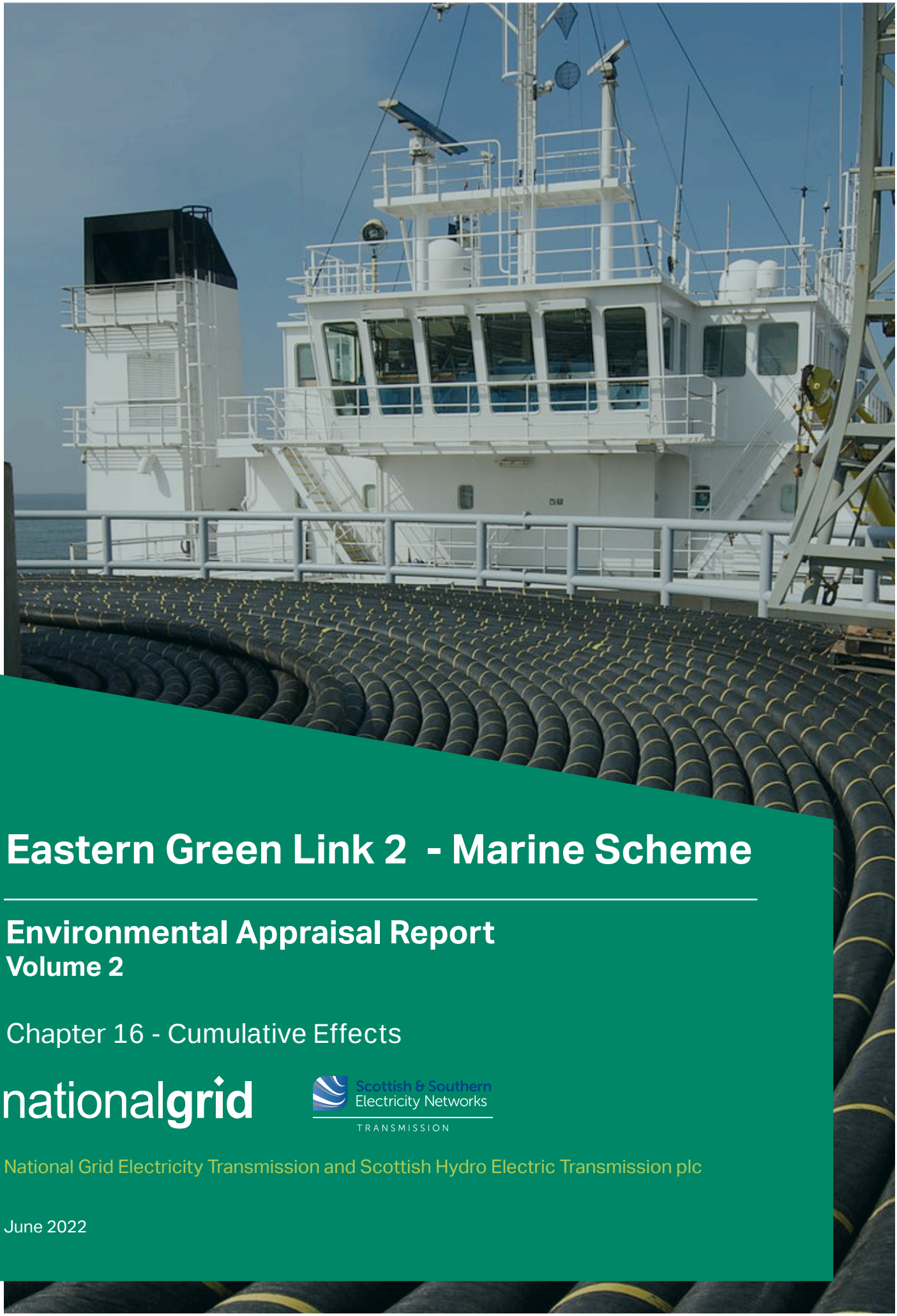


Eastern Green Link 2 - Marine Scheme

Environmental Appraisal Report
Volume 2

Chapter 16 - Cumulative Effects

nationalgrid

Scottish & Southern Electricity Networks
TRANSMISSION

National Grid Electricity Transmission and Scottish Hydro Electric Transmission plc

June 2022

Prepared for:

National Grid Electricity Transmission and
Scottish Hydro Electric Transmission Plc

Prepared by:

AECOM UK Limited
1 Tanfield
Edinburgh EH3 5DA
United Kingdom

T: +44 131 301 8600
aecom.com

In association with:

Xodus Group (Shipping and Navigation);

Wessex Archaeology (Marine Archaeology); and

Brown and May Marine Ltd (Commercial Fisheries).

Table of Contents

Figures

Tables

16. Cumulative and In-Combination Effects

16.1 Introduction

This chapter of the Environmental Appraisal Report (EAR) reports the appraisal of cumulative and in-combination effects arising from the Marine Scheme. The general approach to the cumulative appraisal is described in Section 4.5 of Chapter 4: Approach to Environmental Appraisal.

The cumulative effects appraisal of the Marine Scheme considers the following types of effect:

- Cumulative Effects: These effects, sometimes referred to as inter-project effects, derive from scheme-specific impacts which, when considered together with the impacts of other planned developments, could result in a new or different significant effect or an effect of greater significance than the scheme's effect when considered in isolation; and
- In-Combination Effects: These effects, sometimes referred to as intra-project effects, derive from combinations of different scheme-specific impacts which, when acting together on the same receptor, would result in a new or different effect(s) or an effect of greater significance than one impact would result in, when considered in isolation.

The appraisal has been based on the best available data from other plans, projects, marine activities, and associated information that is currently in the public domain, or which has been provided to the Marine Scheme. The appraisal has assumed that publicly available information is accurate and has relied on collaboration with a range of statutory consultees to the Marine Licensing process, neighbouring authorities and other developers to identify changes in information which may be relevant to the appraisal. It has also been tailored to the feedback received during the non-statutory scoping process; further information on this is provided in Section 16.3.1.

16.2 Legislation, Policy and Guidance

As this appraisal is non-statutory, there is no overarching legislative requirement to identify and report on cumulative and in-combination effects, although a cumulative and in-combination effects appraisal has been undertaken to inform decision making in respect to the Marine Licence Applications for the Marine Scheme. The Marine Policy Statement (MPS) provides the policy framework for the marine planning system in the UK and set outs the following regarding cumulative effects (HM Government 2011):

> *'when considering potential benefits and adverse effects, decision makers should also consider any multiple and cumulative impacts of proposals in the light of other projects and activities'*

The MPS sets out the framework for preparing Marine Plans which detail priorities for future development, inform sustainable use of marine resources and help marine users understand their environment (HM Government , 2021). The MPS states that when considering potential benefits and adverse effects, decision makers should consider any multiple and cumulative impacts of proposals, in the light of other projects and activities (HM Government, 2011). The MPS also states that:

> "*The marine plan authority will need to consider the potential cumulative impact of activities and, using best available techniques, whether for example:*
>
> - *The cumulative impact of activities, either by themselves over time or in conjunction with others, outweigh the benefits;*
> - *A series of low impact activities would have a significant cumulative impact which outweighs the benefit; or,*
> - *An activity may preclude the use of the same area/resource for another potentially beneficial activity."*

The relevant marine plans in both Scotland and England state the importance of identifying and mitigating cumulative effects during planning of development. For example, Scotland's National Marine Plan (Scottish Government, 2015) states in policy GEN21:

> "*Cumulative impacts affecting the ecosystem of the marine plan area should be addressed in decision making and plan implementation*."

The North East Inshore and North East Offshore Marine Plan (HM Government, 2021) states in policy NE-CE-1:

> "*Proposals which may have adverse cumulative effects with other existing, authorised or reasonably foreseeable proposals must demonstrate that they will, in order of preference:*
>
> *a) Avoid*
> *b) Minimise*
> *c) Mitigate adverse cumulative and/or in-combination effects so they are no longer significant."*

Whilst the East Inshore and East Offshore Marine Plans (HM Government, 2014) states in policy ECO1:

> "*Cumulative impacts affecting the ecosystem of the East marine plans and adjacent areas (marine, terrestrial) should be addressed in decision-making and plan implementation*."

