity being in May and June, with numbers declining from July onwards as nest sites are abandoned. Highest numbers present close to nesting colonies.
Kittiwake	Kittiwake is a qualifying feature of the St Abb's Head to Fast Head SPA, as well as	Kittiwake are likely to be present throughout the marine installation corridor, albeit, likely in low

Qualifying species	Summary of qualifying species	Presence in the Marine Scheme
	<p>part of the seabird assemblage for the Farne Islands SPA and Coquet Island SPA where they nest on sea cliffs. Smaller colonies are also present at other locations, e.g., along the River Tyne. The species forages widely throughout the Outer Firth of Forth and St Andrews Bay Complex SPA and Northumberland Marine SPA (SNH &amp; JNCC, 2016, NE, 2015).</p> <p>Prey species include capelin <i>Mallotus villosus</i>, herring, sprat and sand eel and kittiwake have been known to take crustaceans such as shrimps.</p>	<p>numbers. The areas where there may be more frequent occurrence are sections of the marine installation corridor which run closer to nesting colonies, such as St Abb's Head and the Farne Islands and Coquet Island.</p> <p>Widely distributed throughout the study area all year, but particularly between May and August.</p>
Guillemot	<p>The largest colonies of over 10,000 individuals are found from Northumberland and northwards up the east coast of Scotland, with important in the Firth of Forth, St Abb's Head and the Farne Islands (SNH &amp; JNCC, 2016, NE, 2015).</p> <p>Prey species predominantly consist of sandeel and clupeids <i>Clupeidae</i> spp. Highest numbers recorded in the spring and early summer</p>	<p>Guillemot are likely to be present throughout the marine installation corridor, albeit, likely in low numbers. The areas where there may be more frequent occurrence are sections of the marine installation corridor which run closer to nesting colonies, such as St Abb's Head and the Farne Islands. Present from April / May with numbers declining from July onwards as nest sites are abandoned.</p>
Shag	<p>The foraging areas of breeding shag in the Outer Firth of Forth and St Andrews Bay Complex are determined by location of the breeding colonies of which the colony on the Isle of May is the largest (SNH &amp; JNCC, 2016). Although shag do forage up to a maximum of approximately 17 km from their colony (Thaxter <i>et al.</i> 2012) tracking studies of birds from the Isle of May show that these birds feed within the Firth of Forth with few moving more than 12 km (Bogdanova <i>et al.</i> 2013).</p> <p>The Farne Islands SPA also supports breeding shag, but not in sufficient numbers to meet criteria for SPA designation (NE, 2015). Studies of the foraging ecology of the Farne Islands shag colony suggest foraging generally took place within the nearshore areas and around the islands (Morgan, 2017).</p> <p>Shag are preponderantly benthic feeders (i.e., they find their prey on the sea bottom). They eat a wide range of fish but their primary food source is sandeel.</p>	<p>The section of the Outer Firth of Forth and St Andrews Bay Complex SPA which overlaps the marine installation corridor is outside the core areas which are understood to be used by foraging shag breeding in the SPA. Notwithstanding, given that the St Abb's Head to Fast Castle SPA is well within the foraging distance for the species, shag are likely to be present within the marine installation corridor, albeit in low numbers.</p> <p>Along the rest of the marine installation corridor, it is unlikely that shag are present and if they are, e.g. where the marine installation corridor overlaps the Northumberland Marine SPA, then numbers are likely to be low and occurrence sporadic.</p> <p>The species is predominantly present between November and June, although recorded throughout the year, but likely to be present in higher numbers within the study area nearest its breeding colonies.</p>
Herring gull	<p>A qualifying feature of the Outer Firth of Forth and St Andrews Bay Complex SPA in Scotland. Opportunistic feeder, taking fish, crustaceans, young birds and even garbage. Recorded throughout the year.</p>	<p>Present all year round, but likely to be present in higher numbers within the study area where it approaches coastal areas. The offshore areas of the marine installation corridor are unlikely to support significant numbers of foraging herring gull.</p>
Manx shearwater	<p>During the breeding season the Outer Firth of Forth and St. Andrews Bay Complex SPA provides foraging grounds for this species. They feed at the sea-surface, either making plunge dives from a height of 1-2 m, or making shallow, wing-propelled dives to catch prey items. Prey species include herring, sardine <i>Sardina pilchardus</i> and sprat plus sometimes squid.</p>	<p>Low numbers likely to be present throughout the study area between May and August.</p>

Qualifying species	Summary of qualifying species	Presence in the Marine Scheme
Gannet	<p>The nearest gannet colony is the Bass Rock colony located approximately 19 km north of the Marine Scheme, although small numbers (&lt;5 pairs) nest at St. Abbs Head. Recent surveys carried out on this colony showed that gannets dispersed widely around the Bass Rock colony to forage, with high densities concentrated in the outermost Firth of Forth, including the south-eastern boundary of the Outer Firth of Forth and St. Andrews Bay Complex SPA, where the marine installation corridor overlaps the SPA boundary. Lower densities were recorded over vast areas 100–450 km from Bass Rock (SNH &amp; JNCC, 2016). The majority of gannet recorded during the surveys were during the summer (June - August) (Camphuysen, 2011).</p> <p>Gannet are pelagic feeders, foraging primarily on lipid-rich pelagic fish up to 30 cm in length such as mackerel <i>Scomber scombrus</i>, herring and sandeel.</p>	<p>Likely to be present throughout the northern sections of marine installation corridor between April and September with highest numbers between June and August and likely only sporadic presence between October and March.</p>
Razorbill	<p>Within the Firth of Forth the species is concentrated around the Isle of May, with foraging extending west into the Firth of Forth, north to St Andrews Bay and east into the North Sea (SNH &amp; JNCC, 2016). Breeding begins in late April with a peak in mid-May. Prey species predominantly consists of sandeel. Highest numbers recorded in the spring and early summer. They feed mainly on small fish (e.g. sandeel, herring, sprat, cod <i>Gadus morhua</i>)</p>	<p>The marine installation corridor does not represent key foraging areas for razorbill, although the foraging distances for the species could potentially mean that the species does occur, particularly where the marine installation corridor overlaps with the Outer Firth of Forth and St Andrews Bay Complex SPA and Northumberland Marine SPA. However, numbers are likely to be low and occurrence sporadic.</p>

## 4.2.2 Non-breeding seabirds and waterbirds associated with European sites

Red-throated diver and Slavonian grebe are Annex I species designated as qualifying species of the Outer Firth of Forth and St Andrews Bay Complex SPA which overlaps with the northern section of the marine installation corridor, east of the landfall at Thorntonloch. Red-throated diver and other migratory non-breeding waterbirds protected as qualifying features for this site, such as eider, common scoter, red-breasted merganser and little gull move to coastal areas in winter from their breeding sites.

Red-throated diver, Slavonian grebe and red-breasted merganser feed on a wide variety of fish, which they catch by diving from the surface and pursuing their prey underwater. Little gull feed by picking up food off the water surface, by plunging into the water to catch their prey and / or wading in the shallow water. The fish species taken by these bird species will be influenced by what is locally most readily available, but the diet of these species can include haddock *Melanogrammus aeglefinus*, cod, herring, sprat and gurnard *Eutrigla gurnardus* along with smaller species such as sandeels, pipefish *Syngathidae*, gobies *Gobiidae*, flatfish *Pleuronectidae* and butterfish *Pholis gunnellus*. Common scoter and eider feed almost exclusively on molluscs and small crustaceans, diving from the surface to pluck their prey from the seabed. Diving activity varies among species, but average foraging dive depths are shallower than 15 m.

Red-throated diver arrive in UK coastal waters in September, however the main period of occurrence in coastal offshore waters is from October to March (Natural England, 2016). Red-throated diver, along with eider, common scoter and red-breasted merganser, are associated with inshore waters, occurring in sandy bays, firths, and sea lochs, as well as open coastline and shallow offshore areas such as sandbanks. Aerial surveys used to assess populations of waterbirds in association with the Outer Firth of Forth and St Andrews Bay Complex SPA, showed that the highest densities of red-throated Diver

were concentrated around the Firth of Tay estuary with the inshore waters surrounding the Firth of Forth estuary area also supporting high densities of this species (Natural England, 2016). The remaining coast and waters further offshore, had very low densities of red-throated diver, close to or equal to 0 individuals / km<sup>2</sup>.

Slavonian grebe arrive in UK waters in March and within the Outer Firth of Forth and St Andrews Bay Complex SPA, peak numbers are present between January and March (Evans, 2000). Shore-based surveys show that the Outer Firth of Forth and St Andrews Bay Complex SPA supports one of only two notable concentrations of Slavonian grebe in the east of Scotland (an average of 30 birds) (Natural England, 2016). They occurred in both of the major estuaries of the Firths (Natural England, 2016) but were far more abundant in the Forth. The largest known wintering population of little gull in Scotland is in the Outer Firth of Forth and St Andrews Bay Complex SPA. This little gull population was recorded in large numbers (over 300 individuals) during aerial surveys for wintering waterfowl (2003-2004) with the highest density of this species located in the central Firth of Forth, outside of the study area (Natural England, 2016).

Shore based counts have shown that the Outer Firth of Forth and St Andrews Bay Complex SPA supports one of only two large (>1,500 birds) common scoter populations on the east coast of Scotland and it is also one of the most important sites for red-breasted merganser, velvet scoter and goldeneye in Great Britain.

The highest densities of common scoter, red-breasted merganser and velvet scoter are concentrated around the St. Andrews Bay, with the inshore waters of the Firth of Forth estuary also supporting high densities of these species (including goldeneye), however the areas where high densities of these species occur do not extend into the study area (Natural England, 2016).

Marine surveys showed that during the non-breeding season guillemot were found throughout the North Sea although there was a clear abundance offshore of the large Scottish east coast colonies from the Scottish Borders to Caithness. During winter a regular aggregation of guillemot (more than 2,000 individuals) occurs in much the same areas of the Outer Firth of Forth and St Andrews Bay Complex SPA as gannet and puffin during the breeding season and this non-breeding population therefore extends into the Survey Area (Natural England, 2016).

The presence of non-breeding birds associated with designated sites within the Marine Scheme is summarised in Table 4-4 below.

**Table 4-4: Summary of the presence and distribution of ornithological receptors within the study area during the non-breeding season**

Qualifying species	Summary of qualifying species	Presence in the Marine Scheme
Red-throated diver	Within the Outer Firth of Forth and St Andrews Bay Complex SPA the species is concentrated around the Firth of Tay estuary and the inshore waters of the Firth of Forth estuary (SNH & JNCC, 2016).	The marine installation corridor does not represent key foraging areas for overwintering red-throated diver, with the species favouring the shallower waters of the inner Firth of Forth and Firth of Tay and not noted in significant numbers elsewhere along the marine installation corridor.
Slavonian grebe	Within the Outer Firth of Forth and St Andrews Bay Complex SPA the species is concentrated around the inshore waters of the Firth of Forth estuary (SNH & JNCC, 2016).	The marine installation corridor does not represent key foraging areas for overwintering Slavonian grebe, with the species favouring the coastal waters of the inner Firth of Forth and not noted in significant numbers elsewhere along the marine installation corridor.
Eider	Within the Outer Firth of Forth and St Andrews Bay Complex SPA the species is concentrated around the Firth of Tay estuary and the inshore waters of the Firth of Forth estuary (SNH & JNCC, 2016).	The marine installation corridor does not represent key foraging areas for non-breeding eider, with the species favouring the coastal waters of the inner Firth of Forth and Firth of Tay. Eider are not noted in significant numbers elsewhere along the marine installation corridor.
Long-tailed duck	Within the Outer Firth of Forth and St Andrews Bay Complex SPA the species is concentrated around the Firth of Tay	The marine installation corridor does not represent key foraging areas for overwintering long-tailed duck, with the species favouring the



Qualifying species	Summary of qualifying species	Presence in the Marine Scheme
	estuary and the inshore waters of the Firth of Forth estuary (SNH & JNCC, 2016).	coastal waters of the inner Firth of Forth and Firth of Tay. Long-tailed duck are not noted in significant numbers elsewhere along the marine installation corridor.
Common scoter	Within the Outer Firth of Forth and St Andrews Bay Complex SPA the species is concentrated around the Firth of Tay estuary and the inshore waters of the Firth of Forth estuary (SNH & JNCC, 2016).	The marine installation corridor does not represent key foraging areas for overwintering common scoter, with the species favouring the coastal waters of the inner Firth of Forth and Firth of Tay. Common scoter are not noted in significant numbers elsewhere along the marine installation corridor.
Velvet scoter	Within the Outer Firth of Forth and St Andrews Bay Complex SPA the species is concentrated around the Firth of Tay estuary and the inshore waters of the Firth of Forth estuary (SNH & JNCC, 2016).	The marine installation corridor does not represent key foraging areas for overwintering velvet scoter, with the species favouring the coastal waters of the inner Firth of Forth and Firth of Tay. Velvet scoter are not noted in significant numbers elsewhere along the marine installation corridor.
Goldeneye	Within the Outer Firth of Forth and St Andrews Bay Complex SPA the species is concentrated around the inshore waters of the Firth of Forth estuary (SNH & JNCC, 2016).	The marine installation corridor does not represent key foraging areas for overwintering goldeneye, with the species favouring the coastal waters of the inner Firth of Forth and Firth of Tay. Goldeneye are not noted in significant numbers elsewhere along the marine installation corridor.
Red-breasted merganser	Within the Outer Firth of Forth and St Andrews Bay Complex SPA the species is concentrated around the Firth of Tay estuary and the inshore waters of the Firth of Forth estuary (SNH & JNCC, 2016).	The marine installation corridor does not represent key foraging areas for overwintering red-breasted merganser, with the species favouring the coastal waters of the inner Firth of Forth and Firth of Tay. Red-breasted merganser are not noted in significant numbers elsewhere along the marine installation corridor.
Little gull	Within the Outer Firth of Forth and St Andrews Bay Complex SPA the species is concentrated in the central Firth of Forth estuary (SNH & JNCC, 2016).	The marine installation corridor does not represent key foraging areas for overwintering little gull, with the species favouring the central Firth of Forth. Little gull are not noted in significant numbers elsewhere along the marine installation corridor.
Non-breeding seabirds, including guillemot, gulls and other auks	Widely distributed throughout the Outer Firth of Forth and St Andrews Bay Complex SPA, but with concentrating overlapping with the waterbirds listed above.	The marine installation corridor is unlikely to represent key foraging areas for the non-breeding seabirds, but low numbers are likely to be encountered sporadically across the marine installation corridor.