The consideration of cumulative and in-combination effects as part of the decision-making process is also set out in Regulation 28 of The Conservation of Offshore Marine Habitats and Species Regulations 2017, which states that:

> *"28.(1) Before deciding to undertake, or give consent, permission or other authorisation for, a relevant plan or project, a competent authority must make an appropriate assessment of the implications of the plan or project for the site in view of that site's conservation objectives.*
>
> *(2) In paragraph (1), a "relevant plan or project" is a plan or project which –*
>
> *(a) is to be carried out on or in any part of the waters or on or in any part of the seabed or subsoil comprising the offshore marine area, or on or in relation to an offshore marine installation;*
>
> *(b) is likely to have a significant effect on a European offshore marine site or a European site (either alone* ***or in combination with other plans or projects****), and*
>
> *(c)is not directly connected with or necessary to the management of the site,*

Regulation 63 of The Conservation of Habitats and Species Regulations 2017 (as amended), states that:

> *"63.(1) A compe*tent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which
>
> *(a) is likely to have a significant effect on a European site or a European offshore marine site (either alone* ***or in combination with other plans or projects****),* and
>
> *(b) is not directly connected with or necessary to the management of that site,*
>
> *must make an appropriate assessment of the implications of the plan or project for that site in view of that site's* conservation objectives."

Furthermore, in Regulation 48 of The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) in Scotland, states that:

> *"48.(1) A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which–*
>
> *(a)is likely to have a significant effect on a European site in Great Britain (either alone* ***or in combination with other plans or projects****), and*

(b)is not directly connected with or necessary to the management of the site,

shall make an appropriate assessment of the implications for the site in view of that site's conservation objectives."

The legislation combined are collectively referred to as 'the Habitats Regulations' and consideration of in-combination effects in the context of the Habitats Regulations is given in EAR Appendix 8.1: Habitats Regulations Assessment Report.

16.2.1 Guidance

In addition to the MPS, the following guidance and advice has been used to inform the scope of the cumulative and in-combination effects appraisal, and to assist the identification and mitigation of likely significant effects:

- **Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects**: Although the Marine Scheme is not defined as a nationally significant infrastructure project, the approach set out in this advice note can be applied to a range of project types. This has been applied when undertaking a staged process of identification and appraisal of other planned developments within the appraisal (Planning Inspectorate, 2019);
- **A Strategic Framework for Scoping Cumulative Effects**: A framework for scoping cumulative effects of marine activities across the strategic, regional, and individual project level (MMO, 2014). This has been considered by this appraisal when undertaking the staged process detailed below; and
- **Consenting and Licensing Guidance:** For Offshore Wind, Wave and Tidal Energy Applications: Guidance on applying for consents and marine licences for offshore renewable energy projects within both Scottish territorial and offshore waters (Marine Scotland, 2018). Again, the Marine Scheme is not related to an offshore wind, wave or tidal energy application, but aspects of the guidance have been applied.

The approach to the appraisal of cumulative and in-combination effects has accordingly been informed by these documents, as was proposed as part of the non-statutory scoping exercise.

16.3 Approach to Cumulative and In-Combination Appraisal

16.3.1 Summary of Consultations

A non-statutory scoping report was submitted to, and consulted on, by the Marine Scotland Licensing Operations Team (MS-LOT) and the Marine Management Organisation (MMO). Scoping responses were received on 06 September 2021 and 03 November 2021 respectively, which identified aspects of the Marine Scheme that have the potential to result in cumulative effects during the Installation, Operation and Maintenance and Decommissioning Phases. Their feedback on the proposed scope of the EAR has been considered as part of the cumulative and in-combination appraisal.

Further details of the consultation process and associated responses are presented in Chapter 6: Consultation and Stakeholder Engagement, with all scoping related comments captured within Appendix 6-1.

16.3.2 Cumulative Appraisal Methodology

In accordance with the approach contained within Advice Note Seventeen (PINS, 2019), the following stages were followed when carrying out the cumulative appraisal:

- Stage 1: Establishing the Long List of Other Developments;
- Stage 2: Establishing the Short List of Other Developments;
- Stage 3: Information gathering; and
- Stage 4: Assessment.

16.3.2.1 Study Area

PINS (2019) recommend that the spatial and temporal impacts of a project be determined to help identify a long list of other development likely to result in significant cumulative effects.

An initial search area from the Marine Installation Corridor was defined for all developments based on a maximum Zone of Influence (ZoI) as discussed in Section 16.3.2.4. This was to allow for overlap in ZoI between the Marine Scheme and other developments.

16.3.2.2 Factors Considered in the Appraisal

The appraisal of cumulative effects has considered the effects on environmental resources and receptors that would likely occur from the incremental changes arising from the Marine Scheme in conjunction with other planned developments.

The process has been guided by the following considerations:

- Understanding the temporal and spatial limits of the effects associated with the Marine Scheme and those of other planned developments;
- The sensitivity, value or importance of the environmental resources or receptors and their susceptibility to effects;
- Whether different types of effect would occur and interact in a way that alters their significance;
- Whether effects would be temporary or permanent, what would their timescale be, and whether the frequency of such effects would be intermittent or constant;
- Whether effects would require any additional mitigation measures to reduce their significance; and
- The degree of certainty and confidence relating to the effects.

16.3.2.3 Existing and Future Baseline Conditions

The appraisal has identified the existing baseline conditions that have the potential to be affected by the Marine Scheme; this involved a review of information relating to known, or the likely presence of, environmental receptors within defined study areas to determine their relative value, importance or sensitivity to change. The process also considered how the existing baseline conditions will likely evolve and change over time (referred to as the future baseline), reflecting the environmental conditions likely to exist immediately prior to the Installation Phase activities of the Marine Scheme.

In establishing the future baseline, professional judgement was used to take account of the following variables that could occur:

- Changes from natural events, trends and evolution;
- Changes in environmental values;
- Changes to the strategic drivers for the Marine Scheme; and
- Changes introduced as a consequence of future development plans and/or projects.

In relation to fully operational or future development projects, developments that will be completed by the start of the Installation Phase activities in 2025 have been considered as part of the baseline conditions reported in Chapters 7 to 15 of the EAR. These projects therefore are not considered as part of the cumulative and in-combination appraisal reported by this chapter. Based on available information relating to their geographic relationship to the Marine Scheme and their implementation timescales, these comprise the following:

- Aberdeen Harbour Extension;
- Blyth Offshore Demonstrator Array 4 (Phase 2);
- Dogger Bank A and B Offshore Wind Farm and Export Cable;
- Inch Cape Offshore Wind Farm;
- Marine Licences and Application: MLA/2020/00489. UXO Clearance. Incineration of any substance or object at sea for the Sofia Offshore Wind Farm Marine Export Cable;
- Neart na Gaoithe Offshore Wind Farm;
- North Sea Link Cable;

- NorthConnect High Voltage Direct Current (HVDC) Link;
- Sea Wall Repair and Extension – Alexandra Parade, Peterhead; and
- Seagreen (Alpha) Offshore Wind Farm.

16.3.2.4 Staged Appraisal

Developments that have yet to be constructed or consented, but which are expected to come forwards in the future, have been evaluated as part of the cumulative effects appraisal reported in this chapter.

Identified developments were reviewed and sifted using the staged methodology described above, in order to establish which projects should be taken forwards for consideration in the cumulative appraisal.

Stage 1: Establishing a long list of other existing development and/or approved development

The maximum study area or cumulative ZoI is defined in Table 16-1 for each environmental topic. This is based on the ZoI for the technical appraisals reported in Chapters 7 to 15 and an assumption that sensitive receptors affected at the furthest extent of the Marine Scheme ZoI would also be at the furthest extent of a theoretical ZoI for other developments.