## 4.3 In-combination Scope

It is a requirement of Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (as amended) and Regulation 28 of The Conservation of Offshore Marine Habitats and Species Regulations 2017, to not only assess the impacts of a development project alone, but also to investigate whether there might be 'in-combination' effects with other projects or plans. In practice, such an 'in-combination' assessment is of greatest relevance when an impact pathway relating to a project would otherwise be screened out because it is considered not to result in likely significant effects.

For the purposes of this HRA, several projects still in the planning stage, which may act in-combination with the Marine Scheme have been identified (See EAR Volume 2 Chapter 16: Cumulative and In-Combination Effects). These are the projects that have been identified as having potential impact pathways to the same European sites as those identified for the Marine Scheme:

- Scotland to England Green Link (SEGL), Eastern Link (EL) 1 – English Onshore Scheme;
- Scotland to England Green Link (SEGL), Eastern Link (EL) 1 – Scottish Onshore Scheme;
- Berwick Bank Offshore Wind Farm (Export cable only);
- Blyth Offshore Demonstrator Array 4 (Phase 2);
- Havhingsten Segment 2.1 South; and
- Dunbar East Beach Sea Defence.

## 5. Test of Likely Significant Effects

### 5.1 Introduction

This first stage of the HRA is essentially a high-level risk assessment to decide whether an Appropriate Assessment is required. It provides an overview of the potential impacts and effects, that may occur during Marine Scheme project phases, and associated Zols. The essential question is:

- Is the project, either alone or in-combination with other relevant projects and plans, likely to result in a significant effect upon any European site?

European designated sites considered within this section are those with qualifying features that fall within or utilise the area within (i.e., foraging ranges/ migration) the Zol of Project related activities, for which LSE could not be ruled out

### 5.2 Impact Pathways

Table 5-1 below provides an overview of the most likely impact pathways associated with the installation and operation of the Marine Scheme. The HRA has been informed by other recent development and consenting data, as required, as well as published academic research articles (e.g., see Taormina et al., 2018 for a thorough review of the ecological effects of submarine power cables<sup>3</sup>).

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<sup>3</sup> Taormina B., Bald J., Want A., Thouzeau G., Lejart M., Desroy N. & Carlier A. (2018). A review of potential impacts of submarine power cables on the marine environment: Knowledge gaps, recommendations and future directions. *Renewable and Sustainable Energy Reviews* **96**: 380-391.

**Table 5-1: Likely impact pathways associated with the installation and operation of the Marine Scheme**

Stage of Development	Impact Pathways	Details	Zone of Influence (Zol)	Potentially Impacted European Sites
Installation	Disturbance and habitat loss	There will be direct temporary disturbance along the 176 km of subsea cable burial, although this effect will not occur along the entire length of the cable at the same time. Rock placement will be required in locations where the target burial depth cannot be achieved and at cable crossings. The installation of rock placement will result in a loss of benthic habitat.	50 m width along the full length of the marine installation corridor during pre-installation activities, 30 m during cable installation.  Full details are presented in EAR Volume 2 Chapter 2: Project Description.	<ul style="list-style-type: none"> <li>Outer Firth of Forth and St Andrews Bay Complex SPA</li> <li>Northumberland Marine SPA</li> </ul>
	Sound and visual disturbance to birds, and disturbance to marine mammals and fish from underwater sound	Regardless of the installation method used, visual and sound (airborne and underwater) disturbance will occur within designated sites (see above) and areas that are functionally linked to noise. Sound disturbance from subsea cable installations is significantly lower than from other anthropogenic sources (sonar, impact piling or explosions). Notwithstanding this, any noise impacts will require detailed consideration.	<p>For most seabirds, airborne sound and visual disturbance can displace birds at up to 2 km from the development, with divers and sea ducks more sensitive, with displacement at up to 4 km (See EAR Volume 2 Chapter 11: Ornithology).</p> <p>For underwater sound, the Zol is defined by the effective disturbance range (EDR) for marine mammals (See EAR Volume 2 Chapter 10: Marine Mammals) which is 5 km.</p>	<ul style="list-style-type: none"> <li>Moray Firth SAC</li> <li>Outer Firth of Forth and St Andrews Bay Complex SPA</li> <li>Northumberland Marine SPA</li> <li>St Abb's Head to Fast Castle SPA</li> <li>Berwickshire and North Northumberland Coast SAC</li> <li>Tweed Estuary SAC</li> <li>Lindisfarne SPA / Ramsar</li> <li>Northumbria Coast SPA / Ramsar</li> <li>Farne Islands SPA</li> <li>Coquet Island SPA</li> <li>Southern North Sea SAC</li> </ul>
	Sediment disturbance/resuspension of sediment	Depending on the nature of the seabed, sediment reworking through ploughing or jetting can lead to turbid plumes, which can persist several hours to days depending upon the particle sizes. While this effect may impede predators that hunt visually (e.g., seabirds and grey seal), such effects are likely to be localised and transient.	1.4 km is expected to be the maximum distance at which increased Suspended Sediment Concentration (SSC) are likely to have a significant impact. Coarse sand is likely to travel no more than 200 m, therefore remaining within the marine installation corridor (500 m wide). Fine sands and silts will however, likely be transported beyond the marine installation corridor, with any fine sand	<ul style="list-style-type: none"> <li>Outer Firth of Forth and St Andrews Bay Complex SPA</li> <li>Northumberland Marine SPA</li> <li>St Abb's Head to Fast Castle SPA</li> <li>Berwickshire and North Northumberland Coast SAC</li> </ul>

Stage of Development	Impact Pathways	Details	Zone of Influence (Zol)	Potentially Impacted European Sites
			settling on the seabed up to 1.4 km from the point where it is mobilised.  Full details are presented in EAR Volume 2 Chapter 7: Physical Environment.	
	Water quality	During construction there is a risk of resuspension of buried contaminants (e.g., heavy metals, hydrocarbons) into the surrounding water column. Furthermore, there is a potential for accidental oil leakages / spillages from ships and hydraulic equipment involved in cable laying. HDD uses drilling fluid to suspend rock cuttings and carry them out of the borehole. The drilling fluid used will be biodegradable and selected from the Centre from Environment, Fisheries, and Aquaculture Science (Cefas) approved list of drilling fluids to ensure no harmful effect on the surrounding environment.	Footprint of the proposed works plus 700 m buffer; based on professional judgement and consideration of worst-case.  Full details are presented in EAR Volume 2 Chapter 7: Physical Environment.	<ul style="list-style-type: none"> <li>Outer Firth of Forth and St Andrews Bay Complex SPA</li> <li>Northumberland Marine SPA</li> <li>St Abb's Head to Fast Castle SPA</li> <li>Berwickshire and North Northumberland Coast SAC</li> </ul>
Operation	Electromagnetic field (EMF) impacts	EMF can affect certain species of fish and marine mammals. For example, magnetic fields have been observed to reduce swimming speed in European eel <i>Anguilla Anguilla</i> in some circumstances (Orpwood, et al., 2015).	Modelling completed for the Marine Scheme indicate that EMF from a 30 m separated bipole configuration, buried at a depth of 1 m reduces to background levels at a distance of between 5 and 10 m from the cable, both vertically and horizontally.	<ul style="list-style-type: none"> <li>Berwickshire and North Northumberland Coast SAC</li> <li>River Tweed SAC</li> <li>Tweed Estuary SAC</li> <li>Southern North Sea SAC</li> <li>Outer Firth of Forth &amp; St Andrews Bay Complex SPA</li> <li>Northumberland Marine SPA</li> </ul>
	Cable heat emission	The transport of electricity will lead to an increase in temperature at the cable surface, potentially warming the surrounding water and sediment in direct contact with the cable. Heat dissipation modelling for bundled cables buried at a depth of 1.5 m indicates that within 50 cm of the seabed surface the increase in sediment temperature is limited to approximately 3°C (Chapter 8: Benthic Ecology) which has been calculated based upon a maximum seabed ambient surface sediment temperature of 15°C (Chapter 2: Project Description). However, this warming effect is	From sheath of the cable to tens of centimetres distance (depending on voltage of the HVDC cable)	<ul style="list-style-type: none"> <li>Outer Firth of Forth &amp; St Andrews Bay Complex SPA</li> <li>Northumberland Marine SPA</li> </ul>

Stage of Development	Impact Pathways	Details	Zone of Influence (Zol)	Potentially Impacted European Sites
		unlikely to materially affect the water column (due to dissipation of heat from continual water flow).		

A Test of Likely Significant Effects for each impact pathway for each European site is reported in the sections below.

## 5.3 Installation Period of Marine Scheme

### 5.3.1 Disturbance and Habitat Loss

There are route preparation and cable installation activities that will temporarily disturb seabed habitats, resulting in short term physical disturbance to, and/or loss of seabed habitats, and in some instances physical damage to less mobile benthic receptors such as bivalves and other molluscs, anemones and echinoderms. These activities include cable route clearance, burial trials, and cable installation. Furthermore, rock placement will be required in locations where the target burial depth cannot be achieved and at cable crossings (EAR Volume 2 Chapter 2: Project Description). The installation of rock placement will result in a loss of benthic habitat (see EAR Volume 2 Chapter 8: Benthic Ecology).

Both the Outer Firth of Forth and St Andrews Bay Complex SPA and Northumberland Marine SPA are designated for non-breeding waterfowl and breeding and non-breeding seabirds. The marine installation corridor intercepts these designated sites between KP 1 – KP 17 (St Andrews Bay Complex SPA) and KP 66 – KP 72 (Northumberland Marine SPA).

The dominant habitat type along the marine installation corridor is sand, accounting for 70% of the total habitat, dominating the shallower areas (see EAR Volume 2 Chapter 8: Benthic Ecology) such as where the marine installation corridor intercepts St Andrews Bay Complex SPA. Communities associated with sandy sediment, particularly in shallow waters where there may be disturbance of the seabed from waves and tides, are expected to be relatively tolerant of disturbance. As sediments are displaced and backfilled there may be some direct mortality for the larger and less mobile benthic species but for many animals, displacement will be temporary, and fauna will be able to redistribute within the sediment as needed once the cable lay vessels have moved away. Recovery is expected to be relatively rapid.

There will be approximately 5.56 km of rock placement required along the section of marine installation corridor which intercepts the Outer Firth of Forth and St Andrews Bay Complex SPA. This equates to an area of 0.09 km<sup>2</sup>, which is only 0.003% of the total area of the SPA. It should be noted that the benthic habitat lost is not a qualifying feature of the SPA but supports the ornithological features for which the site is designated. This habitat loss is not considered likely to have a significant effect on fish, which are prey items for birds (See EAR Volume 2 Chapter 11: Ornithology). Therefore, this is not anticipated to affect the foraging ability of qualifying bird species, given the ample alternative habitat available within the SPA.

In deeper waters, such as where the marine installation corridor intercepts Northumberland Marine SPA, the habitats comprise mixed and coarse sediments that support benthic communities of infaunal and epifaunal species. Disturbance and mortality effects are likely to be greater in areas supporting sessile epifaunal communities as larger particles become buried and some fauna become smothered. However, a review of cable installation activities in similar habitats found habitats comprised mostly of sediments, such as subtidal sands and gravels, often recovered swiftly after disturbance, rapidly returning to pre-construction baselines and adjacent unimpacted areas (RPS, 2019).

The entire section of marine installation corridor which intercepts the Northumberland Marine SPA will require rock placement. This equates to an area of approximately 0.96 km<sup>2</sup>, which is 0.01% of the total area of the SPA. It should be noted that the benthic habitat lost is not a qualifying feature of the SPA but supports the ornithological features for which the site is designated. Given the ample alternative habitat available within the SPA, this is not considered likely to have a significant effect on fish, which are prey items for birds, nor the foraging ability of qualifying bird species.

As per Chapter 8: Benthic Ecology and Chapter 9: Fish and Shellfish Ecology of the EAR Volume 2, it has been concluded that the impact to benthic ecology and fish from disturbance to and loss of subtidal benthic habitats and species is not significant. Thus, it is not considered that the potential availability of prey items for the designated features of St Andrews Bay Complex SPA or Northumberland Marine SPA will be impacted. **Outer Firth of Forth and St. Andrews Bay Complex SPA and Northumberland Marine SPA can therefore be screened out from Appropriate Assessment on the basis that there are no likely significant effects.**



## 5.3.2 Sound & Visual Disturbance to Birds associated with European sites

Various activities associated with the route preparation and cable installation phases of the Marine Scheme may result in disturbance and displacement of ornithological receptors. The main disturbing activities are likely to be those associated with:

- Horizontal Directional Drilling (HDD) and cable pulls at the Scottish and English landfall, including the physical presence of vessels and disturbance associated with works;
- Route preparation activities, including, ploughing, de-trenching of out-of-service cables by grapnelling and rock placement; and
- Subsea cable laying including physical presence of vessels and disturbance associated with works.

The cable installation at both landfalls will be via HDD. This installation method does not require any trenching works in the intertidal zone (between MHWS and MLWS). HDD work may take up to six months to complete at each landfall, with several vessels potentially required to install the cables, including a cable laying vessel (CLV), cable laying barge (CLB), jack-up rig. Details of potential vessel resources are provided in EAR Volume 2 Chapter 2: Project Description.

Installation will be a 24-hour operation to minimise overall installation time, maximise use of fair-weather windows, and take advantage of vessel and equipment availability. The CLV and / or CLB may be supported by vessels including guard and anchor handling vessels.

Prior to installation of the cables a series of route preparation activities are likely to be undertaken. These are described in more detail in EAR Volume 2 Chapter 2: Project Description and will require the presence of vessels in the marine installation corridor.

Installation of subsea cables may utilise the following methods:

- Simultaneous cable lay and burial; and
- Surface cable lay followed by post lay burial (PLB) of the cables.

During simultaneous cable lay and burial the CLV may also deploy the burial equipment, or it may be deployed by another vessel following less than 1 km behind the CLV, creating a single large group of vessels and equipment. The vessel / vessels may move relatively slowly depending on the seabed type encountered, at speeds of between 0.5 km and 5 km per day, appearing effectively stationary.

When surface cable lay is followed by PLB of the cable, the two parts of the operation are discrete operations, separated in distance and time. There may be significant physical distance and time between the surface lay of the CLV and the following burial vessel. The CLV can progress at speeds of up to 7 km per day, with the burial vessel following behind more slowly. Further details of indicative vessel speeds are provided in EAR Volume 2 Chapter 2: Project Description.

Between two and four cable laying campaigns may be required, the duration of each related to the cable carrying capacity of the CLV or CLB, and coordination with other activities such as HDD at the landfalls. In total it is anticipated that the campaigns will consist of vessels being present for 176 days during a two-year installation period. There may be three months between installation campaigns, and campaigns will avoid the winter months.

In Scotland JNCC<sup>4</sup> highlights that, recreational activities such as wildfowling and jet-skiing are a direct threat to qualifying features within the Outer Firth of Forth and St. Andrews Bay Complex SPA and NatureScot<sup>5</sup> lists recreation and disturbance as a negative pressure upon the qualifying features of St. Abb's Head to Fast Castle SPA. The Natural England Site Improvement Plan (SIP) for the Northumberland Coast complex of sites (Natural England, 2015) highlights that several of the European sites in the complex are sensitive to public access and disturbance. At Lindisfarne SPA and Northumbria Coast SPA/Ramsar the main issues are disturbance/displacement of sensitive bird species by wildlife

<sup>4</sup> <https://jncc.gov.uk/our-work/outer-firth-of-forth-and-st-andrews-bay-complex-spa/#conservation-advice> [Accessed 18/11/2021]

<sup>5</sup> <https://sitelink.nature.scot/site/10478> [Accessed 18/11/2021]

tourism, dog walkers, light aircraft and water-sports. The Supplementary Advice for Conservation Objectives (SACO) for Lindisfarne SPA (Natural England, 2019) highlights an understanding of a disturbance effect at the site by including management strategies in the form of temporal and spatial zones for recreational activities and clearly defined bird refuge areas for qualifying species. Wildlife tourism also causes disturbance of sensitive bird species at the Farne Islands SPA and although the SACO for Coquet Island (Natural England, 2019) mentions RSPB managing visitor access by banning boats docking on the island, unauthorised access at Coquet Island SPA may still cause disturbance and displacement of sensitive bird species. The coastal sites in Scotland JNCC highlights that, recreational activities such as wildfowling and jet-skiing are a direct threat to qualifying features within the Outer Firth of Forth and St. Andrews Bay Complex SPA and NatureScot lists recreation and disturbance as a negative pressure upon the qualifying features of St. Abb's Head to Fast Castle SPA.

In addition to the coastal nesting or roosting sites, Northumberland Marine SPA is designated to protect the principal sea areas of importance which support the foraging of populations of five species of tern which breed at three coastal SPA sites along the Northumberland Coast. The marine installation corridor runs through the SPA for a distance of approximately 6.3 km.

Disturbance can lead to several physiological and behavioural responses which can affect demographic characters of the bird population. Responses to disturbance can result in loss of energy, impaired breeding, unrest through increased vigilance, disruption to incubation, and increased nest failures due to predation (due to adults leaving eggs/young more vulnerable) and nest abandonment (Valente & Fisher, 2011).

The extent to which seabirds respond to disturbance is dependent upon a number of factors including: period of breeding cycle during which disturbance occurs; duration, type and intensity of the disturbance (e.g. onshore works are likely to be more disruptive to seabirds than the offshore works due to the generation of loud noises and use of machinery); presence of opportunistic predators; and the degree of habituation with the disturbance (Showler, et al., 2010). Some seabirds are more resilient to disturbance and/or displacement than others with varying responses depending upon marine activity (MMO, 2018).

Within the marine environment the evidence base around disturbance and displacement, and subsequent guidance, has been established in relation to assessing the vulnerability of seabird populations to offshore wind farms. However, the disturbance profile of cable installation activities for the Marine Scheme are significantly different to that of an OWF, particularly in terms of vessel numbers and presence in a given area, *i.e.* cable installation vessels will be moving through the marine installation corridor and not within a fixed area. The nature of the works is also temporary and there will be no permanent infrastructure visible in the marine environment. With OWFs the potential for construction activities associated with export cable laying, namely the physical presence of the cable laying vessel(s), to lead to disturbance and displacement of more sensitive species surrounding the cable laying vessel is only considered where the export cable corridor runs through offshore areas that support higher densities of the more sensitive seabird species, typically within or surrounding SPAs, so this impact pathway is not regularly included within OWF EIAs.

For most seabirds the construction and operation of an OWF can displace birds at up to 2 km from the development, with divers and seaduck more sensitive, with displacement reported at up to 4 km (Furness and Wade (2012), Bradbury (2014), (Joint Natural England & JNCC, 2017)).

Offshore wind farm projects such as Neart na Gaoithe have used a 1 km buffer for construction activities across the wind farm and the export cable corridor (Cork Ecology, 2012). For the Marine Scheme disturbance from cable installation vessels will be less than from offshore wind farm disturbance for the reasons outlined above, and a 1 km buffer ZOI therefore represents a worst-case scenario for disturbance through visual and audible cues and any resulting displacement of bird species from the marine installation corridor during the installation phase. The seabirds associated with the designated sites set out in Table 4-2 show varying degrees of sensitivity to disturbance and displacement, with shag having the highest sensitivity, auks moderate sensitivity and gulls and gannet low sensitivity.

Onshore cable installation activities such as those associated with HDD site set up activities, HDD drilling and the cable pull site set up are over 1.8 km from the main seabird colonies associated with the St Abb's Head to Fast Castle SPA and over 80 km from the little tern colony at Long Nanny associated with Northumbria Coast SPA; a sufficient distance such that noise and visual disturbance

will not occur at nesting colonies. This is because noise attenuates by 6 dB with each doubling of distance, even the loudest construction noise i.e. impact piling at 110 dB one metre from source will attenuate below 70 dB after a few hundred metres. The 70 dB threshold has been accepted by Natural England in other areas as the minimum noise volume to cause bird disturbance.

During the offshore cable installation there will be several vessels present within the marine environment, as described above and detailed in EAR Volume 2 Chapter 2: Project Description. Vessels have the potential to cause disturbance to seabirds utilising the waters near the installation activities. As identified above, different species have different sensitivities associated with visual disturbance due to the presence of vessels. Species that may be more prone to vessel disturbance are puffin, guillemot, razorbill and shag, all of which are qualifying features for the Outer Firth of Forth and St. Andrews Bay Complex SPA. Puffin and guillemot are also qualifying features of Northumberland Marine SPA and the marine installation corridor travels through both these designated sites. Additionally, razorbill, guillemot and shag are all qualifying features of the St. Abb's Head to Fast Castle SPA and guillemot is a qualifying feature of the Farne Islands SPA, which is just 2 km southwest and 7.1 km west of the marine installation corridor respectively. The mean maximum foraging distances for these species range between 13.2 km for shag and 137.1 km for puffin and therefore these qualifying species are likely to be present along the marine installation corridor both within and outside of their respective designated sites.

The Marine Scheme's installation vessels will be slow moving and any potential disturbance will take place in the context of existing sources of disturbance such as fishing vessels, commercial shipping, recreational boating and wind farm service vehicles. Seabirds tend to raft together in groups on the sea, which means that if a vessel passes through or close to a raft, it has the potential to disturb and displace many individuals at once. The effect of the vessel's presence would be disturbance of potential foraging or resting habitat on the sea, causing the birds to move elsewhere, which may result in birds having less time to forage and cause them to expend additional energy. However, effects on energy budgets are extremely unlikely to result in population dynamic effects (i.e. increased adult mortality or effects on reproduction). Given the localised area of disturbance and wider area available, if birds are present, they are likely to find alternative feeding/loafing grounds in the short term.

At the landfall locations, where marine activities will include the vessels associated with the landfall works, the abundance of seabirds, including those species sensitive to disturbance from vessels, as identified in EAR Volume 2 Chapter 11: Ornithology, is low throughout the year.

The installation vessels generate similar levels of noise to other large marine vessels and the shipping and navigational baseline environment should be taken into consideration. As reported in EAR Volume 2 Chapter 13: Shipping and Navigation, this part of the North Sea is busy with fishing vessels, cargo vessels and increasingly, vessels associated with the offshore renewables industry. A total of 11,435 Automatic Identification System (AIS) vessel tracks were recorded across a two-season (summer/winter) study period. With roughly similar numbers during both periods (5,723 summer/5,712 winter), which averaged to 61.1 vessels tracking into the study area per day. However, the composition changed between summer and winter with fewer fishing vessels in the summer compared to the winter, and less passenger, recreational and other vessels over the winter compared to summer. Therefore, it is likely birds are used to both hearing and seeing vessels within the areas they are utilising for foraging and resting.

It is concluded that any disturbance would be minimal compared with the background level of vessel disturbance, and temporary in nature, resulting in with low magnitude.

Given the following:

- Low numbers of loafing or foraging seabirds are likely to be present within the Marine Scheme Area and ZoI, and much of the marine installation corridor does not represent key foraging areas for seabirds;
- Cable installation works will be temporary;
- Breeding colonies are at a considerable distance from the landfall areas, particularly in the context of existing baseline activities along the marine installation corridor; and
- The generally low sensitivities of the species present to the preparation and installation methods.

**The effect on seabirds in offshore waters has been assessed as minor to negligible and therefore will not constitute a likely significant effect upon any European site and can be screened out from Appropriate Assessment.**

### 5.3.3 Disturbance to Marine Mammals and Fish from underwater sound

All construction activities associated with route preparation and cable installation have the potential to generate underwater sound. Geophysical surveys and rock placement activities are impulsive sound sources, while vessel presence and movements, drilling, cutting, direct positioning (DP) of vessels, and dredging are considered continuous sound sources. These sounds are modified by the marine environment as they propagate.

These anthropogenic sources of underwater noise have potential to cause physical and physiological effects (e.g., mortality, non-recoverable and recoverable injury, permanent and temporary shifts in hearing thresholds) and elicit behavioural responses (e.g., modification of vocalisations, interruption or cessation of feeding or social interactions, alteration of movement or diving behaviours) in marine mammals. They can also mask biologically significant sounds produced by conspecifics, predators, and prey.

Grey seal *Halichoerus grypus* is a primary reason for the site selection of Berwickshire and North Northumberland Coast SAC. For any geophysical survey works during the breeding or moulting season many seals will be spending time on land, unaffected by underwater sound. However, there will be animals foraging at these times and outside the key seasons so there is likely to be disturbance of grey seal because of the survey activity. However, the survey vessel will be in the vicinity of the SAC for a very short period, a matter of a few days at most, so disturbance will be of very short duration. Grey seals are also known to undertake extensive foraging trips and so food availability is widespread. There may be an energetic cost to displacement from local foraging grounds but as the duration is so short it is not considered likely to have an adverse impact on food availability from alternative foraging grounds.

During offshore cable lay operations, some seals may undertake avoidance behaviour, but the extent and intensity of the impact is likely to be small and temporary, and the number of animals affected small, particularly considering population size. Therefore, **underwater sound disturbance to grey seals can be screened out from Berwickshire and North Northumberland Coast SAC for Appropriate Assessment on the basis that there will be no likely significant effects.**

Annex II species present as a qualifying feature, but not a primary reason for site selection of Tweed Estuary SAC, are sea lamprey *Petromyzon marinus* and river lamprey *Lampetra fluviatilis*. Lamprey are considered to have low hearing sensitivity. They have no swim bladder or other gas chamber, and are therefore less susceptible to barotrauma, detecting particle motion rather than sound pressure.

The River Tweed supports a very large, high-quality Atlantic salmon population in a river which drains a large catchment on the east coast of the UK, with sub-catchments in both Scotland and England. Atlantic salmon is therefore a qualifying feature of the River Tweed SAC. As medium hearing sensitivity fish, with swim bladders in which hearing does not involve the swim bladder or other gas volume, Atlantic salmon are susceptible to barotrauma although hearing only involves particle motion, not sound pressure.

As the geophysical survey activities of the Marine Scheme will use very high frequency acoustic signals, beyond the hearing range of any fish in the study area, there are no likely significant effects on fish and so there will be no impact of underwater sound on any fish species, including lamprey and Atlantic salmon.

The risk of mortality, injury and recoverable injury from continuous sounds sources during construction is low, even for fish in close to the sound source (see EAR Volume 2 Chapter 9: Fish and Shellfish Ecology for full underwater sound impact appraisal). However, at both landfall locations a cable lay vessel will remain on location, with DP operational, as the cable pull operations occur, meaning continuous sound will be produced over an extended period, potentially up to several weeks. This extended period of underwater sound has the potential to increase the risk of temporary threshold shift

(TTS)<sup>6</sup> for species with lower hearing sensitivity, like lamprey. However, since any fish in the local area are likely to move away from the noisy operations, they are unlikely to experience a level of exposure that could result in any temporary injury.

The risk of behavioural responses is moderate for all fish, including lamprey to a distance in the order of hundreds of metres of the cable installation activities. For diadromous species, such as lamprey and salmon, it is not considered that the cable installation operations during migratory seasons will present a barrier to movement. There may be some minor avoidance behaviour but as soon as the vessel has moved away normal migration activity will resume. Therefore, **underwater sound disturbance to lamprey and Atlantic salmon can be screened out from Appropriate Assessment for Tweed Estuary SAC River Tweed SAC on the basis that there are no likely significant effects.**

The Moray Firth in north-east Scotland supports the only known resident population of bottlenose dolphin (*Tursiops truncatus*) in the North Sea. The range of this population has extended southwards since the designation of the SAC, with the population now found as far south as the Firth of Forth and Berwick-upon-Tweed (Hague, et al., 2020; Arso Civil, et al., 2021). The Firth of Tay and Tay Estuary, and St Andrews Bay have been identified as particularly important areas for bottlenose dolphins from the Moray Firth SAC. However, these areas are over 50 km from the northern extent of the Marine Scheme and so there is no indication of any exclusion of bottlenose dolphin from particularly important habitats during geophysical survey works.

Whilst it is possible that a small number of bottlenose dolphin could be present in coastal waters around Thorntonloch, on the approach to the Scottish landfall, the density is not expected to be high and any disturbance from underwater sound caused by pre-installation geophysical surveys and installation activities will be temporary and short-term. Therefore, this disturbance is negligible and not anticipated to significantly affect the population of bottlenose dolphin protected by the SAC both inside and outside its boundary. Thus, **underwater sound disturbance to bottlenose dolphin can be screened out from Appropriate Assessment for Moray Firth SAC on the basis that there are no likely significant effects.**

Harbour porpoise (*Phocoena phocoena*) is found throughout the North Sea; however, the Southern North Sea SAC (located over 110 km away from the Marine Scheme) is the site that has been designated due to its importance for this Annex II species. Whilst the geophysical survey associated with the Project is likely to disturb individuals away from potential foraging opportunities, individuals will not be displaced from key areas and have extensive other grounds to move into. There will also be disturbance of cetaceans, such as harbour porpoise, during the cable installation periods, but the vessel is mobile, each cable lay period is of short duration and the zone of disturbance of limited extent. Therefore, effects are not anticipated to directly reach the SAC boundary. Thus, **underwater sound disturbance to harbour porpoise can be screened out from Appropriate Assessment for Southern North Sea SAC on the basis that there are no likely significant effects.**

### 5.3.4 Increased SSC and sediment deposition

There will be no pre-sweep dredging of sand waves for the Marine Scheme and so the installation and burial of the cable is predicted to create the most sediment disturbance. The largest sediment plumes and highest levels of SSC will be associated with the locations in which installation and burial of the cable are planned to take place in sediments with the highest proportion of fine particulate material, i.e., muds and clays, that will remain in suspension and settle to the seabed only slowly.