Table 16-1: Zones of Influence

Receptor Group	Maximum ZoI	ZoI for Cumulative Appraisal
Physical Environment	1.5 km	• Temporary increases in suspended sediment concentrations (SSC): Coarse materials in the sediment plume will redeposit at seabed within the Marine Installation Corridor (estimated 240 m travel distance). Any other particles will travel up to 1.5 km from the point where they are mobilised, beyond this distance there will be no discernible increase above background as a result of dilution; and • See Chapter 7: Physical Environment Section 7.6 for further information.
Benthic Ecology	1.5 km	• Temporary physical disturbance during route preparation: up to 25 m footprint; • Permanent loss of habitat and species: up to 12 m wide within Marine Installation Corridor; • Temporary increases in SSC: 1.5 km from the Marine Installation Corridor; • Temporary changes to marine water quality: footprint of the proposed works plus 1.5 km buffer; • Disturbance due to submarine cable thermal emissions: ~1 m from cable depending on heat carrying capacity of particular sediment; and • Disturbance due to cable electromagnetic field emissions: up to 20 m from cable.
Fish and Shellfish	1.5 km	• Temporary physical disturbance during route preparation: up to 25 m footprint; • Permanent habitat loss during route preparation: The footprint of rock protection and/ or concrete mattresses on the seabed; and • Temporary increases in SSC: 1.5 km from the Marine Installation Corridor.
Marine Mammals	Greater North Sea Ecoregion	• The ZoI for marine mammals encompasses the Greater North Sea Ecoregion[1] and recognises the highly mobile and transient nature of marine mammal species and the potential implications of local impacts on wider species populations.
Ornithology	North Sea	• The ZoI for ornithology recognises the highly mobile and transient nature of seabirds and is informed, in part, by their distribution at sea (i.e. Waggitt et al, 2020) and foraging ranges from breeding colonies (i.e. Woodward, et al., 2019)
Marine Archaeology	0 km (spatial extent of the Marine Scheme)	• Given the highly localised nature of direct impacts on marine archaeological receptors, the ZoI for cumulative appraisal is considered to be the spatial extent of the Marine Scheme within UK waters; and • Indirect impacts relating to burial of marine archaeological assets through sediment transport pathways (see ZoI for Physical Environment).

[1] The Greater North Sea ecoregion includes the North Sea, English Channel, Skagerrak, and Kattegat

Receptor Group	Maximum ZoI	ZoI for Cumulative Appraisal
Shipping and Navigation	5 nautical mile (NM) (9.26 km)	• Vessel navigation routes within, crossing, or directly affected by the Marine Scheme, within 5 NM of the Marine Installation Corridor centreline.
Commercial Fisheries	80 km	• The International Council for the Exploration of the Sea (ICES) rectangles within which the Marine Scheme is located: – ICES rectangles 42E8 and 43E8: located in Scottish waters, encompass the northern part of the Marine Installation Corridor (rectangle 43E8 includes the area around the Scottish landfall); – ICES rectangles 40E8, 41E8 and 41E9: partly located in both Scottish and English waters, include the middle sections of the Marine Installation Corridor; and – ICES rectangles 37E9, 37F0, 38E9, 38F0, 39E9, 40E9: located in English waters, encompass the southern section of the Marine Installation Corridor including the area around the English landfall (rectangle 37E9).
Other Sea Users	10 km	• Temporary disturbance to marine recreational users in shallow waters: 10 km from Marine Installation Corridor (defined by the extent to which other sea users may be directly or indirectly impacted by the Marine Scheme); • Temporary disturbance to vessel routeing in deep waters and access to other sea user working areas: 500 m from Marine Installation Corridor; and • Damage to or interference with a third-party cable or pipeline asset: The Marine Installation Corridor.

The largest ZoI used in the technical chapters for the Marine Scheme is 10 km, with the exception of Chapter 10: Marine Mammals, Chapter 11: Ornithology and Chapter 14: Commercial Fisheries. The ZoI for these chapters was significantly larger (see Table 16-1:); however, the number of projects within these larger ZoIs would have led to a disproportionate level of appraisal. Accordingly, a 20 km (10 km in either direction) ZoI was considered appropriate and proportionate for the cumulative effects appraisal for these receptor groups (furthermore, this distance also covered an area containing more distant projects/plans requested by stakeholders for consideration, as detailed within Chapter 6: Consultation and Stakeholder Engagement).

Based on a 20 km ZoI, an initial long list of other developments was identified and agreed at the non-statutory scoping stage; this was subsequently updated using the data sources listed in Section 16.4.1. These are presented in Table 16-3, and on Figure 16-1.

Stage 2: Establishing a shortlist of other existing development and/or approved development

This stage involved reviewing the long list of planned developments to identify those to be taken forward into the cumulative effects appraisal. Shortlisting was informed by factors including availability of published information regarding the likely environmental impacts and effects of projects; the geographical relationship of projects to the Marine Scheme; the potential for temporal (timescale) overlaps between projects and the Marine Scheme; and the current status and position of projects in the planning process.

Following shortlisting, a number of projects were discounted from further consideration. For those taken forwards, more detailed information gathering was subsequently undertaken during Stage 3 to assist the identification of cumulative effects.

Stage 3: Information gathering

This stage involved reviewing available information relating to the shortlisted developments to establish their likely environmental impacts and effects, including a review of information sources such as published scoping reports, environmental appraisals and Environmental Statements.

Stage 4: Appraisal

This stage involved a review of the likely environmental impacts and effects of each shortlisted project against those identified in the appraisals of the Marine Scheme, to determine where cumulative effects would be likely to occur on environmental resources and receptors common to both projects. Where

impacts were identified as being likely to occur, the significance of the resulting cumulative effects was then determined.

16.3.2.5 Data Sources and Limitations

Projects and project types considered within the staged cumulative appraisal included, but were not limited to, the following:

- Other (onshore) components associated with Eastern Green Link 2;
- Offshore wind farms and associated cables;
- Other cables and pipelines;
- Oil and gas infrastructure;
- Carbon capture, utilisation and storage;
- Marine aggregate sites (including areas identified as having large-scale potential for marine aggregate extraction);
- Licenced disposal sites;
- Coastal energy; and
- Coastal protection.

Data on these and other projects, plans, and activities were established through desk-based review of published information from the following sources:

- MMO Public Register (2022);
- MS-LOT Public Register (Marine Scotland, 2022);
- KIS-ORCA Marine Cables Information (2021);
- National Infrastructure Planning website (2022);
- The Crown Estate website (The Crown Estate, 2021);
- The Crown Estate Scotland website (The Crown Estate Scotland, 2022);
- Department for Business, Energy, and Industrial Strategy (BEIS) Oil and Gas Asset Map (OGA, 2021); and
- The following development websites:
  - Seagreen Windfarm Project website (2022);
  - Berwick Bank and Marr Bank Project website (previously known as Seagreen 2 and Seagreen (SSE Renewables, 2022);
  - Inch Cape Wind Farm project website (Inch Cape Offshore Limited, 2022);
  - Dogger Bank Wind Farm Project website (Dogger Bank Wind Farm, 2022);
  - Hornsea Project Four Project website (Orsted, 2022);
  - Neart na Gaoithe Wind Farm Project website (EDF Renewables, 2022);
  - NorthConnect HVDC Link (NorthConnect, 2022);
  - Northern Endurance Partnership websites (Northern Endurance Partnership, 2022);
  - East Coast Cluster website (East Coast Cluster, 2022a); and
  - North Sea Network (NSN) Link Cable Corridor Project website (Statnett and National Grid, 2022).

The data is subject to the following limitations and/or assumptions:

- Given the timeframes for the Marine Scheme, the information for some other projects (such as timescales and detailed construction information) is not available at the stage when this EAR was finalised. A ‘watching brief’ was maintained on these sources as the Marine Scheme progressed through the environmental appraisal process, such that the most appropriate level of information has been used for the appraisal at the time of submission;
- Where information was not available, but an assumption of the spatial extent of an impact could be inferred based on expert knowledge, these projects have been taken forward for appraisal;

- Where there was limited information or not enough certainty to carry out the cumulative appraisal, these projects have been scoped out. It should be noted that best efforts have been made to either source publicly available information or contact appropriate developers prior to the decision to scope out a project based on lack of information. This process is in line with the guidance (MMO, 2014) and ensures that only cumulative effects for which there is a high degree of confidence are appraised; and
- Third party and publicly available data is correct at the time of publication of the EAR.

16.3.2.6 Appraisal Criteria

The significance of cumulative effects has been determined based on the criteria outlined in Table 16-2. Effects of moderate, large and very large significance constituted significant cumulative effects.

Table 16-2: Criteria used to determine the significance of cumulative effects

Significance category	Typical descriptors of effect
Very large (typically adverse only)	Where the cumulative impacts of the Marine Scheme in association with other developments upon an individual or collection of environmental receptors would be very highly significant (positive or negative). Effects would be permanent for receptors of very high value.
Large (adverse or beneficial)	Where the cumulative impacts of the Marine Scheme in association with other developments upon an individual or collection of environmental receptors would be highly significant (positive or negative). Effects would be widespread and permanent for receptors of high value or localised and temporary for receptors of very high value.
Moderate (adverse or beneficial)	Where the cumulative impacts of the Marine Scheme in association with other developments upon an individual or collection of environmental receptors would be significant (positive or negative). Effects would be permanent for receptors of medium value or localised and temporary for receptors of high value.
Sight (adverse or beneficial)	Where the cumulative impacts of the Marine Scheme in association with other developments upon an individual or collection of environmental receptors would be noteworthy but not significant (positive or negative). Effects would be permanent for receptors of low value or localised and temporary for receptors of medium value.
Neutral	Where the cumulative impacts of the Marine Scheme in association with other developments upon an individual or collection of environmental receptors would be negligible and not significant (positive or negative).