The distance travelled before deposition by suspended coarse sand is expected to be around 200 m. Fine sands and silts may however be transported beyond the marine installation corridor with any fine sand settling on the seabed up to 1.4 km from the point where it is mobilised. Based on the calculated settling velocities any silt-sized material may remain in suspension for several days and may therefore travel significant distances. However, given that dispersion processes will also act to dilute the concentration of silt carried in suspension, elevated concentration levels at 1.4 km from the source will be negligible. It is considered that there will be no significant elevated concentration levels beyond the

<sup>6</sup> A reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range

travel distance calculated for fine sand which corresponds to 1.4 km from the point of mobilisation within the marine installation corridor.

The EAR concluded that the impact to benthic ecology from increased SSC and sediment deposition is not significant. It also concluded that impacts to fish, including herring and sandeel (demersal spawners), diadromous fish, and shellfish amongst other marine fish are also not significant (see EAR Volume 2 Chapter 9: Fish and Shellfish Ecology). Thus, it is not considered that any potential availability of prey items for the designating features of St Andrews Bay Complex SPA or Northumberland Marine SPA will be impacted. **Outer Firth of Forth and St. Andrews Bay Complex SPA and Northumberland Marine SPA can therefore be screened out from Appropriate Assessment for sediment disturbance on the basis that there are no likely significant effects.**

The Moray Firth in north-east Scotland supports the only known resident population of bottlenose dolphin *Tursiops truncatus* in the North Sea. The range of this population has extended southwards since the designation of the SAC, with the population now found as far south as the Firth of Forth and Berwick-upon-Tweed (Hague, et al., 2020; Arso Civil, et al., 2021). These locations are an estimated 300 km away from the boundary of the SAC (Hague, et al., 2020). The Firth of Tay and Tay Estuary, and St Andrews Bay have been identified as particularly important areas for bottlenose dolphins from the Moray Firth SAC (Hague, et al., 2020; Arso Civil, et al., 2021). Although the Tay Estuary and adjacent waters are further north than the marine installation corridor, the presence of Moray Firth bottlenose dolphin in these waters indicates that movement along the east coast of Scotland and England is high. There is some seasonal variation, with movement from the Tay Estuary and adjacent waters towards the Moray Firth SAC being highest in early summer. In late summer, movement in the opposite direction increases.

As bottlenose dolphin are now known to travel as far south as Berwick-upon-Tweed, it is highly likely that this species will be present in coastal waters around Thorntonloch and on the approach to the Scottish landfall, up to 30 km from the coast. However, the presence of Moray Firth bottlenose dolphin in the remaining marine installation corridor is not likely further south to Seaham.

Given the highly mobile nature of this species and the general behavioural response of marine mammals to avoid areas of high suspended sediment, it is not considered that the integrity of the Moray Firth SAC will be compromised by the activities of the Marine Scheme, and as such **Moray Firth SAC can be screened out from Appropriate Assessment for sediment disturbance on the basis that there are no likely significant effects.**

Annex II species, grey seal *Halichoerus grypus* is a primary reason for the site selection of Berwickshire and North Northumberland Coast SAC, which supports an important breeding colony. The grey seal is an opportunistic predator, feeding on a variety of fish and cephalopods, and occasionally even on crustaceans and seabirds. The effects to general fish communities caused by increased SSC has been appraised as not significant (EAR Chapter 9: Fish and Shellfish Ecology).

Whilst modelling has shown that grey seals typically spend 43% of their foraging time within 10 km of a haul-out site (McConnell, et al., 2001) they also forage over significant distances, up to 135 km, and can spend up to thirty days at sea without return to their haul-out site (SCOS, 2020). Grey seals forage along the majority of the eastern coast of Scotland and England, encompassing the majority of the marine installation corridor, with offshore activity much lower in comparison (Carter, et al., 2020).

Given that 1.4 km is expected to be the maximum distance at which increased SSC are likely to have a significant impact, and the highly mobile nature of the species with regards to foraging, it is not considered that the integrity of the Berwickshire and North Northumberland Coast SAC will be compromised by the activities of the Marine Scheme. As such, **Berwickshire and North Northumberland Coast SAC can be screened out from Appropriate Assessment for sediment disturbance on the basis that there are no likely significant effects.**

### 5.3.5 Water Quality

During construction, there is a risk of resuspension of buried contaminants (e.g., heavy metals, hydrocarbons) into the surrounding water column. Furthermore, there is a potential for vessels and hydraulic equipment to result in accidental oil leakages / spillages during cable laying.

The conservation objectives for Outer Firth of Forth & St Andrews Bay Complex SPA include '*maintain the habitats and food resources of the qualifying features in favourable condition*'. St Abb's Head to Fast Castle SPA, Northumberland Marine SPA, Lindisfarne SPA / Ramsar, Northumbria Coast SPA / Ramsar, Farne Islands SPA and Coquet Island SPA all include an objective to ensure that the integrity of the site is maintained or restored as appropriate by maintaining or restoring '*the structure and function of the habitats of the qualifying features*'.

Whilst this impact pathway has no means of impacting the qualifying feature of the SPAs directly (i.e., non-breeding waterfowl, and breeding and non-breeding seabirds), it could result in an impact to the associated fish and shellfish species (and their habitats) utilised as a prey resource by the birds.

However, it is anticipated that any low concentration sediment-bound contaminants mobilised during the cable installation will be dispersed and diluted rapidly and are not likely to exceed natural levels of variation. Natural disturbance to the sediment such as during storm events and periods of strong wave action regularly mobilise contaminants and subject fish to temporary and localised changes in water quality. As a result, fish and shellfish at all life stages are expected to have a high tolerance to minor changes in the surrounding water due to mobilisation of sediment-bound contaminants.

Measures will be taken to minimise the risk of accidental leaks and spills irrespective of the presence of European sites to comply with regulations and guidance on pollution. Since these are not introduced specifically to protect European sites they can be considered at the Test of Likely Significant Effects. Full details of these measures can be found in EAR Volume 2 Chapter 2: Project Description of the Marine Scheme EAR. A summary of these measures includes the following:

- A Construction Environmental Management Plan (CEMP), Emergency Spill Response Plan and a Waste Management Plan will be developed and implemented for the installation phase of the Marine Scheme in accordance with in the coastal and marine environmental site guide (John, et al., 2015);
- All effluent from construction vessels will be discharged in accordance with the applicable MARPOL Convention Regulations; and
- Drilling fluids required for HDD operations will be carefully managed to minimise the risk of breakouts into the marine environment.

It is therefore considered that there will be no likely significant effects on these designated sites as a result of water quality and associated prey resource utilised by waterbirds in the subtidal zone from installation activities. **Water quality can be screened out from Appropriate Assessment for St Abb's Head to Fast Castle SPA, Lindisfarne SPA / Ramsar, Farne Islands SPA, Coquet Island SPA, Outer Firth of Forth & St Andrews Bay Complex SPA, Northumberland Marine SPA, and Northumbria Coast SPA / Ramsar on the basis that there are no likely significant effects.**

Annex II species, grey seal *Halichoerus grypus* is a primary reason for the site selection of Berwickshire and North Northumberland Coast SAC. Any changes to water quality due to release of contaminants, leaks or spills, if substantial, has the potential to significantly alter water quality which could, in turn, affect any marine mammals, including seals, present in the vicinity of activities. However, the regulations and best practice set out above will avoid or minimise any potential for impacts to water quality. Since these measures are not introduced specifically to protect European sites they can be considered at the Test of Likely Significant Effects.

The risk of accidental spillage and release of pollutants has been appraised as negligible and it is considered that there will be no likely significant effects on this SAC because of changes in water quality. Therefore, **water quality can be screened out from Appropriate Assessment for Berwickshire and North Northumberland Coast SAC on the basis that there are no likely significant effects.**



## 5.4 Operation Period of Marine Scheme

### 5.4.1 Electromagnetic Field Impacts

There will be electromagnetic field (EMF) emissions from the HDVC cables proposed for the Marine Scheme. EMF emissions have potential to disrupt sensory mechanisms in magnetosensitive and electrosensitive marine species.

Project specific modelling has shown that magnetic fields above natural geomagnetic levels are only expected to occur close to the cable location (approximately 35 m both horizontally and vertically around the cables). (See EAR Appendix 2.1). Beyond this, the cable installation will not raise background EMF beyond natural levels.

Grey seal *Halichoerus grypus* is an Annex II species and is a primary reason for the site selection of Berwickshire and North Northumberland Coast SAC. Magnetic sensitivity in marine mammals has primarily been investigated in cetaceans (Normandeau, et al., 2011) and there is no evidence to suggest that pinnipeds are directly influenced by, are sensitive to, or use magnetic fields. It is an area in which data gaps exist due to the difficulties of evaluating impacts (Taormina, et al., 2018). Recent meta studies have discounted pinnipeds as a receptor at risk of impact from EMF generated from subsea cables (Copping, et al., 2016; Copping, et al., 2020). Therefore, **EMF can be screened out from Appropriate Assessment for Berwickshire and North Northumberland Coast SAC on the basis that there are no likely significant effects.**

Annex II species present as a qualifying feature, but not a primary reason for site selection of Tweed Estuary SAC, are sea lamprey *Petromyzon marinus* and river lamprey *Lampetra fluviatilis*. The marine installation corridor is likely to pass through the migratory routes of river lamprey and sea lamprey, and during operation of the HVDC cable, these species may respond by changes in swimming speed or adjustments in swimming direction. However, the effect is limited to a small, localised area and the buried cable is will not pose a significant barrier to migration. Therefore, **EMF can be screened out from Appropriate Assessment for Tweed Estuary SAC on the basis that there are no likely significant effects.**

Atlantic salmon *Salmo salar* is an Annex II species, which is a primary reason for selection of River Tweed SAC. Sea lamprey, river lamprey and brook lamprey, are also Annex II species present as a qualifying feature but not as a primary reason for site selection. There is evidence that EMF anomalies from cables can affect the behaviour of migratory fish. Based on current knowledge and modelling, it can be concluded that an increase in the background EMF is restricted to up to 35 m from the cable. Most pelagic species, including salmon, are known to use the entire depth range of the water column and so can also undertake avoidance behaviour via water depth selection. Any responses are expected to be limited locally to the marine installation corridor. Therefore, the buried cable is not thought to pose a significant barrier to the migration of Atlantic salmon and **EMF can therefore be screened out from Appropriate Assessment for River Tweed SAC on the basis that there are no likely significant effects.**

The Southern North Sea SAC has been designated due to its importance for the Annex II species harbour porpoise *Phocoena phocoena*. The SAC supports an estimated 17.5% of the UK North Sea marine mammal Management Unit (JNCC 2019). The conservation objective of this site is 'to ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status (FCS) for Harbour Porpoise in UK waters'. There is no evidence of any physical or behavioural effects on cetaceans as a result of exposure to EMF (Klimley, 2021) and this receptor group is therefore expected to be unaffected by the presence of subsea cables (Copping, et al., 2020). Based on these findings and the very limited extent of elevated EMF associated with the Marine Scheme, **EMF can be screened out from Appropriate Assessment for Southern North Sea SAC on the basis that there are no likely significant effects.**

The conservation objectives for Outer Firth of Forth & St Andrews Bay Complex SPA include 'maintain the habitats and food resources of the qualifying features in favourable condition'. Whilst this impact pathway has no means of impacting the qualifying features of this SPA directly (i.e., the non-breeding waterfowl, and breeding and non-breeding seabirds), it could result in an impact to the associated fish and shellfish species utilised as a prey resource by the birds.



This indirect pathway also applies to the Northumberland Marine SPA, where conservation objectives include ensuring that the integrity of the site is maintained or restored as appropriate by maintaining or restoring *'the structure and function of the habitats of the qualifying features'*.

The EAR concluded that the impact to fish and shellfish ecology from the maximum EMF strength modelled for the Marine Scheme is not significant (see EAR Volume 2 Chapter 9: Fish and Shellfish Ecology). Given the relatively narrow ZoI, as EMF attenuated quickly, it is reasonable to expect an insignificant proportion of the North Sea fish population will encounter EMF levels higher than the natural geomagnetic range. This is therefore highly unlikely to have any impact on the availability of prey items for the marine SPA qualifying ornithological features.

Therefore, it is considered that disturbance to habitat and species as a result of sub-sea cable EMF will result in no adverse effect to the integrity on the SPAs, and **EMF can be screened out from Appropriate Assessment for both the Outer Firth of Forth & St Andrews Bay Complex SPA and Northumberland Marine SPA on the basis that there are no likely significant effects.**

### 5.4.2 Cable Heat Emissions

The operational subsea HVDC cables will generate heat due to resistance in the conductor components which can warm the cable surface and surrounding sediments. Coarser sediments such as gravel and sand have lower thermal resistivity than clays and mud and can therefore lead to greater transfer of heat (OSPAR Commission, 2009). Heat dissipation modelling for bundled cables buried at a depth of 1.5 m indicates that within 50 cm of the seabed surface the increase in sediment temperature is limited to approximately 3°C which has been calculated based upon a maximum seabed ambient surface sediment temperature of 15°C (EAR Volume 2 Chapter 2: Project Description).

The conservation objectives for Outer Firth of Forth & St Andrews Bay Complex SPA include *'maintain the habitats and food resources of the qualifying features in favourable condition'*. Whilst this impact pathway has no means of impacting the qualifying features of this SPA directly (i.e., the non-breeding waterfowl, and breeding and non-breeding seabirds), it could result in an impact to the associated fish and shellfish species utilised as a prey resource by the birds.

This indirect pathway also applies to the Northumberland Marine SPA, where conservation objectives include ensuring that the integrity of the site is maintained or restored as appropriate by maintaining or restoring *'the structure and function of the habitats of the qualifying features'*.

The duration of cable heat emissions will be long term, occurring throughout the operational lifetime of the cable. Effects will also occur along the full length of the cable but would be localised to a few metres from the cable, dependent upon the heat carrying capacity of particular sediments. Despite the long-term nature of this impact, the overall scale of temperature change expected is very small, particularly when compared to the overall habitat extent in the North Sea, which demersal and burrowing fish and shellfish species are well adapted to.

Therefore, it is considered that disturbance to habitat and species as a result of sub-sea cable thermal emissions will result in no adverse effect to the integrity on the SPAs, and **cable heat emissions can be screened out from Appropriate Assessment for both the Outer Firth of Forth & St Andrews Bay Complex SPA and Northumberland Marine SPA on the basis that there are no likely significant effects.**

## 5.5 Maintenance and Cable Repair of Marine Scheme

The maintenance and repair phase of the Marine Scheme has the same or reduced potential for effects as the route preparation and cable installation phase. Please refer to Section 5.3 for assessments of the route preparation and cable installation phases.