16.3.3 In-Combination Effects Appraisal Methodology

The in-combination effects appraisal methodology involved the identification of impact interactions associated with the Marine Scheme upon individual environmental resources and receptors, to understand the overall combined environmental effect of the Marine Scheme.

Potential interactions have been identified by reviewing the conclusions presented within each technical appraisal chapter in this EAR to establish where individual impacts may interact together and result in combined effects.

The significance of in-combination effects upon environmental receptors and resources has been determined using professional judgement.

16.4 Appraisal of Cumulative Effects

16.4.1 Stage 1: Establishing a long list of other existing development and/or approved development

Table 16-3 presents the long list of other developments.

Table 16-3: Long list of Other Developments to be Considered within the Cumulative Appraisal

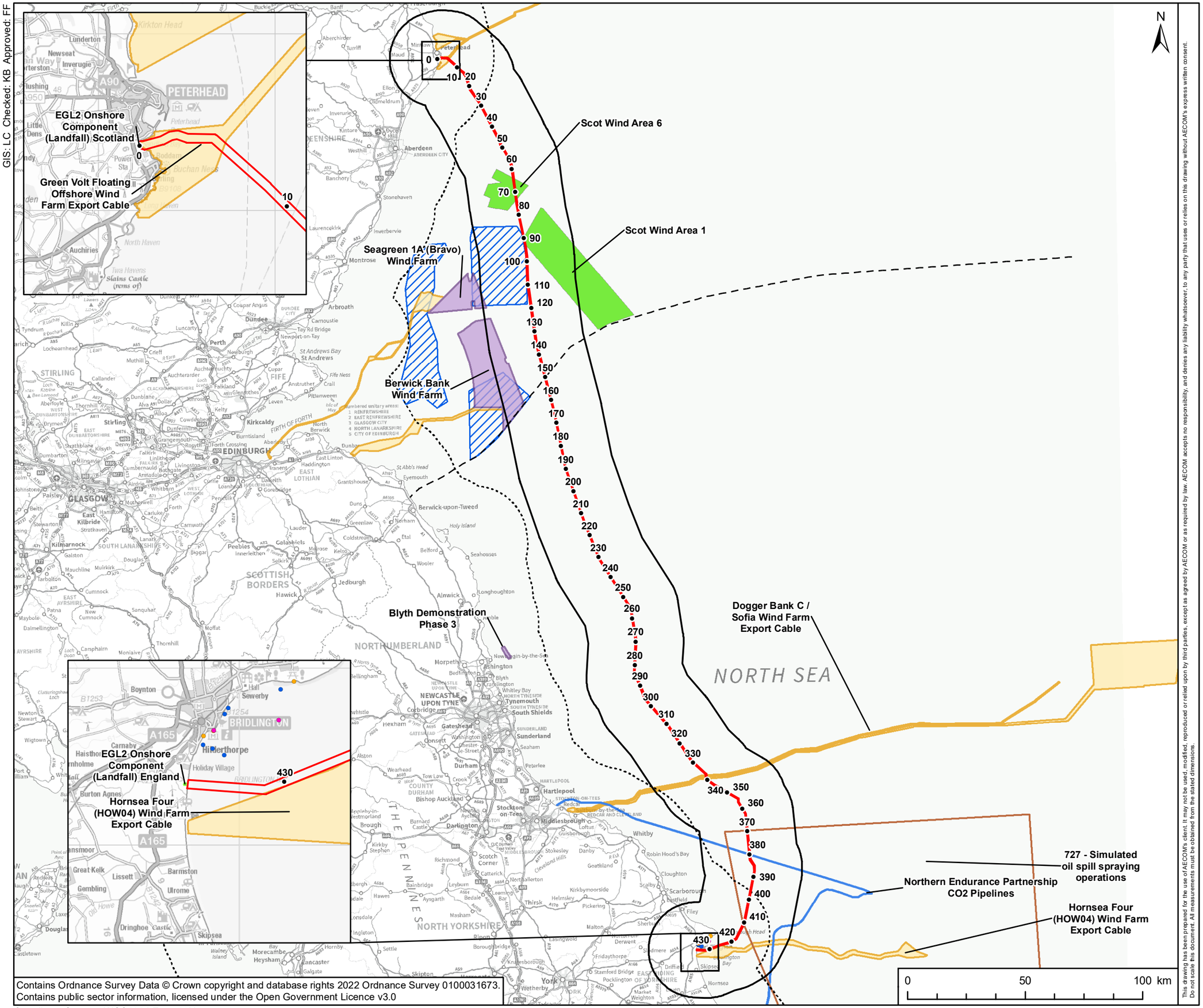
Project	Owner	Status	Distance to the Marine Installation Corridor (and KP point measured from)	Stage 1: Within maximum ZoI study area of 20 km (if yes, progress to Stage 2)	Stage 2			Progress to Stage 3/4?
					Temporal overlap	Scale and nature likely to have potential significant effect	Other factors	
Other Components of Eastern Green Link 2								
Eastern Green Link 2 – Scottish Onshore Components	SHE Transmission	Application submitted	0 km – Joins to KP0 Overlap between Mean High Water Spring (MHWS) and Mean Low Water Spring (MLWS)	Yes	Yes	No significant residual effects reported by Environmental Appraisal for the Scottish Onshore Scheme. There are no overlapping ZoI for ornithological receptors. Irrespective of this no significant effects are predicted on ornithological receptors during any phase of the Marine Scheme (see Section 11.8).	Use of HDD results in a spatial separation between the onshore and offshore activities associated with the schemes of the Project. Cumulative effects are considered unlikely to occur.	No
Eastern Green Link 2 – English Onshore Components	National Grid	Planning	0 km - Joins to KP436 Overlap between MHWS and MLWS	Yes	Yes	No significant residual effects reported by Environmental Impact Assessment (EIA) for the English Onshore Scheme. No potential for overlapping ZoI for marine ornithological receptors at the coastal interface due to the use of HDD installation methods. Irrespective of this, significant concentrations of marine ornithological receptors are reported as generally absent from the ZoI at the coastal interface between the onshore and offshore components of the Project.		No
Offshore Windfarms and Associated Cables								
Green Volt - Floating Offshore Wind Farm Export Cable	Green Volt Offshore Wind Ltd	Scoping Opinion received April 2022/ Pre-application	Intersects Marine Installation Corridor between KP0 and KP5	Yes	Yes	Potential for simultaneous operations to be required as Installation and Operation and Maintenance Phases overlap between the proposed development and the Marine Scheme. There is therefore potential for ZoIs to overlap between the two schemes where the export cable and the Marine Scheme intersect near their Scottish landfalls.		Yes, although only within ZoI from location where export cable and Marine Scheme are in close proximity on approaches to the Scottish landfall.
ScotWind - Offshore Wind Proposed Site 6 (ScotWind Plan Option E3)	Deme, Aspiravi and Qair	Pre-planning	Intersects Marine Installation Corridor between KP64 and KP73	Yes	No construction programme is available so worst-case temporal overlap is assumed.	Very limited environmental information available but considered unlikely.	Unlikely to cause cumulative effects with Marine Scheme; however, progress to Stage 3 due to proximity.	Yes
ScotWind - Offshore Wind Proposed Site 1 (ScotWind Plan Option E1)	BP Alternative Energy Investments and EnBW	Pre-planning	Intersects Marine Installation Corridor between KP91 and KP92	Yes	No construction programme is available so worst-case temporal overlap is assumed.	Very limited environmental information available but considered unlikely.	Unlikely to cause cumulative effects with Marine Scheme; however, progress to Stage 3 due to proximity.	Yes
Seagreen 1A (Bravo) Offshore Wind Farm	Seagreen Alpha Wind Energy Limited	A screening report was submitted in January 2022. Section 36C Application submitted April 2022. Construction planned to commence 2025. Plans to be operational by 2030	18.71 km from KP117	Yes	Yes.	Considered that there is potential for operational cumulative effects on commercial fisheries only due to permanent loss of fishing grounds associated with presence of cable protection and fishing gear snagging risk. There is also a potential for cumulative effects associated with shipping and navigation as a result of the proximity of the two schemes.		Yes, for commercial fisheries and shipping and navigation only.

Project	Owner	Status	Distance to the Marine Installation Corridor (and KP point measured from)	Stage 1: Within maximum ZoI study area of 20 km (if yes, progress to Stage 2)	Stage 2			Progress to Stage 3/4?
					Temporal overlap	Scale and nature likely to have potential significant effect	Other factors	
Berwick Bank Offshore Wind Farm	Seagreen Wind Energy / TotalEnergies and SSE Renewables	Currently at the Scoping stage, Scoping Report submitted in October 2021. Construction planned to commence 2025. Plans to be operational by 2030.	11.42 km from KP158	Yes	Yes	Considered that there is potential for operational cumulative effects on commercial fisheries only due to permanent loss of fishing grounds associated with presence of cable protection and fishing gear snagging risk. There is also a potential for cumulative effects associated with shipping and navigation as a result of the proximity of the two schemes.		Yes, for commercial fisheries and shipping and navigation only.
Blyth Offshore Demonstrator Array 3a – Phase 3 (i.e., tranche 3 of 3)	Blyth Offshore Demonstrator Limited	Site is consented, along with Phase 1 and 2. However, Array 3a is no longer being developed under the issued consent.	45.48 km from KP283	No	Developer confirmed in variation to Marine Licence that Phase 3a is no longer being progressed.			
Dogger Bank C Export Cable / Sofia Export Cable	SSE/ Equinor	Approved. Offshore construction planned to commence in 2023. Operational in 2026	0 km – Crosses at KP338 and KP339	Yes	Yes	Potential for simultaneous operations to be required as construction and operational phases overlap between the proposed development and the Marine Scheme. There is therefore potential for ZoI to overlap between the two schemes in the location where the export cables and the Marine Scheme overlap.		Yes, although only within ZoI from location where export cables and Marine Scheme overlap.
Hornsea Project Four (HOW04) - Offshore Wind Site Export Cable	Orsted	Application submitted to PINS for examination. Examination closing date 22 August 2022. Construction planned 2024-2029.	Runs adjacent to Marine Installation Corridor between KP425 to KP431	Yes	Yes	Potential for simultaneous operations to be required as construction and operational phases overlap between the proposed development and the Marine Scheme. There is therefore potential for ZoI to overlap between the two schemes in the location where the export cables and the Marine Scheme run adjacent to each other on the approaches to the English landfall.		Yes, although only within ZoI from location where export cable and Marine Scheme are in close proximity on approaches to the English landfall.
Other Cables and Pipelines								
Central North Sea Electrification Cable	BP – Harbour – Shell – Total Energies	Concept selection expected in 2022. Aims for delivery of low carbon electrical power to assets by 2030.	Intersects Marine Installation Corridor between KP0 to KP5.	Yes	No construction programme is available so worst-case temporal overlap is assumed.	No environmental information available but significant effects considered unlikely.	Unlikely to cause cumulative effects with Marine Scheme.	No
Jersey Oil and Gas Proposed Cable	Jersey Oil and Gas	Concept. Pre-planning	Intersects Marine Installation Corridor at KP3.1.	Yes	No construction programme is available so worst-case temporal overlap is assumed.	No environmental information available but significant effects considered unlikely.	Unlikely to cause cumulative effects with Marine Scheme.	No
Northern Endurance Partnership (NEP) carbon dioxide (CO_2) Pipelines (Teesside and Humber)	Northern Endurance Partnership	Scoping Report submitted September 2021. Installation of pipelines to commence in 2024. With construction complete by 2026.	Teesside Pipeline intersects Marine Installation Corridor at KP380 and the Humber Pipeline is located 13.2 km east of KP410.	Yes	Yes	Potential for simultaneous operations to be required as construction and operational phases overlap between the proposed development and the Marine Scheme. There is therefore potential for ZoI to overlap between the two schemes in the location where the export cables and the Marine Scheme overlap.		Yes, for commercial fisheries and shipping and navigation only for both Teesside and Humber Pipelines and for other receptors for Teesside Pipeline only.

Project	Owner	Status	Distance to the Marine Installation Corridor (and KP point measured from)	Stage 1: Within maximum ZoI study area of 20 km (if yes, progress to Stage 2)	Stage 2			Progress to Stage 3/4?
					Temporal overlap	Scale and nature likely to have potential significant effect	Other factors	
Altantic Super Connector Cable	Atlantic SuperConnection LLP	Concept. Connection Agreement secured for Creyke Becke Substation.	Unknown	Unknown, assumed yes	No construction programme is available so worst-case temporal overlap is assumed.	No environmental information available but significant effects considered unlikely.		No
Continental Link	National Grid Ventures	Concept. Application expected in Q3 2023 to Planning Inspectorate.	Unknown	Unknown, assumed yes	No construction programme is available so worst-case temporal overlap is assumed.	No environmental information available but significant effects considered unlikely.		No
Oil and Gas Infrastructure								
None identified for inclusion within long list.								
Marine Aggregate Sites								
None identified for inclusion within long list.								
Licenced Disposal Sites								
MLA/2021/00384: Renewal of Dredging Licence for 5 years	Bridlington Harbour Commissioners	Submitted (In progress) [On Hold] (planned dates 2021-2026)	BRIDLINGTON A – 2.4 km to KP429 Bridlington Harbour Dredge Area – 3 km to KP434	Yes	Yes	Unlikely	Unlikely to cause significant cumulative effects due to small scale of proposed development and distance from Marine Scheme	No
Other								
Potential for the implementation of closures to commercial fishing within the Firth of Forth Banks Complex MPA.	Marine Scotland	Potential	Runs directly adjacent east of the Firth of Forth Banks Complex MPA between KP84 and KP118.	Yes, and also included at Marine Scotland request	No programme is available so worst-case temporal overlap is assumed.	Potential for prohibition of scallop dredging and demersal trawling within the Firth of Forth Banks Complex MPA		Yes, for commercial fisheries only.
727- Simulated oil spill spraying operations	Oil Spill Response Ltd (OSRL)	License period approved 2018-2028	Intersects between KP370 and KP410	Yes	Yes	Small scale works over a relatively large spatial area. It is assumed that works will follow best practice measures and effects would be temporary and not significant.		No
MLA/2017/00202: RNLI North Division – Regional Licence for Low Impact Maintenance Works (RNLI Flamborough Lifeboat Station, RNLI Bridlington Lifeboat Station: Slipway, Bridlington Mooring)	RNLI Flamborough Lifeboat Station	License period approved 2017-2027	RNLI Flamborough Lifeboat Station – 5 km KP427 RNLI Bridlington Lifeboat Station: Slipway – 2.7 km KP435 Bridlington Mooring – 3.1 km KP434	Yes	Yes	Small scale works ranging from 2.7 km to 5 km from KP427 to KP435. It is assumed that works will follow best practice measures and effects would be temporary and not significant.		No

Project	Owner	Status	Distance to the Marine Installation Corridor (and KP point measured from)	Stage 1: Within maximum ZoI study area of 20 km (if yes, progress to Stage 2)	Stage 2			Progress to Stage 3/4?
					Temporal overlap	Scale and nature likely to have potential significant effect	Other factors	
MLA/2016/00417/1: Long term maintenance and repair marine license (Flamborough Village Long Sea Outfall (LSO) / Combined Water Outfall (CWO), Limekiln Lane CWO, Sands Lane Brid CWO, Belgrave CWO, Bridlington LSO / CWO).	Yorkshire Water Services	License period approved 2017-2027	Flamborough Village LSO CWO – 4.3 km to KP429 Limekiln Lane CWO – 4.4 km to KP434 Sands Lane Brid CWO – 4 km to KP434 Bridlington SSO CWO – 2.2 km to KP435 Belgrave CWO – 2 km to KP434 Bridlington LSO CWO – 1.6 km to KP433	Yes	Yes	Small scale works ranging from 1.6 km to 4.4 km from KP429 to KP435. It is assumed that works will follow best practice measures and effects would be temporary and not significant.		No