## 5.6 Decommissioning of Marine Scheme

This phase of the Marine Scheme has the same or reduced potential effects as the route preparation and cable installation phase. Please refer to Section 5.3 for assessments of the route preparation and cable installation phases.

## 6. In-combination Effects

### 6.1 Introduction

EAR Volume 2 Chapter 16 identified the following projects to have some potential for in-combination effects with the Marine Scheme:

- Scotland to England Green Link (SEGL), Eastern Link (EL) 1 – English Onshore Scheme
- Scotland to England Green Link (SEGL), Eastern Link (EL) 1 – Scottish Onshore Scheme
- Berwick Bank Offshore Wind Farm (Export cable only)
- Blyth Offshore Demonstrator Array 4 (Phase 2)
- Havhingsten Segment 2.1 South
- Dunbar East Beach Sea Defence

The appraisal of in-combination effects resulting from the Marine Scheme and those projects identified in EAR Volume 2 Chapter 16: Cumulative and In-Combination Effects, all ranged from **negligible** to **minor** effects, which are **not significant**.

The following sections of this HRA will address those in-combination effects and consider if there is any potential to impact the integrity of the relevant European sites.

#### 6.1.1 Scottish Onshore Scheme Effects

The Scottish Onshore Scheme will connect to the Marine Scheme at the interface between MHWS and MLWS at Thorntonloch Beach, East Lothian. The converter station, located in the Torness area, will connect to the landfall via 7.5 km of buried cable, and to the new 400 kilovolt (kV) substation, located in Branxton, via approximately 5 km of High Voltage Alternating Current (HVAC) cable. The planning application has been submitted to East Lothian Council under the Town and Country Planning (Scotland) Regulations 1997.

The converter and HVDC / HVAC cables associated with the Scottish Onshore Scheme were not considered in the cumulative effects assessment; only the landfall infrastructure is considered to have any potential for cumulative effects.

It is anticipated that installation of the landfall infrastructure will occur between late 2025 and early 2027 (SP Energy Networks, 2021).

Likely impact pathways associated with the installation of the Scottish Onshore Scheme were identified in the HRA as:

- Water quality;
- Disturbance/displacement; and
- Habitat loss.

The potential operational effects are expected to be minimal and were therefore scoped out of the assessment.

The Scottish Onshore Scheme HRA identified the potential for impacts on the Outer Firth of Forth and St Andrews Bay Complex SPA, associated with the increased risk of pollution incidents and increases in suspended sediments because of construction activities. It is also unlikely that the Scottish Onshore Scheme will cause pollution of the marine environment. Given the relatively small size and scale of the proposed development, the dilution effect and the large tidal flows (should the unlikely event occur) within the extensive SPA, any potential pollution event (even in the absence of the standard pollution prevention measures and buffer zones included in the CEMP) would not result in a likely significant effect on the habitats which support the qualifying features of the SPA. Therefore, there are no LSEs.

Potential impacts associated with disturbance / displacement of foraging and roosting birds within the footprint of the construction works and adjacent fields were considered in the terrestrial HRA for the Outer Firth of Forth and St Andrews Bay Complex SPA, St Abb's Head to Fast Castle SPA, and Firth of Forth SPA / Ramsar site. However, no likely significant effects on the integrity of the bird populations associated with the SPAs were identified. Given that this HRA (Section 5.3.2) also concluded that the effect on seabirds in offshore waters will be negligible, no significant in-combination effects are anticipated. Therefore, there are no LSEs.

Impacts associated with loss of foraging / roosting habitat under the footprint of the construction works (c.6 ha) were considered. The Marine Scheme will not result in any loss of terrestrial habitat and the Scottish Onshore Scheme will not result in any loss of marine habitats. Therefore, there are no LSEs.

The Scottish Onshore Scheme HRA therefore concluded that no likely significant effects are anticipated alone or in-combination with other plans or projects. The Scottish Onshore Scheme is therefore not considered to have any in-combination effect on designated sites associated with the Marine Scheme.

### 6.1.2 English Onshore Scheme Effects

The English Onshore Scheme will connect to the Marine Scheme at the interface between MHWS and MLWS north of Seaham, County Durham. The converter station, located at Hawthorn Pit will connect to the landfall via approximately 10 km of underground HVDC cable, and to the new 400 kV substation via approximately 1 km of HVAC cable. The planning application was submitted to Durham County Council under the Town and Country Planning Act 1990.

The converter and HVDC/HVAC cables associated with the English Onshore Scheme were not considered in the cumulative appraisal (EAR Volume 2 Chapter 16: Cumulative and In-Combination Effects); only the landfall infrastructure is considered to have any potential for cumulative effects.

It is anticipated that construction of the landfall infrastructure will commence in Spring 2025 and complete in early 2027 (English Onshore Scheme EAR Chapter 3: Description of the EOS).

Likely impact pathways associated with the installation and operation of the English Onshore Scheme were identified in the HRA as:

- Noise and Visual Disturbance;
- Loss of Functionally Linked Habitat; and
- Pollution – Dust and Run-off.

The LSE test for the onshore scheme, determined that noise and visual disturbance could be screened out with regards to the Northumbria Coast SPA / Ramsar, due to the distance to the European site from the Landfall Onshore Works Area (c. 550 m) as well as the sea cliff creating a natural barrier to noise and visual presence on the foreshore below. Therefore, there are no LSEs.

Loss of functionally linked habitat was screened out, as the 2020 / 2021 AECOM baseline surveys and data search showed that the habitats within the English Onshore Scheme scoping boundary are not functionally linked to the Northumbria Coast SPA. Therefore, there are no LSEs.

Finally, pollution in the form of dust and run-off was also screened out with regards to the Northumbria Coast SPA / Ramsar and the Durham Coast SAC as both European sites are c. 550 m from the English Landfall Onshore Works Area. Therefore, there are no LSEs.

The English Onshore Scheme HRA ultimately concluded that due to the distance of the works from European sites and / or the low sensitivity of those sites to terrestrial works, there will be no LSE either alone or in-combination with other plans and projects.

The English Onshore Scheme is therefore not considered to have any in-combination effect on designated sites associated with the Marine Scheme.

### 6.1.3 Berwick Bank Offshore Wind Farm (Export cable only)

In 2021, it was announced that Berwick Bank and Marr Bank wind farms have merged and continue to operate under the 'Berwick Bank' name (NS Energy Business, 2021). The enlarged Berwick Bank Offshore Wind Farm will deliver up to 4.1 Gigawatt (GW) of installed capacity (SSE, 2020). Located in the Firth of Forth, approximately 43 km off the coast of East Lothian, the undersea cables will come to land at Skateraw, approximately 2.3 km north-west of the marine installation corridor at KP 1. The Berwick Bank Offshore Wind Farm is estimated to begin construction in 2025 (SSE Renewables, n.d.).

The impact pathways included in the cumulative effects appraisal for the Berwick Bank Offshore Wind Farm (Export cable) due to possible interaction with Marine Scheme were:

- Underwater sound;
- Vessel movement; and
- Temporary disturbance and displacement of birds from installation activities associated with sound, visual impacts, and presence from vessel and construction activity.

Underwater sound and vessel movement impact pathways would be most applicable to interactions with European sites designated for highly mobile marine mammals (i.e., Berwickshire and North Northumberland Coast SAC, Moray Firth SAC, and Southern North Sea SAC).

It was concluded that installation vessels for either project would only be at any particular location for short periods of time and that noise levels would be similar to background levels. The potential in-combination effect is therefore considered **negligible** and therefore **not significant**. Therefore, there are no LSEs.

Similarly, the small number of vessels involved in the installation is unlikely to significantly increase the risk of collision with marine mammals relative to background shipping levels. Thus, the in-combination effect of these highly localised effects is considered negligible and therefore not significant. Therefore, there are no LSEs.

Temporary disturbance and displacement of birds from installation activities is possible for cable installation projects, especially if installation is occurring at the same location at the same time. The marine installation corridor passes through the Outer Firth of Forth & St Andrews Bay Complex SPA as it leaves the Scottish landfall, which coincides with the Berwick Bank Offshore Wind Farm Export cable. Any effects on prey are predicted to be localised in nature and the effects of the Marine Scheme alone were considered negligible, which is not significant. It is anticipated that the Berwick Bank Offshore Wind Farm (Export cable) is likely to have an equally insignificant impact on prey items as the Marine Scheme. Therefore, there are no LSEs.

The Berwick Bank Offshore Wind Farm (Export cable) project is therefore not considered to have any in-combination effect on designated sites associated with the Marine Scheme.

### 6.1.4 Blyth Offshore Demonstrator Array 4 (Phase 2)

This project is located further inshore of the marine installation corridor at KP 131 to KP 136. Array 4 (Phase 2) has been consented under a variation to the original marine licence application for five additional turbines with a capacity of up to 58.4 MW. The exact configuration is yet to be determined. The proposed wind farm is targeting to be fully commissioned by 2025, which will coincide with the installation of the Marine Scheme.

The appraisal of in-combination effects resulting from the Marine Scheme and those projects identified in EAR Volume 2 Chapter 16: Cumulative and In-Combination Effects, all ranged from **negligible** to **minor** effects, which are **not significant**.

The impact pathways included in the cumulative effects appraisal for the Blyth Offshore Demonstrator Array 4 (Phase 2) project due to be fully commissioned by 2025 (which will coincide with the installation of the marine installation corridor) were:

- Underwater sound;

- Vessel movement; and
- Temporary disturbance and displacement of birds from installation activities associated with sound, visual impacts, and the presence of vessels and construction activity.

Underwater sound and vessel movement impact pathways would be most applicable to interactions with European sites designated for highly mobile marine mammals (i.e., Berwickshire and North Northumberland Coast SAC, Moray Firth SAC, and Southern North Sea SAC).

The Blyth Offshore Demonstrator Array 4 (Phase 2) is a floating wind farm and will not have any fixed foundation turbines. The floating platforms and turbines will be built at the quayside and towed to site and will not rely on many vessels or specialized vessels. Therefore, the installation of this wind farm will not involve piling and so underwater sound will not be generated. Therefore, there are no LSEs.

There will be only a small number of vessels involved in installation of the Marine Scheme, which are unlikely to significantly increase the risk of collision with marine mammals when considered against background shipping levels and assuming concurrent construction. Thus, the in-combination effect of these highly localised effects is considered negligible and therefore not significant. Therefore, there are no LSEs.

If any of the seabird species were to be disturbed and displaced due to the Marine Scheme, they could encounter the construction or operation of Blyth Offshore Demonstrator, or vice versa. This is particularly applicable to qualifying features of Outer Firth of Forth and St Andrews Bay Complex SPA, Northumberland Marine SPA, St Abb's Head to Fast Castle SPA, Lindisfarne SPA / Ramsar, Northumbria Coast SPA / Ramsar, Farne Islands SPA, and Coquet Island SPA. However, the effects on even the most sensitive species (shag) were considered **minor to negligible**, which is **not significant**, in EAR Volume 2 Chapter 16: Cumulative and In-Combination Effects, given the localised and temporary nature of the cable laying works. As such it is considered that the likelihood of significant in-combination effects occurring is negligible. Therefore, there are no LSEs.

The Blyth Offshore Demonstrator Array 4 (Phase 2) project is therefore not considered to have any in-combination effect on designated sites associated with the Marine Scheme.

### 6.1.5 Havhingsten Segment 2.1 South

The Havhingsten cable system, also called North Sea Connect, is a planned subsea telecommunication network connecting the UK and Denmark. The first segment, which comes to shore at Seaton Sluice, Northumberland, intersects the Marine Scheme between KP 137 and KP 138, and was due to be ready for service in 2019 (Intertek, 2019a). The second segment, which comes to shore at Whitley Bay, Northumberland, approximately 4.5 km south of Seaton Sluice, is a 'stubbed cable route'; this will be installed but not immediately connected to the telecommunications network (Intertek, 2019b). It is intended that the stubbed cable route will be extended within 10 years of completion of the Havhingsten installation project.

There is no clear timescale to this segment of the project. When the Marine Licence application was submitted in June 2019, it was intended that the project would be operational in Q1 2020, but the status of the application is still 'In Progress.'

The only impact pathways included in the cumulative effects appraisal for the Havhingsten Segment 2.1 South project were related to birds and were dependent upon programme:

- Temporary disturbance and displacement from installation activities associated with sound, visual impacts, and presence from vessel and construction activity;
- Disturbance to seabed resulting in changes in prey availability; and
- Alteration of water quality due to increased suspended sediment concentrations (SSC), unplanned releases, accidental leaks, and spills from vessels and plant.

The Marine Scheme will require a crossing agreement with Havhingsten Segment 2.1 South and, dependent on both project's programme, it is likely that installation activities may have temporal and spatial interactions. This is applicable to qualifying features of Outer Firth of Forth and St Andrews Bay

Complex SPA, Northumberland Marine SPA, St Abb's Head to Fast Castle SPA, Lindisfarne SPA / Ramsar, Northumbria Coast SPA / Ramsar, Farne Islands SPA, and Coquet Island SPA.

Physical disturbance of the seabed during the route preparation and cable installation activities of both projects occurring concurrently would temporarily increase SSC which may subsequently result in sediment deposition and smothering of prey species (fish and shellfish). However, cable installation of both projects concurrently will disturb only a small proportion of the total prey species in the area and the loss of prey will result in a low level of change for a short period of time. The cumulative effect upon fish and shellfish due to both smothering, and displacement from underwater sound, was appraised as negligible and therefore not significant. Therefore, there are no LSEs.

With vessels associated with both projects located in proximity to one another, there is a risk of unplanned releases of pollutants occurring at the same time. The measures committed to manage the risk of pollution by the Marine Scheme, resulted in a low likelihood of occurrence, with the magnitude deemed negligible and the effect **negligible** which is **not significant**. Given that much of this is covered by regulations that will apply equally to the construction of the Havhingsten project, it can be concluded that in-combination effects would also be negligible. Therefore, there are no LSEs.

The Havhingsten Segment 2.1 South project is therefore not considered to have any in-combination effect on designated sites associated with the Marine Scheme.

### 6.1.6 Dunbar East Beach Sea Defence

East Lothian Council is proposing the construction of a seawall defence project to promote the natural regeneration of Dunbar East Beach. The works are to repair / replace an existing groyne at the south of the site that has fallen into disrepair, alongside works to improve the exposure conditions in the bay to encourage any sediment that is in the local system to remain on the foreshore. In the application to Marine Scotland, there was a proposed construction completion date of March 2020 (Marine Scotland, 2018a); however, the project is currently in 'pre-application' stage and the works have not yet commenced. Timescales are unclear but likely to occur in the next five years.