GIS: LC Checked: KB Approved: FF



Coordinate System: WGS1984 Zone 30N

Scale @ A3 1:1,500,000 / 1:200,000

nationalgrid
Scottish & Southern Electricity Networks

PROJECT
Eastern Green Link 2

KEY

- Marine Installation Corridor
- 20km Study Area
- Kilometre Point (KP)
- UK Territorial Sea Limit
- Scottish/English Water Border
- Firth of Forth Banks Complex Nature Conservation Marine Protected Area (MPA)

Cumulative Development Type

- Carbon Capture Usage and Storage (CCUS)
- Marine Licences and Applications
- Scot Wind Area
- EGL2 Onshore
- Wind Farm
- Wind Farm Export Cable
- Marine Licence Application - MLA/2016/00417/1
- Marine Licence Application - MLA/2017/00202
- Marine Licence Application - MLA/2021/00384

NOTES;
Concept projects are not included

TITLE
Figure 16-1
Long List of Developments

REFERENCE
SEGL2_M_EAR_16-1_v8_20220623

SHEET NUMBER
1 of 1

DATE
23/06/2022

16.4.2 Stage 2: Establishing a Shortlist of Other Existing Development and/or Approved Development

A total of nine 'other existing developments and/or approved developments' have been shortlisted for inclusion in the appraisal of cumulative effects, as detailed below and shown in Figure 16-2.

- **Green Volt Floating Offshore Wind Farm Export Cable** – The Green Volt associated floating offshore wind farm project, which received its Scoping Opinion in April 2022, is located approximately 75 km east of the Aberdeenshire coast in an area of approximately 144 km^2. The proposal is for up to 30 floating Wind Turbine Generators with a total installed capacity of approximately 300 Megawatt (MW). Construction is scheduled over two seasons, with the aim of connecting to the UK grid by Q2 2025 and completing and energising by 2026. Construction is expected to start with the installation of the substation, offshore export cable and final connection to the Buzzard platform. This cumulative assessment considers the export cable only. The proposed development intersects the Marine Installation Corridor between KP0 and KP5;
- **ScotWind - Offshore Wind Proposed Site 6 (ScotWind Plan Option E3)** – DEME, Aspiravi and Qair obtained Option Agreement in January 2022. Installed capacity 1,008 MW. Development timescales unknown (The Crown Estate Scotland, 2022). Proposed development area overlaps with the Marine Scheme between KP64 and KP73;
- **ScotWind - Offshore Wind Proposed Site 1 (ScotWind Plan Option E1)** – Developer BP and EnBW obtained Option Agreement in January 2022. Installed capacity 2,907 MW. Development timescales unknown (The Crown Estate Scotland, 2022). Proposed development area overlaps with the Marine Scheme between KP91 and KP92;
- **Potential for the implementation of closures to commercial fishing within the Firth of Forth Banks Complex MPA** (Shortlisted for potential cumulative effects with commercial fisheries receptors only) – Potential for prohibition of scallop dredging and demersal trawling within the Firth of Forth Banks Complex MPA. Marine Scheme runs directly adjacent east of the Firth of Forth Banks Complex MPA between KP84 and KP118.
- **Seagreen 1A (Bravo) Offshore Wind Farm** (Shortlisted for potential cumulative effects with commercial fisheries and shipping and navigation receptors only) – Seagreen 1A (Bravo) offshore wind farm makes up the remaining 36 consented turbines from the 150 granted for Seagreen (Alpha) Offshore Wind farm (began construction in September 2021). This development will have a separate grid connection via an export cable to Cockenzie, East Lothian (Seagreen 1A, 2022). A screening report was submitted in January 2022 to increase the size of the 36 consented turbines. Construction planned to commence 2025. Plans to be operational by 2030. Proposed development is located 18.71 km from KP117;
- **Berwick Bank Offshore Wind Farm** (Shortlisted for potential cumulative effects with commercial fisheries and shipping and navigation receptors 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 Thorntonloch. Construction planned to commence 2025. Plans to be operational by 2030. Proposed development is located 11.42 km from KP158;
- **Dogger Bank C Export Cable / Sofia Export Cable** – The Dogger Bank C and Sofia Offshore Wind Farms are located next to each other on the Dogger Bank, in the North Sea. These offshore export cables will run in parallel for more than 200 km to the landfall between Redcar and Marske-by-the-Sea. Offshore construction planned to commence in 2023. Operational in 2026 (Dogger Bank Wind Farm, 2022). The export cables cross the Marine Scheme between KP338 and KP339;
- **NEP CO_2 Pipelines (Teesside and Humber)** Northern Endurance Partnership – a partnership between bp, Eni, Equinor, National Grid, Shell and Total plan to develop the offshore infrastructure to transport and store millions of tonnes of CO2 emissions safely from the industrial centres of Teesside and Humber, using carbon capture utilization and storage (CCUS). This infrastructure will serve the proposed Net Zero Teesside (NZT) and Zero Carbon Humber (ZCH) projects and will include one 145 km CO_2 Export Pipeline from NZT (Teesside Pipeline) and one 103 km CO_2 Export Pipeline from ZCH (Humber Pipeline). Each pipeline will be directed to a new UK North Sea Store – the Endurance Store. The offshore CO_2 pipelines will require consent under the Petroleum Act 1998. From May 2022 Successful projects will be shortlisted in phase-2 of

UK Government's Cluster sequencing process (Net Zero Teesside, 2022). The Scoping Report was submitted September 2021, which detailed that installation of pipelines would commence in 2024, with construction complete by 2026 (East Coast Cluster, 2022b). The Teesside Pipeline intersects the Marine Installation Corridor at KP380 and the Humber Pipeline is located 13.2 km to the east of KP410; and

- **Hornsea Project Four (HOW04) Offshore Wind Site Export Cable** – Hornsea Project Four will be located approximately 65 km offshore the East Riding of Yorkshire in the Southern North Sea. Hornsea Four will include both offshore and onshore infrastructure including an offshore wind farm, export cables to landfall, and connection to the electricity transmission network. Construction planned 2024-2029 (Orsted, 2022). Proposed development runs adjacent to the Marine Scheme between KP425 and KP431 on the approaches to the English landfall.

16.4.3 Stage 3: Information Gathering

Publicly available environmental information was collected for each of the shortlisted developments to inform Stage 4: Appraisal.

16.4.4 Stage 4: Appraisal

This section presents the appraisals of cumulative effects between the Marine Scheme and the shortlisted developments for each technical chapter of this EAR. The potential for cumulative effects is summarised in Table 16-4. For the purposes of the cumulative effects appraisal, it was considered that the potential for cumulative effects will be greatest during the Installation Phase of the Marine Scheme, and that Decommissioning is assumed to have similar (or lesser) impacts than installation.

16.4.4.1 Potential Pathways Excluded from Cumulative Appraisal

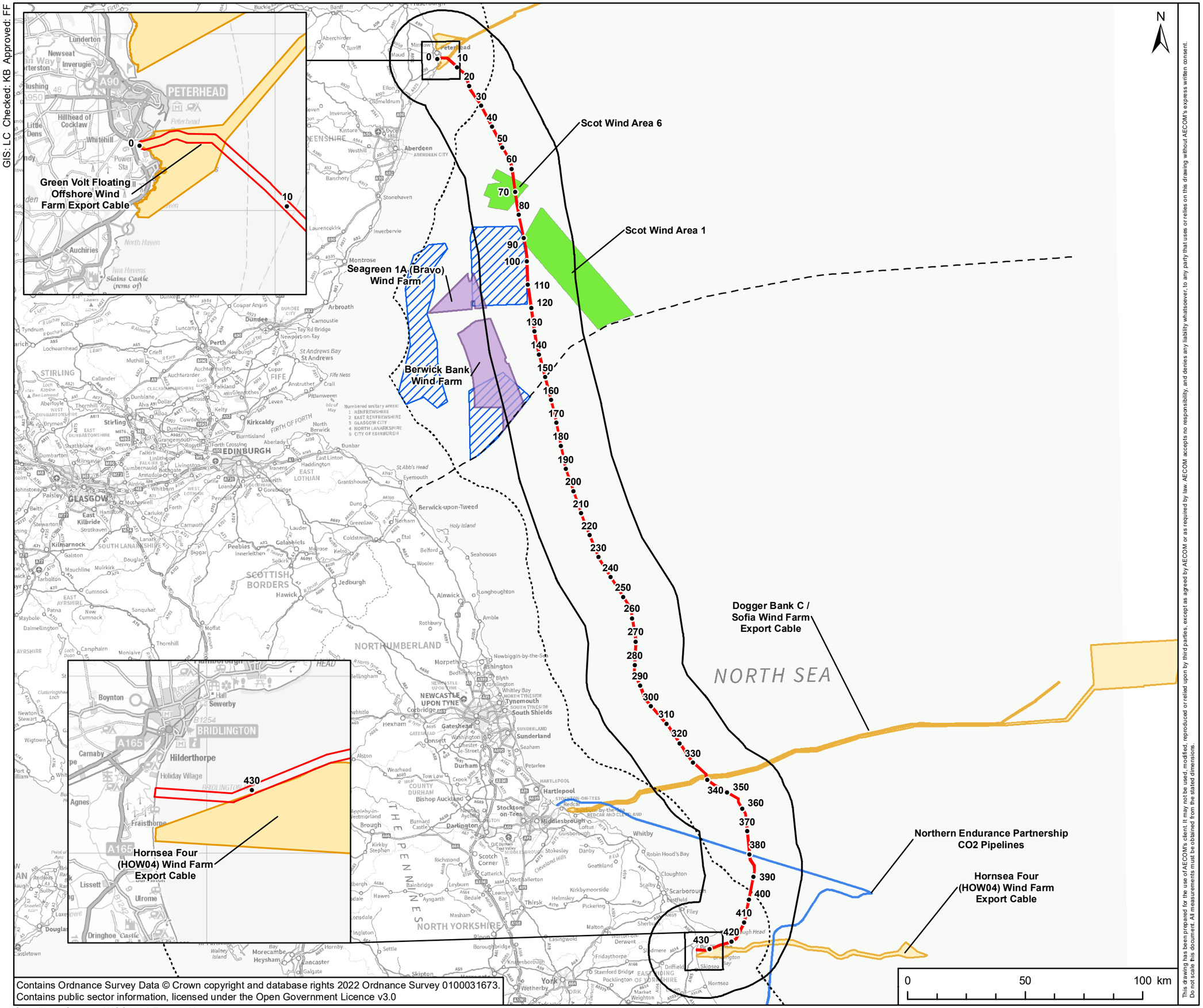
Table 16-4 presents the potential pathways excluded from cumulative appraisal and the reasoning for their exclusion.

Table 16-4: Potential pathways excluded from cumulative appraisal

Phase	Potential pathway	Reason for exclusion
Installation	Potential effects on the intertidal zone	There will be no works in the intertidal zone because HDD will be used to install cables between an area inland of MHWS and the HDD breakout which will be below MLWS. This will prevent any direct impacts on intertidal receptors.
Installation	Disturbance or destruction of discrete marine archaeological sites and unknown sites	Discrete marine archaeological sites, and unknown sites encountered by chance will be localised and therefore interactions with effects from other developments and activities in the area are highly unlikely to occur.
Installation	Water contamination as a result of release of drilling fluids	As described in Chapter 2: Project Description, industry standard drilling fluids and additives, which are required during the HDD operations, would be biologically inert and selected from the Centre from Environment, Fisheries, and Aquaculture Science (Cefas) approved list of drilling fluids, and the OSPAR List of Substances/Preparations Used and Discharged Offshore which are Considered to Pose Little or No Risk to the Environment (PLONOR). The residual volume of released drilling fluids would be expected to be diluted rapidly. Fine grained solid particles within drilling fluids will also be released and may travel up to 4.3 km from the source of release, however, as a result of dilution, increases in SSC are expected not to be significant beyond 1.5 km. Furthermore, HDD operations will be single events over a short period of time and fluids will rapidly disperse in the open sea coastal environment. Whilst these losses to the marine environment are unavoidable, they will be minimised insofar as practicable

Phase	Potential pathway	Reason for exclusion
		through the implementation of industry best practice, for example, clearing runs or reducing volumes of drilling fluids in the borehole prior to the breakout to the marine environment. As such, it is considered that cumulative impacts to the surrounding water as a result of a release of drilling fluids are not considered to be significant.
Installation	Water contamination resulting from accidental spills	Industry standards require all vessels to adhere to the International Regulations for Preventing Collisions at Sea 1972 (COLREGS) and International Convention for the Safety of Life at Sea 1974 (SOLAS). It is also a requirement that all vessels will be in compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL) regulations and will therefore be equipped with waste disposal facilities onboard. Control measures and shipboard oil pollution emergency plans (SOPEP) will be in place and adhered to under MARPOL Annex I requirements for all vessels. These measures will therefore ensure that an accidental spill would be unlikely to occur, or if it did occur was dealt with appropriately so that any effects are not considered significant.
Operation and Maintenance	Routine planned maintenance work	The cable system is designed to avoid the need for routine maintenance work during the lifetime of the Marine Scheme. The cumulative appraisal assumes that any maintenance and repair work associated with the Marine Scheme would be sporadic, temporary, and highly localised. Therefore, any disturbance would be highly unlikely to interact with similar effects resulting from other projects during either their construction or maintenance.
Decommissioning	Other development decommissioning	It is currently unknown if any other development or decommissioning will be occurring at the same time as the Marine Scheme's decommissioning activities. The cumulative effects cannot be defined without knowing which other operations will be occurring during the Decommissioning Phase of the Marine Scheme.

GIS: LC Checked: KB Approved: FF



Coordinate System: WGS1984 Zone 30N

Scale @ A3 1:1,500,000 / 1:200,000

nationalgrid
Scottish & Southern Electricity Networks

PROJECT
Eastern Green Link 2

KEY

- Marine Installation Corridor
- 20km Study Area
- Kilometre Point (KP)
- UK Territorial Sea Limit
- Scottish/English Water Border
- Firth of Forth Banks Complex Nature Conservation Marine Protected Area (MPA)

Cumulative Development Type

- Carbon Capture Usage and Storage (CCUS)
- Scot Wind Area
- Wind Farm
- Wind Farm Export Cable

TITLE
Figure 16-2
Short List of Developments

REFERENCE
SEGL2_M_EAR_16-2_v7_20220623

SHEET NUMBER
1 of 1

DATE
23/06/2022

16.4.4.2 Physical Environment

The potential physical environment pathway interactions between the Marine Scheme and other projects have been identified in Table 16-5.

Table 16-5: Matrix to identify potential physical environment impact pathway interactions included in the cumulative effects appraisal.