All impact pathways for this project could be excluded from the cumulative effects appraisal. The Dunbar East Beach Sea Defence project is therefore not considered to have any in-combination effect on designated sites associated with the Marine Scheme.

## 7. Conclusions

This HRA has been prepared as part of the EAR to support Marine Licence applications to the MS-LOT and the MMO for the Scotland England Green Link 1/ Eastern Link 1 Marine Scheme.

Fifteen European sites were considered within the scope of the assessment, and seven potential impact pathways (five during installation and two during operation) identified.

All designated sites were screened out from the need for Appropriate Assessment for all impact pathways. No likely significant effects alone or in combination with other plans or projects are anticipated.

A conclusion of **No Likely Significant Effects** can therefore be determined, and no further stages of Habitats Regulations Assessment will be required.



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## Appendix A European Sites Background

### Moray Firth SAC (Scotland)

#### Introduction

The Moray Firth Special Protection Area (SPA) is a funnel-shaped body of sea on the northeast mainland coast of Scotland. Most of the Firth is shallow water (less than 20metres (m)) over a sandy substrate, apart from a 50m deep channel running east-west through muddy substrate. Tidal flows are relatively weak with a maximum tidal range of 3m and the Firth is relatively sheltered, at least in comparison to the exposure of the Atlantic west coasts

The Moray Firth in north-east Scotland supports the only known resident population of bottlenose dolphin *Tursiops truncatus* in the North Sea. The population is estimated to be around 130 individuals. Dolphins are present all year round, and, while they range widely in the Moray Firth, they appear to favour particular areas.

#### Conservation Objectives<sup>7</sup>

To ensure that the qualifying features of Moray Firth SAC are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.

To ensure that the integrity of Moray Firth SAC is maintained or restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:

#### For Subtidal Sandbanks

- 2a. Extent and distribution of the habitat within the site.
- 2b. Structure and function of the habitat and the supporting environment on which it relies.
- 2c. Distribution and viability of typical species of the habitat.

#### For Bottlenose Dolphin

- 2a. The population of bottlenose dolphin is a viable component of the site.
- 2b. The distribution of bottlenose dolphin throughout the site is maintained by avoiding significant disturbance.
- 2c. The supporting habitats and processes relevant to bottlenose dolphin and the availability of prey for bottlenose dolphin are maintained.

#### Qualifying Features<sup>8</sup>

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Sandbanks which are slightly covered by sea water all the time

Annex II species that are a primary reason for selection of this site:

- Bottlenose dolphin *Tursiops truncatus*

#### Environmental Vulnerabilities<sup>9</sup>

- Physical disturbance
- Invasive species
- Water quality
- Fisheries: removal of target and non-target species (i.e., entanglement of bottlenose dolphins in fishing gear and removal of their prey species)

<sup>7</sup> <https://apps.snh.gov.uk/sitelink-api/v1/sites/8327/documents/59> [Accessed 09/11/2021]

<sup>8</sup> <https://sac.jncc.gov.uk/site/UK0019808> [Accessed 09/11/2021]

<sup>9</sup> <https://apps.snh.gov.uk/sitelink-api/v1/sites/8327/documents/59> [Accessed 09/11/2021]

- Other fishing including: pelagic, hand gathering oysters/mussels, salmon fishing, static gear, mobile gear and aquaculture - shellfish.
- Underwater noise (i.e., acoustic surveys etc)
- Commercial shipping, ferries, personal leisure craft, wildlife tour boats and tidal turbines (death or injury by collision)
- Coastal development
- Cables and pipelines

## River Teith SAC

### Introduction

The Teith SAC is designated for three different species of river lamprey and Atlantic salmon. Designated in 2005, the site covers an area of 1289.33 Ha.

The site is considered one of the best areas in the United Kingdom for sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis* and brook lamprey *Lampetra planeri*; whilst the area is also considered to support a significant presence of Atlantic Salmon *Salmo salar*.

### Conservation Objectives<sup>10</sup>

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained, and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species, including range of genetic types for salmon, as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

### Qualifying Features

Annex II species that are a primary reason for selection of this site:

- Sea lamprey *Petromyzon marinus*,
- Brook lamprey *Lampetra planeri*, and
- River lamprey *Lampetra fluviatilis*,

Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Atlantic salmon *Salmo salar*

### Environmental Vulnerabilities<sup>10</sup>

- Forestry operations
- Water management
- Water quality

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<sup>10</sup> <https://sitelink.nature.scot/site/8367#overview> [Accessed 07/04/22]

## River Tay SAC

### Introduction

The River Tay SAC, designated in 2005, extends 9461.63 Ha. The Tay drains a very large catchment and has the greatest flow of all UK rivers. There is considerable ecological variety in the Tay catchment, resulting in the Tay supporting the full range of salmon life-history types found in Scotland, with adult salmon entering the River Tay throughout the year to spawn in different parts of the catchment.

### Conservation Objectives<sup>11</sup>

To ensure that the qualifying features of River Tay SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.

This contribution would be achieved through delivering the following objectives for each of the site's qualifying features:

For Lamprey:

- a) Maintain the population of the lamprey species' as viable components of the site
- b) Maintain the distribution of the lamprey species throughout the site
- c) Maintain the habitats supporting the lamprey species within the site, and availability of food

For Atlantic Salmon:

- a) Maintain the population of Atlantic salmon, including range of genetic types, as a viable component of the site
- b) Maintain the distribution of Atlantic salmon throughout the site
- c) Maintain the habitats supporting Atlantic salmon within the site and availability of food

For European Otter:

- a) Maintain the population of otter as a viable component of the site
- b) Maintain the distribution of otter throughout the site
- c) Maintain the habitats supporting otter within the site and availability of food

### Qualifying Features

Annex II species that are a primary reason for selection of this site

- Atlantic salmon *Salmo salar*

Annex II species present as a qualifying feature, but not a primary reason for site selection

- Sea lamprey *Petromyzon marinus*
- Brook lamprey *Lampetra planeri*
- River lamprey *Lampetra fluviatilis*
- Otter *Lutra lutra*

### Environmental Vulnerabilities<sup>12</sup>

- Extraction
- Game/ fisheries management

<sup>11</sup> [file:///C:/Users/alison.curtis/Downloads/Conservation\\_Advice\\_Package\\_8366.pdf](file:///C:/Users/alison.curtis/Downloads/Conservation_Advice_Package_8366.pdf) [Accessed 07/04/22]

<sup>12</sup> <https://sitelink.nature.scot/site/8366> [Accessed 07/04/22]

- Invasive species
- Water management
- Water quality
- Development
- Agricultural operations
- Recreation/disturbance

## River South Esk SAC

### Introduction

The River South Esk SAC was designated in 2005 and covers an area of 471.85 Ha.

Freshwater pearl mussels are abundant in the River South Esk, representing the south-eastern range of the species in Scotland. The pearl mussel population is most abundant in the middle reaches of the river where they attain densities > 20 m<sup>2</sup>. The conservation importance of the site is further increased by the abundance of juveniles which comprise approximately 20% of the population. The presence of juvenile pearl mussels less than 20 mm long indicates that there has been successful recruitment since 1996.

The South Esk supports a large, high-quality salmon population in a river draining a moderate-sized catchment on the east coast of Scotland. It has a strong nutrient gradient along its length, rising in the nutrient-poor Grampians and flowing for half of its length through the rich agricultural lands of Strathmore. The high proportion of the South Esk which is accessible to salmon and the range of ecological conditions in the river allows it to support the full range of life-history types found in Scotland, with sub-populations of spring, summer salmon and grilse all being present.

### Conservation Objectives<sup>13</sup>

To ensure that the qualifying features of the River South Esk SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.

This contribution would be achieved through delivering the following objectives for each of the site's qualifying features:

For Freshwater Pearl Mussel:

- a) Restore the population of freshwater pearl mussel as a viable component of the site
- b) Restore the distribution of freshwater pearl mussel throughout the site
- c) Restore the habitats supporting freshwater pearl mussel within the site and availability of food
- d) Restore the distribution and viability of freshwater pearl mussel host species and their supporting habitats

For Atlantic Salmon:

- a) Restore the population of Atlantic salmon, including range of genetic types, as a viable component of the site
- b) Restore the distribution of Atlantic salmon throughout the site
- c) Restore the habitats supporting Atlantic salmon within the site and availability of food

### Qualifying Features

Annex II species that are a primary reason for selection of this site:

<sup>13</sup> [file:///C:/Users/alison.curtis/Downloads/Conservation\\_Advice\\_Package\\_8364.pdf](file:///C:/Users/alison.curtis/Downloads/Conservation_Advice_Package_8364.pdf) [Accessed 07/04/22]

- Freshwater pearl mussel *Margaritifera margaritifera*
- Atlantic salmon *Salmo salar*

#### **Environmental Vulnerabilities<sup>14</sup>**

- Agricultural operations
- Climate Change
- Forestry operations
- Invasive species
- Over grazing
- Water management
- Water quality
- Wildlife crime

## **River Dee SAC (Aberdeenshire)**

### **Introduction**

The Dee is a major east coast Scottish river, which flows uninterrupted for some 130 km from its upland reaches in the high Cairngorms to the North Sea. It supports a functional population of freshwater pearl mussel, which is common in the Dee, recorded from a location approximately 30 km from the river source to approximately 6-7 km upstream from its mouth.

The River Dee supports a high-quality Atlantic salmon population in a river draining a large catchment on the east coast of Scotland. There is a weak nutrient gradient along its length, but it is essentially a nutrient-poor river. The high proportion of the river accessible to salmon has resulted in it supporting the full range of life-history types found in Scotland, with sub-populations of spring, summer salmon and grilse all being present. The headwaters which drain the southern Cairngorm and northern Grampian mountains are particularly important for multi sea-winter spring salmon, but there has been a significant decline in their abundance in recent years. The extensive areas accessible to salmon means the River Dee supports a significant proportion of the Scottish salmon resource. In recent years it has contributed about 4 or 5% of all salmon caught in Scotland.

The Dee is a major east coast Scottish river, which flows uninterrupted for some 130 km from its upland reaches in the high Cairngorms to the North Sea. Surveys have indicated that the otter *Lutra lutra* is found throughout Dee catchment, from its mouth at Aberdeen to many of the high-altitude lochs. The river system contains extensive areas of suitable habitat for otter feeding, resting and breeding, including watercourses with a high fish biomass and islands and marshy areas for resting. This is a strong, high quality population, representative of north-east Scotland.

### **Conservation Objectives<sup>15</sup>**

To ensure that the qualifying features of the River Dee SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.

This contribution would be achieved through delivering the following objectives for each of the site's qualifying features:

For freshwater pearl mussel:

- a) Restore the population of freshwater pearl mussel as a viable component of the site
- b) Restore the distribution of freshwater pearl mussel throughout the site

<sup>14</sup> <https://sitelink.nature.scot/site/8364> [Accessed 07/04/22]

<sup>15</sup> [file:///C:/Users/alison.curtis/Downloads/Conservation\\_Advice\\_Package\\_8357.pdf](file:///C:/Users/alison.curtis/Downloads/Conservation_Advice_Package_8357.pdf) [Accessed 07/04/22]

- c) Restore the habitats supporting the freshwater pearl mussel within the site and availability of food
- d) Maintain the distribution and viability of freshwater pearl mussel host species and their supporting habitats

For Atlantic salmon:

- a) Maintain the population of Atlantic salmon, including range of genetic types, as a viable component of the site
- b) Maintain the distribution of Atlantic salmon throughout the site
- c) Maintain the habitats supporting Atlantic salmon within the site and availability of food

For European otter:

- a) Maintain the population of otter, as a viable component of the site
- b) Maintain the distribution of otter throughout the site
- c) Maintain the habitats supporting otter within the site and availability of food

### Qualifying Features

Annex II species that are a primary reason for selection of this site

- Atlantic salmon *Salmo salar*
- Freshwater pearl mussel *Margaritifera margaritifera*
- Otter *Lutra lutra*

### Environmental Vulnerabilities<sup>16</sup>

- Agricultural operations
- Invasive species
- Water management
- Water quality
- Development
- Over grazing

## Outer Firth of Forth and St. Andrews Bay Complex SPA (Scotland)<sup>17</sup>

### Introduction

The Outer Firth of Forth and St Andrews Bay Complex SPA contains many sheltered areas, such as firths, inlets and sandy bays, used by seabirds and waterbirds to feed, moult, rest and roost. They lie close to the nesting sites of a large number of birds breeding in the area during the summer season. During this time, the SPA provides feeding grounds for thousands of northern gannets (*Morus bassanus*), black-legged kittiwakes *Rissa tridactyla*, Atlantic puffins *Fratercula arctica* and the largest concentration of common terns in Scotland.

The SPA is also an important refuge for birds which have migrated thousands of miles from their breeding grounds in northern Europe and western Siberia to spend the winter in the area. During this time of the year, the site supports more than 35% of the common eider *Somateria mollissima* and over

<sup>16</sup> <https://sitelink.nature.scot/site/8357> [Accessed 07/04/22]

<sup>17</sup> <https://incc.gov.uk/our-work/outer-firth-of-forth-and-st-andrews-bay-complex-spa/#conservation-advice> [Accessed 04/11/2021]



23% of the velvet scoter British wintering populations, along with the largest Scottish concentrations of red-throated diver *Gavia stellata* and little gull *Larus minutus*.

### Conservation Objectives

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, subject to natural change, thus ensuring that the integrity of the site is maintained in the long-term and it continues to make an appropriate contribution to achieving the aims of the Birds Directive for each of the qualifying species.

This contribution would be achieved through delivering the following objectives for each of the site's qualifying features:

- a) Avoid significant mortality, injury and disturbance of the qualifying features, so that the distribution of the species and ability to use the site are maintained in the long-term;
- b) To maintain the habitats and food resources of the qualifying features in favourable condition.

### Qualifying Features

#### Non-breeding waterfowl

- Red-throated diver *Gavia stellata* – 5% of the GB population
- Slavonian grebe *Podiceps auritus* – 2.7% of the GB population
- Common eider *Somateria mollissima* – 35.9% of the GB population
- Long-tailed duck *Clangula hyemalis* – 17.7% of the GB population
- Common scoter *Melanitta nigra* – 4.7% of the GB population
- Velvet scoter *Melanitta fusca* – 23.2% of the GB population
- Common goldeneye *Bucephala clangula* – 2.9% of the GB population
- Red-breasted merganser *Mergus serrator* – 5.1% of the GB population
- Non-breeding waterfowl assemblage (divers, grebes & ducks) – >20,000 birds

#### Breeding and non-breeding seabirds

- Common tern *Sterna hirundo* – breeding – 8.8% of the GB population
- Artic tern *Sterna paradisaea* – breeding – 1.0% of the GB population
- European shag *Phalacrocorax aristotelis* – breeding – 4.6% of the GB population
- European shag – non-breeding – 2.2% of the GB population
- Northern gannet *Morus bassanus* – breeding – 2.5% of the GB population
- Atlantic puffin *Fratercula arctica* – breeding – 5.3% of the GB population
- Black-legged kittiwake *Rissa tridactyla* – breeding 1.6% of the GB population
- Black-legged kittiwake – non-breeding – >2,000 birds
- Manx shearwater *Puffinus puffinus* – present during breeding season - >2000 birds
- Common guillemot *Uria aalge* – breeding – 1.6% of the GB population
- Common guillemot – non-breeding – >2,000 birds
- Razorbill *Alca torda* – non-breeding – >2,000 birds
- Herring gull *Larus argentatus* – breeding – 1.1% of the GB population
- Herring gull – non-breeding – 1.7% of the GB population
- Little gull *Larus minutus* – non-breeding – >50 birds

- Black-headed gull *Chroicocephalus ridibundus* – non-breeding – 1.2% of the GB population
- Common gull *Larus canus* – non-breeding – 2.1% of the GB population
- Sea bird assemblage – breeding – >20,000 birds
- Sea bird assemblage – non-breeding – >20,000 birds

#### Environmental Vulnerabilities<sup>18</sup>

- Fishing – mobile gear, mechanical and hydraulic benthic dredging, benthic trawls, pelagic trawls and seines
- Fishing – static gear, drift nets, bottom set nets (including fyke nets)
- Harvesting – intertidal shellfish and bait
- Navigational and maintenance dredging, existing maintenance dredging, dredging spoil disposal, capital dredging
- Ports and Harbours: new development, ship to ship transfer
- Recreational users: wildfowling, jet skiing, wildlife tour operators, surfing, diving, angling, kayaking, boating
- Renewables: wind energy development

## St. Abb's Head to Fast Castle SPA (including its marine extension, Scotland)<sup>19</sup>

### Introduction

St Abb's Head to Fast Castle SPA comprises an area of sea cliffs and coastal strip stretching over 10km along the Berwickshire Coast north of St Abb's. The boundary of the SPA overlaps with that of St Abb's Head to Fast Castle SSSI, and the seaward extension extends approximately 1 km into the marine environment to include the seabed, water column and surface.

### Conservation Objectives

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

### Qualifying Features<sup>20</sup>

- Seabird assemblage – >20,000 birds. (regularly supports 79,560 seabirds)
- Razorbill *Alca torda* – 2,180 individuals, 1% of the GB population
- Common guillemot *Uria aalge* – 31,750 individuals, 3% of the GB population
- Black-legged kittiwake *Rissa tridactyla* – 21,170 individuals, 4% of the GB population

<sup>18</sup> <https://www.nature.scot/sites/default/files/2017-11/Marine%20Protected%20Area%20%28Proposed%29%20-%20Advice%20to%20support%20management%20-%20Outer%20Firth%20of%20Forth%20and%20St%20Andrews%20Bay%20Complex.pdf> [Accessed 04/11/2021]

<sup>19</sup> <https://sitelink.nature.scot/site/8579> [Accessed 04/11/2021]

<sup>20</sup> <https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9004271.pdf> [Accessed 04/11/2021]

- Herring gull *Larus argentatus* – 1,160 pairs, 0.7% of the GB population
- European shag *Phalacrocorax aristotelis* – 560 pairs, 1% of the GB population

#### **Environmental Vulnerabilities**

- Recreational pressure
- Visual and noise disturbance
- Marine consents and permits
- Fisheries: Commercial marine and estuarine
- Water pollution

## **St Abb's Head to Fast Castle SAC (Scotland)**

### **Introduction**

St Abb's Head to Fast Castle is a spectacular area of cliff coastline in south-east Scotland, comprising high cliffed sections and rich vegetated areas in more sheltered localities. While some sections are dominated by large seabird colonies which restrict the vegetation in their vicinity, elsewhere extensive vegetated areas are found. A very high number of flowering plant species are present, including many of local distribution, reflecting the range of micro-habitat conditions.

### **Conservation Objectives<sup>21</sup>**

To ensure that the Qualifying Feature of St. Abb's Head to Fast Castle SAC is in favourable condition and makes an appropriate contribution to achieving favourable conservation status.

To ensure that the integrity of St. Abb's Head to Fast Castle SAC is maintained by meeting the following objectives:

- Maintain the extent and distribution of the habitat within the site
- Maintain the structure, function and supporting processes of the habitat
- Maintain the distribution and viability of typical species of the habitat

### **Qualifying Features<sup>22</sup>**

Annex I habitats that are a primary reason for selection of this site:

- Vegetated Sea Cliffs of the Atlantic and Baltic Coasts

#### **Environmental Vulnerabilities**

- Over grazing
- Under grazing
- Trampling
- Air pollution

## **Berwickshire and North Northumberland Coast SAC (Scotland / England)**

### **Introduction**

<sup>21</sup> <https://apps.snh.gov.uk/sitelink-api/v1/sites/8382/documents/66> [Accessed 04/11/2021]

<sup>22</sup> <https://sac.jncc.gov.uk/site/UK0030281> [Accessed 04/11/2021]

The Berwickshire & Northumberland Coast SAC supports a biodiverse assemblage of marine life. It covers 115 km of coastline and extends out to four nautical miles to encompass 645 square kilometers of shore and sea.

### Conservation Objectives<sup>23</sup>

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of qualifying species
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

### Qualifying Features<sup>24</sup>

Annex I habitats that are a primary reason for selection of this site:

- Mudflats and sandflats not covered by seawater at low tide
- Large shallow inlets and bays
- Reefs
- Submerged or partially submerged sea caves

Annex II species that are a primary reason for selection of this site:

- Grey seal *Halichoerus grypus*

### Environmental Vulnerabilities<sup>25</sup>

- Public access/disturbance
- Water pollution
- Invasive species
- Change in species distributions
- Coastal squeeze
- Direct impact from third parties
- Transportation and service corridors
- Change in land management
- Fisheries: Commercial marine and estuarine

## Tweed Estuary SAC (England)

### Introduction

<sup>23</sup> <http://publications.naturalengland.org.uk/publication/5920077534724096> [Accessed 04/11/2021]

<sup>24</sup> <https://sac.jncc.gov.uk/site/UK0017072> [Accessed 04/11/2021]

<sup>25</sup> <http://publications.naturalengland.org.uk/publication/5340976100933632> [Accessed 04/11/2021]

The Tweed Estuary SAC is a long narrow estuary, with intertidal mudflats and sandflats. The SAC supports a population of both river and sea lamprey with the water quality classified as excellent throughout.

### Conservation Objectives<sup>26</sup>

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of qualifying species
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

### Qualifying Features<sup>27</sup>

Annex I Habitats that are a primary reason for selection of this site:

- Estuaries
- Mudflats and sandflats not covered by seawater at low tide

Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Sea lamprey *Petromyzon marinus*
- River lamprey *Lampetra fluviatilis*

### Environmental Vulnerabilities<sup>28</sup>

- Public access/disturbance
- Water pollution
- Invasive species
- Changes in species distribution
- Coastal squeeze
- Transport and service corridors
- Change in land management
- Fisheries: commercial marine and estuarine

## River Tweed SAC (England)

### Introduction

The River Tweed is the most species-rich example of a river with *Ranunculus* in the north-eastern part of its range. The river has a high ecological diversity which reflects the mixed geology of the catchment. Stream water-crowfoot *Ranunculus penicillatus* ssp. *pseudofluitans*, a species of southern rivers and streams, here occurs at its most northerly location as does fan-leaved water-crowfoot *R. Circinatus*,

<sup>26</sup> <http://publications.naturalengland.org.uk/publication/5015032228216832> [Accessed 04/11/2021]

<sup>27</sup> <https://sac.jncc.gov.uk/site/UK0030292> [Accessed 04/11/2021]

<sup>28</sup> <http://publications.naturalengland.org.uk/publication/5340976100933632> [Accessed 04/11/2021]

along with river water-crowfoot *R. Fluitans*, common water-crowfoot *R. Aquatilis*, pond water-crowfoot *R. Peltatus* and a range of hybrids. The river is also designated for Atlantic salmon, otter, sea lamprey, brook lamprey and river lamprey.

### Conservation Objectives<sup>29</sup>

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of qualifying species
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

### Qualifying Features

Annex I habitats that are primary reasons for selection of the site:

- Water courses of plain to montane levels with *Ranunculion fluitantis* and Callitriche-Batrachion vegetation.

Annex II species that are a primary reason for selection of this site:

- Atlantic salmon *Salmo salar*
- Otter *Lutra lutra*

Annex II species present as a qualifying feature but not as a primary reason for site selection:

- Sea lamprey
- River lamprey
- Brook lamprey *Lampetra planeri*

### Environmental Vulnerabilities<sup>30</sup>

- Water pollution
- Invasive species
- Physical modification
- Water abstraction

## Northumberland Marine SPA (England)

### Introduction

The Northumberland coast boasts four seabird colonies with significant populations of breeding seabirds: the Farne Islands, Croquet Island, Lindisfarne, and the Long Nanny. Coquet Island is the only regular breeding site for roseate terns in England. In addition, the Farne Islands support large numbers of breeding Atlantic puffin and common guillemot, and this is also true for Atlantic puffin at Coquet Island. Both Coquet Island and the Farne Islands are also areas where internationally important seabird

<sup>29</sup> <http://publications.naturalengland.org.uk/publication/4964678031638528> [Accessed 04/11/2021]

<sup>30</sup> <http://publications.naturalengland.org.uk/publication/5407765459632128> [Accessed 04/11/2021]

assemblages of over 20,000 individuals can be found. The breeding sites are protected under separate SPA designations. The Northumberland Marine SPA protects the marine waters around these colonies. The colonies use these waters for 'maintenance' activities such as bathing or preening and also use these waters for foraging.

### Conservation Objectives<sup>31</sup>

With regard to this SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

### Qualifying Features<sup>32</sup>

#### Breeding

- Sandwich tern *Sterna sandvicensis* – 19.66% of the GB population (5 year mean 2010-2014)
- Common tern *Sterna hirundo* – 12.86% of the GB population (5 year mean 2010-2014)
- Arctic tern *Sterna paradisaea* – 9.02% of the GB population (5 year mean 2010-2014)
- Roseate tern *Sterna dougallii* – 93.02% of the GB population (5 year mean 2010-2014)
- Little tern *Sternula albifrons* – 2.37% of the GB population (5 year mean 2010-2014)
- Atlantic puffin *Fratercula arctica* – 1.05% of the biogeographic population (5 year mean 2010-2014)
- Common guillemot *Uria aalge* – 1.72% of the biogeographic population (5 year mean 2010-2014)

The site holds an internationally important assemblage of seabirds. In the breeding season the area regularly supports 214,669 individual seabirds (5 year peak mean 2010-2014) including great cormorant *Phalacrocorax carbo*, black-headed gull *Chroicocephalus ridibundus*, and black-legged kittiwake *Rissa tridactyla*.

### Environmental Vulnerabilities<sup>33</sup>

- Public access/disturbance
- Invasive species
- Change in species distribution
- Predation
- Coastal squeeze
- Direct impact from third party
- Transportation and service corridors
- Change in land management
- Fisheries: commercial marine and estuarine

<sup>31</sup> <http://publications.naturalengland.org.uk/publication/4891545554649088> [Accessed 04/11/2021]

<sup>32</sup> <https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9020325.pdf> [Accessed 04/11/2021]

<sup>33</sup> <http://publications.naturalengland.org.uk/publication/5340976100933632> [Accessed 04/11/2021]



## Lindisfarne SPA / Ramsar (England)

### Introduction

The area comprises a range of coastal habitats, including rocky shore, sand dunes, saltmarsh and intertidal sand and mudflats, that support internationally important numbers of wintering waterfowl. The extensive intertidal flats of sand and silt contain abundant invertebrates, and also support beds of eelgrass *Zostera spp.*, important food sources for wintering birds. There is a large area of saltmarsh, especially around Holy Island Sands. The lower marsh is dominated by the introduced common cordgrass *Spartina anglica*, but at higher levels common saltmarsh-grass and thrift *Armeria maritima* are the main species. Extensive sand dunes are found on the eastern and northern parts of Holy Island, and on the mainland at Ross Links, between Holy Island and Budle Bay. The foredunes are dominated by marram, with older dunes supporting acidic communities including dune heath. Dominated by creeping willow *Salix arenaria* and cross-leaved heath *Erica tetralix*, the dune slacks are more species-rich.

### Conservation Objectives<sup>34</sup>

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

### Qualifying Features<sup>3536</sup>

Qualifying features of the SPA:

#### Breeding

- Roseate terns *Sterna dougallii* – 4 pairs – 5% of GB population
- Little terns *Sternula albifrons* – 42 pairs – 2% of GB population

#### Non-breeding

- Whooper swan *Cygnus cygnus* – 95 individuals – 2% of GB population
- Golden plover *Pluvialis apricaria* – 2,350 individuals – 1% of GB population
- Greylag geese *Anser anser* – 3,500 individuals – 3% of total population
- Light-bellied brent goose *Branta bernicla hrota* – 2,700 individuals – 68% of total population, 77% of GB population
- Shelduck *Tadorna tadorna* – 900 individuals – 1% of GB population
- Wigeon *Anas penelope* – 16,400 individuals – 2% of NW European population, 7% of GB population.
- Eider *Somateria mollissima* – 2,500 individuals – 5% of GB population
- Long-tailed duck *Clangula hyemalis* – 370 individuals

<sup>34</sup> <http://publications.naturalengland.org.uk/publication/4529235456688128> [Accessed 09/11/2021]

<sup>35</sup> <http://publications.naturalengland.org.uk/file/4511337522659328> [Accessed 04/11/2021]

<sup>36</sup> <https://jncc.gov.uk/jncc-assets/RIS/UK11036.pdf> [Accessed 09/11/2021]

- Common scoter *Melanitta nigra* – 670 individuals – 2% of GB population
- Red-breasted merganser *Mergus serrator* – 110 individuals – 1% of GB population
- Ringed plover *Charadrius hiaticula* – 490 individuals – 1% of East Atlantic Flyaway population, 2% of GB population
- Grey plover *Pluvialis squatarola* – 1,500 individuals – 7% of GB population
- Sanderling *Calidris alba* – 160 individuals – 1% of GB population
- Dunlin *Calidris alpina* – 9,000 individuals – 2% of GB population
- Bar-tailed godwit *Limosa lapponica* – 7,500 individuals – 7% of East Atlantic Flyaway population, 12% of GB population
- Common redshank *Tringa totanus* – 3,600 individuals – 5% of East Atlantic Flyaway population, 3% of GB population

Qualifying features of the Ramsar:

#### **Ramsar Criterion 1**

- The site contains extensive intertidal flats, together with a large area of saltmarsh, and major sand dune system with well-developed dune slacks.

#### **Ramsar Criterion 5**

Assemblages of international importance:

- Species with peak counts in the winter: 44970 waterfowl (5 year peak mean 1998/99 – 2002/03)

#### **Ramsar Criterion 6**

Species/populations occurring at levels of international importance:

Species with peak counts in the spring/autumn:

- Light-bellied brent goose – 2,799 individuals – 55.9% of the population (5 year peak mean 1998/99 – 2002/03)
- Eurasian wigeon – 10,857 individuals – 2.6% of the GB population
- Ringed plover – 114 individuals – average of 0.3% of the GB population
- Common redshank – 1,572 individuals – average of 1.3% of the GB population

Species with peak counts in winter:

- Greylag goose – 750 individuals – average of 0.9% of the GB population
- Bar-tailed godwit – 3,757 individuals – average of 3.1% of the population

Species/populations identified subsequent to designation for possible future consideration under Criterion 6

Species with peak counts in spring/autumn:

- Pink-footed goose *Anser brachyrhynchus* – 2,531 individuals – average of 1% of the population

#### **Environmental Vulnerabilities<sup>37</sup>**

- Public Access/disturbance
- Water pollution
- Invasive species
- Changes in species distributions

<sup>37</sup> <http://publications.naturalengland.org.uk/publication/5340976100933632> [Accessed 09/11/2021]

- Predation
- Coastal squeeze
- Direct impact from third party
- Transportation and service corridors
- Changes in land management
- Air pollution: risk of atmospheric nitrogen deposition
- Fisheries: commercial marine and estuarine

## Northumbria Coast SPA/Ramsar (England)

### Introduction

The Northumbria Coast SPA/Ramsar site comprises several discrete sections of rocky foreshore between Spittal, in the north of Northumberland, and an area just south of Blackhall Rocks in County Durham. These stretches of coast regularly support nationally important numbers of purple sandpiper and high concentrations of turnstone. The SPA/Ramsar site also includes an area of sandy beach at Low Newton, which supports an nationally important breeding colony of little terns, and parts of three artificial pier structures which form important roost sites for purple sandpiper.

### Conservation Objectives<sup>38</sup>

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

### Qualifying Features<sup>39</sup>

Qualifying features for the SPA:

- Little tern *Sternula albifrons* – 1.7% of the GB breeding population (5 year peak mean 1992/93 – 1996/97)
- Turnstone *Arenaria interpres* – 2.6% of the East Atlantic Flyaway population
- Purple Sandpiper *Calidris maritima* – 1.6% of the East Atlantic Flyaway population

Qualifying features for the Ramsar:

### Ramsar Criterion 6

Species/populations occurring at levels of international importance

Species regularly supported during the breeding season:

- Little tern – 43 apparently occupied nests – average of 2.2% of the GB population

Species with peak counts in the winter:

<sup>38</sup> <http://publications.naturalengland.org.uk/file/5211071631851520> [Accessed 09/11/2021]

<sup>39</sup> <http://publications.naturalengland.org.uk/file/4522374> [Accessed 09/11/2021]

- Purple sandpiper – 291 individuals – average of 1.6% of the GB population
- Turnstone – 978 individuals – average of 1% of the GB population

#### **Environmental Vulnerabilities<sup>40</sup>**

- Public Access/disturbance
- Changes in species distributions
- Predation
- Coastal squeeze
- Direct impact from third party
- Transportation and service corridors
- Changes in land management
- Fisheries: commercial marine and estuarine

## **Durham Coast SAC (England)**

### **Introduction**

Durham Coast SAC is the only example of vegetated sea cliffs on magnesian limestone exposures in the UK. These cliffs extend along the North Sea coast for over 20 km from South Shields southwards to Blackhall Rocks. Their vegetation is unique in the British Isles and consists of a complex mosaic of para-maritime, mesotrophic, and calcicolous grasslands, tall-herb fen, seepage flushes and wind-pruned scrub. Within these habitats rare species of contrasting phytogeographic distributions often grow together forming unusual and species-rich communities of high scientific interest. The communities present on the sea cliffs are largely maintained by natural processes including exposure to sea spray, erosion, and slippage of the soft magnesian limestone bedrock and overlying glacial drifts, as well as localised flushing by calcareous water.

### **Conservation Objectives<sup>41</sup>**

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats
- The structure and function (including typical species) of qualifying natural habitats, and
- The supporting processes on which the qualifying natural habitats rely

### **Qualifying Features<sup>42</sup>**

Annex I habitats that are a primary reason for selection of this site:

- Vegetated sea cliffs of the Atlantic and Baltic Coasts

### **Environmental Vulnerabilities<sup>43</sup>**

- Natural changes to site conditions
- Inappropriate coastal management

<sup>40</sup> <http://publications.naturalengland.org.uk/publication/5340976100933632> [Accessed 09/11/2021]

<sup>41</sup> <http://publications.naturalengland.org.uk/file/5518496490586112> [Accessed 09/11/2021]

<sup>42</sup> <https://sac.jncc.gov.uk/site/UK0030140> [Accessed 09/11/2021]

<sup>43</sup> <http://publications.naturalengland.org.uk/file/5185664152764416> [Accessed 09/11/2021]

- Invasive species
- Fertiliser use
- Vehicles: illicit
- Changes to site conditions
- Public access/disturbance

## Farne Islands SPA (England)

### Introduction

The Farne Islands are a group of low-lying islands 2-6 km off the coast of Northumberland in northeast England. They form the easternmost outcroppings of the Great Whin Sill of quartz dolerite, and although some islands retain cappings of boulder clay or peaty deposits, vegetation is limited to pioneer communities. Vegetation is further affected by the maritime conditions and large numbers of seabirds. The islands are important as nesting areas for these birds, especially terns, gulls, and auks. The seabirds feed outside the SPA in nearby waters, as well as more distantly in the North Sea.

### Conservation Objectives<sup>44</sup>

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

### Qualifying Features<sup>45</sup>

- Common tern *Sterna hirundo* – 183 pairs, 355 individuals – 1.69% of the GB population
- Atric tern *Sterna paradisaea* – 2,003 pairs, 4,006 individuals – 3.78% of the GB population
- Roseate tern *Sterna dougallii* – 13 pairs, 26 individuals – 1.88% of the GB population
- Sandwich tern *Sterna sandvicensis* – 862 pairs, 1,724 individuals – 7.84% of the GB population
- Common guillemot *Uria aalge* – 32,875 pairs, 65,751 individuals – 1.72% of *aalge* biogeographic population

During the breeding season the area supports 163,819 individual seabirds (2010-2014) including the 5 qualifying species listed above plus:

- Atlantic puffin *Fratercula arctica* – 76,798 breeding adults – 6.62% of the GB population
- Great cormorant *Phalacrocorax carbo* – 230 breeding adults – 1.37% of the GB population
- European shag *Phalacrocorax aristotelis* – 1,677 breeding adults – 3.11% of the GB population
- Black-legged kittiwake *Rissa tridactyla* – 8,241 breeding adults – 1.11% of the GB population

### Environmental Vulnerabilities<sup>46</sup>

<sup>44</sup> <http://publications.naturalengland.org.uk/file/6464920761925632> [Accessed 09/11/2021]

<sup>45</sup> <http://publications.naturalengland.org.uk/file/6255242773004288> [Accessed 09/11/2021]

<sup>46</sup> <http://publications.naturalengland.org.uk/file/5185664152764416> [Accessed 09/11/2021]

- Public access/disturbance
- Invasive species
- Changes in species distribution
- Predation
- Coastal squeeze
- Direct impact from third party
- Transportation and service corridors
- Change in land management
- Fisheries: commercial marine and estuarine

## Coquet Island SPA (England)

### Introduction

Coquet Island is located 1 km off the coast of Northumberland in north-east England. It is a small, flat-topped island with a plateau extent of approximately 7 hectares. The island consists of sandy soil and peat over a soft sandstone base. Low cliffs of approx. 2.4-3.7m high result from earlier quarrying. Surrounding the island is a rocky upper shore and intertidal covering 15 ha when fully exposed. There is a sandy beach on the south west of the island and the southeast corner is shingle and rock. A small, shallow, man-made well lies in the centre of the plateau, which is fed by non-potable surface water. The peaty soil of the plateau supports short fescue grassland (mainly *Festuca rubra* but with some *F. ovina*), with docks *Rumex spp.* and ragwort *Senecio jacobaea*. Maritime species such as sea campion *Silene maritima* and thrift *Armeria maritima* are scarce. Where nutrient input from seabird colonies is greatest, there are dense stands of taller species, including nettles *Urtica spp.* These provide cover for some of the nesting terns.

### Conservation Objectives<sup>47</sup>

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

### Qualifying Features<sup>48</sup>

- Common tern *Sterna hirundo* – 1,189 pairs, 2,378 individuals – 11.89% of the GB population
- Arctic tern *Sterna paradisaea* – 1,230 pairs, 2,460 individuals – 2.32% of the GB population
- Roseate tern *Sterna dougallii* – 80 pairs, 160 individuals – 93.02% of the GB population
- Sandwich tern *Sterna sandvicensis* – 1,300 pairs, 2,600 individuals – 11.82% of the GB population

During the breeding season the site supports 47,662 individual seabirds (2010-2014) including the four qualifying species listed above plus:

<sup>47</sup> <http://publications.naturalengland.org.uk/file/5254489456246784> [Accessed 09/11/2021]

<sup>48</sup> <http://publications.naturalengland.org.uk/file/6286141707255808> [Accessed 09/11/2021]

- Atlantic puffin *Fratercula arctica* – 31,686 breeding adults – 2.73% of the GB population
- Black-headed gull *Chroicocephalus ridibundus* – 7,772 breeding adults – 2.99% of the GB population

#### Environmental Vulnerabilities<sup>49</sup>

- Public access/disturbance
- Invasive species
- Changes in species distribution
- Predation
- Coastal squeeze
- Direct impact from third party
- Transportation and service corridors
- Change in land management
- Fisheries: commercial marine and estuarine

## Southern North Sea SAC (England)

### Introduction

The Southern North Sea SAC is an area of importance for harbour porpoise. This site includes key winter and summer habitat for this species and covers an area over three times the size of Yorkshire, making it the largest SAC in UK and European waters at the point of designation in 2019.

Located to the east of England, this site stretches from the central North Sea (north of Dogger Bank) to the Straits of Dover in the south, covering an area of 36,951 km<sup>2</sup>. The majority of this site lies offshore, though it does extend into coastal areas of Norfolk and Suffolk crossing the 12 nautical mile boundary.

A mix of habitats, such as sandbanks and gravel beds, are included in the site, which overlaps with Dogger Bank SAC; Haisborough, Hammond and Winterton SAC; and North Norfolk Sandbanks and Saturn Reef SAC.

### Conservation Objectives<sup>50</sup>

To ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status (FCS) for Harbour Porpoise in UK waters. In the context of natural change, this will be achieved by ensuring that:

- Harbour porpoise is a viable component of the site;
- There is no significant disturbance of the species; and
- The condition of supporting habitats and processes, and the availability of prey is maintained.

### Qualifying Features<sup>51</sup>

Annex II species that are a primary reason for selection of this site:

- Harbour porpoise *Phocoena phocoena*

### Environmental Vulnerabilities<sup>52</sup>

- Commercial fisheries with bycatch of harbour porpoise (predominantly static nets)

<sup>49</sup> <http://publications.naturalengland.org.uk/file/5185664152764416> [Accessed 09/11/2021]

<sup>50</sup> <https://data.jncc.gov.uk/data/206f2222-5c2b-4312-99ba-d59dfd1dec1d/SouthernNorthSea-conservation-advice.pdf> [Accessed 09/11/2021]

<sup>51</sup> <https://sac.jncc.gov.uk/site/UK0030395> [Accessed 09/11/2021]

<sup>52</sup> <https://data.jncc.gov.uk/data/206f2222-5c2b-4312-99ba-d59dfd1dec1d/SouthernNorthSea-conservation-advice.pdf> [Accessed 09/11/2021]



- Discharge/run-off from landfill, terrestrial and offshore industries
- Shipping, drilling, dredging and disposal, aggregate extraction, pile driving, acoustic surveys, underwater explosions, military activity, acoustic deterrent devices, and recreational boating activities
- Shipping, recreational boating and tidal energy installations
- Commercial fisheries (reduction in prey resources)

## Dogger Bank SAC (England)

### Introduction

Dogger Bank is the largest single continuous expanse of shallow sandbank in UK waters and a unique example of a relict sandbank formed by glacial processes in UK waters. Despite its location in open sea, Dogger Bank lies in relatively shallow water, with parts lying in less than 20m deep. This exposes the bank to substantial wave energy, preventing the colonisation of sand by vegetation on the shallower parts of the bank. The bank extends into both Dutch and German waters. It is home to a variety of species which live both on and within the sandy sediment such as flat fish and long thin silver sand eels. The latter can be found on the sides of the sandbank and are food for many seabirds, whales and dolphins and fish such as cod.

The Crown Estate has completed its work on the Round 4 Plan-Level HRA to assess the potential impacts of the six (offshore wind) projects identified through the Round 4 tender process (the "Round 4 plan") which includes Dogger Bank SAC.

### Conservation Objectives<sup>53</sup>

The Annex I sandbank feature is currently in unfavourable condition. For the feature to be in favourable condition thus ensuring site integrity in the long term and contribution to Favourable Conservation Status of Annex I Sandbanks which are slightly covered by seawater all the time.

This contribution would be achieved by maintaining or restoring, subject to natural change:

- The extent and distribution of the qualifying habitat in the site;
- The structure and function of the qualifying habitat in the site; and
- The supporting processes on which the qualifying habitat relies.

### Qualifying Features<sup>54</sup>

Annex I habitats that are a primary reason for site selection:

- Sandbanks which are slightly covered by sea water all the time

### Environmental Vulnerabilities<sup>55</sup>

- Demersal fishing
- Oil and gas industry
- Aggregates
- Cabling
- Renewable energy

<sup>53</sup> <https://data.jncc.gov.uk/data/26659f8d-271e-403d-8a6b-300defcabcb1/DoggerBank-2-ConservationObjectives-v1.0.pdf> [Accessed 09/11/2021]

<sup>54</sup> <https://sac.jncc.gov.uk/site/UK0030352> [Accessed 09/11/2021]

<sup>55</sup> <https://data.jncc.gov.uk/data/26659f8d-271e-403d-8a6b-300defcabcb1/DoggerBank-4-Statements-v1.0.pdf> [Accessed 09/11/2021]