Project name	Potential impact pathways that could interact with Marine Scheme			Proposed mitigation	Residual cumulative effect
	Temporary seabed disturbance	Localised permanent seabed disturbance due to displacement and removal of debris and boulders	Temporary increases in suspended sediment concentrations		
Green Volt Floating Offshore Wind Farm Export Cable	***Excluded*** This potential development intersects the Marine Installation Corridor between KP0 and KP5. There is potential for simultaneous operations (SIMOPS) to occur during the lifetime of the Marine Scheme, for instance where construction periods overlap or where maintenance is required. This has been recognised by the Applicants of the Marine Scheme and has been considered within the impact assessment for the Physical Environment (Chapter 7) which found no significant effects as a result of temporary seabed disturbance, localised permanent seabed disturbance or temporary increases in SSC. Proximity and/or crossing agreements will be required to manage risks including the necessary mitigation and controls such as the application of trenching exclusion zones. Given the potential for SIMOPS, ongoing collaboration between the Applicant and the developer will be informed by appropriate industry guidance, such as the International Marine Contractors Association (IMCA) guidance on SIMOPS (IMCA M203, Version II 2021). Should the potential for Installation Phase vessels associated with the Marine Scheme coincide with installation of the Green Volt export cable, a proximity and/or crossing agreement would be agreed with the asset owner to ensure that SIMOPS could be undertaken to manage risks between vessels and activities. This will manage the risk of effects being cumulative. Therefore. cumulative effects are unlikely since activities would be temporally separated.			No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area / Option Agreement 6	***Excluded*** These potential developments are both at pre-planning stage, with Option Agreements obtained in January 2022. There is presently very limited information available on the potential timelines for these sites, as well as information regarding potential environmental effects. They have however been included within the Stage 3 appraisal as a worst-case, with the assumption that construction periods, and therefore ZoIs, will be overlapping. The Marine Scheme overlaps with Site 1 between KP91 and KP92 and with Site 6 between KP64 and KP73. In the areas where the proposed sites overlap between KP64 and KP73, it is anticipated that boulder clearance plough would not be required and that the minimum depth of lowering could be achieved using non-displacement trenching techniques. The exception to this is between KP66.6 and KP68.5, where it is anticipated that external rock protection would be required along 50% of this area. Between KP91 and KP92, it is anticipated that a boulder clearance plough would be required and that a displacement plough may be required to achieve the minimum depth of lowering. It is also anticipated that external rock protection would be required along 75% of this area. It is assumed therefore that any inter-array or export cables would be laid in a similar manner. For the purpose of this cumulative appraisal, it is assumed that the Marine Scheme would be considered a hard constraint during the planning for the location of proposed turbine foundations and that they would be located an agreed distance from the Marine Scheme. The potential effects of the Marine Scheme have been determined to be not significant (see Chapter 7: Physical Environment) and it is assumed that the effects of the potential developments within the Site Areas would also be not significant and therefore it is considered unlikely that significant cumulative effects would occur on the physical environment receptors.			No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area / Option Agreement 1				No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Dogger Bank C Export Cable / Sofia Export Cables	***Excluded*** The Dogger Bank C Export Cable / Sofia Export Cable crosses the Marine Installation Corridor at KP338 and KP339. At this location it is anticipated that boulder clearance plough may be used in advance of the cables being laid and that external rock protection will be required to protect the cables between KP336.3 to KP339.4. It is assumed that the Dogger Bank C Export Cable / Sofia Offshore Wind Farm Export Cable will be installed in a similar manner in the location where the two cables intersect. The Teesside Pipeline of the NEP project crosses the Marine Installation Corridor at KP380. At this location no boulder clearance plough or displacement plough is anticipated to be required and rock placement has not been planned, therefore it is assumed that the minimum depth of lowering can be achieved by non-displacement trenching techniques.			No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
NEP CO_2 Pipelines (Teesside and Humber)	The proposed route for the Hornsea Project Four Offshore Wind Site Export Cable lies in close proximity to the Marine Installation Corridor between KP425 and KP431 on the approaches to the English landfall. Allowance has been made within the appraisal of potential effects in Chapter 7: Physical Environment for crossing both the Dogger Bank C Export Cable / Sofia Export Cable and the NEP pipelines. The appraisal has considered that these projects are constructed before the Marine Scheme, as a worst-case, and therefore the other developments form part of the future baseline, against which the potential effects of the Marine Scheme have been assessed. This therefore excludes the effects of these crossings from further consideration in the cumulative appraisal. There is potential however, for simultaneous operations (SIMOPS) to occur during the lifetime of the Marine Scheme, for instance where construction periods overlap or where maintenance is required. This has been recognised by the Applicants of the Marine Scheme and has been considered within the impact assessment for the Physical Environment (Chapter 7) which found no significant effects to the Holderness coastline or Smithic Bank. Proximity and/or crossing agreements will be required in order to manage risks including the necessary mitigation and controls such as the application of trenching exclusion zones. Given the potential for SIMOPS, ongoing collaboration between the Applicant and the relevant developers will be informed by appropriate industry guidance, such as the International Marine Contractors Association (IMCA) guidance on SIMOPS (IMCA M203, Version II 2021). Should the potential for Installation Phase vessels associated with the Marine Scheme coincide with other vessels working on existing assets, or those under installation, a proximity and/or crossing agreement would be agreed with the asset owner to ensure that SIMOPS could be undertaken to manage risks between vessels and activities, therefore managing the risk of effects being cumulative and making them unlikely to occur since activities would be both spatially and temporally separated.			No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Hornsea Project Four (HOW04) - Offshore Wind Site Export Cable				No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

16.4.4.3 Benthic Ecology

The potential benthic impact pathway interactions between the Marine Scheme and other projects have been identified in Table 16-6.

Table 16-6: Matrix to identify potential benthic ecology impact pathway interactions included in the cumulative effects appraisal.

Project Name	Potential Impact Pathways that could interact with Marine Scheme					Proposed mitigation	Residual cumulative effect
	Temporary physical disturbance to benthic habitats and species	Permanent loss of benthic habitats and species	Increased SSC in subtidal habitats	EMF emissions	Thermal emissions		
Green Volt Floating Offshore Wind Farm Export Cable	***Excluded*** The Green Volt Floating Offshore Wind Farm Export Cable overlaps with the Marine Scheme at KP 4.5. The habitat type at KP4.5 was identified as Offshore Circalittoral Mixed Sediment with Patches of encrusting *Sabellaria spinulosa*. The quality of Annex I *S. spinulosa* reef habitats at KP 4.5, was assessed as low to medium though the areas of medium reefiness were present as patches within larger areas of low reefiness. Although features are deemed representative of Annex I *S. spinulosa* reef across the Marine Installation Corridor, these areas do not form part of a designated site under the EC 92/43/EEC or any other protected site. Due to the sporadic nature of medium resemblance reef ground truthed across the camera transects, and the extent of the area identified, no significant cumulative effects are anticipated to occur between the proposed developments and the Marine Scheme.	***Excluded*** Allowance has been made within the appraisal of potential effects in Chapter 8: Benthic Ecology for crossing both the Dogger Bank C Export Cable / Sofia Export Cable. The appraisal has considered that these projects will be constructed before the Marine Scheme, and therefore forms part of the future baseline, against which the potential effects of the Marine Scheme have been assessed. This therefore excludes the effects of these crossings from further consideration in the cumulative appraisal.	***Excluded*** Increased SSC has been appraised as not significant effects in Chapter 8: Benthic Ecology. Any works would be spatially and temporally separated allowing any localised increases in SSC to disperse and dilute. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** EMF and thermal emissions have been appraised as resulting in no significant effects in Chapter 8: Benthic Ecology. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.		No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area / Option Agreement 1	***Excluded*** ScotWind Proposed Site Area / Option Agreement 1 overlap with the Marine Scheme between KP91 and KP92. The habitat type at KP91 and KP92 was identified as Rippled Offshore Circalittoral Sand with exposed underlying Circalittoral Rock and Occasional Megarippled Sandwaves. In this area, dominated by mixed sediments, which following a review of cable installation activities in similar habitats, found that these habitats typically recovered swiftly after disturbance, rapidly returning to pre-construction baselines and those of adjacent unimpacted areas (RPS, 2019). Therefore, no significant cumulative effects are anticipated to occur between the proposed developments and the Marine Scheme.	***Included*** These potential developments are both at pre-planning stage, with Option Agreements obtained in January 2022. There is presently very limited information available on the potential timelines for these sites, as well as information regarding potential environmental effects. They have however been included within the Stage 3 appraisal as a worst-case, with the assumption that construction periods, and therefore ZoIs, will overlap. The Marine Scheme overlaps with Site 1 between KP91 and KP92 and with Site 6 between KP64 and KP73. For the purpose of this cumulative appraisal, it is assumed that the Marine Scheme would be considered a hard constraint during the planning for the location of	***Excluded*** Increased SSC has been appraised as not significant effects in Chapter 8: Benthic Ecology. Any works would be spatially and temporally separated allowing any localised increases in SSC to disperse and dilute. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** EMF and thermal emissions have been appraised as resulting in no significant effects in Chapter 8: Benthic Ecology. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.		No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

Project Name	Potential Impact Pathways that could interact with Marine Scheme					Proposed mitigation	Residual cumulative effect
	Temporary physical disturbance to benthic habitats and species	Permanent loss of benthic habitats and species	Increased SSC in subtidal habitats	EMF emissions	Thermal emissions		
ScotWind Proposed Site Area / Option Agreement 6	***Excluded*** ScotWind Proposed Site Area / Option Agreement 6 overlap with the Marine Scheme between KP64 and KP73. The habitat type at KP64 and KP73 was identified as Offshore Circalittoral Sand. In this area, dominated by sandy sediments, which following a review of cable installation activities in similar habitats, found that these habitats typically recovered swiftly after disturbance, rapidly returning to pre-construction baselines and those of adjacent unimpacted areas (RPS, 2019). Therefore, no significant cumulative effects are anticipated to occur between the proposed developments and the Project Marine Scheme.	proposed turbine foundations and that they would be located a suitable distance from the Marine Scheme. It is also assumed that there is potential for inter-array and export cables to cross the Marine Scheme requiring the use of external protection. Therefore, there is potential for additional habitat loss to occur as a result of the installation of the Marine Scheme within ScotWind Proposed Site Areas / Option Agreements 1 and 6. The potential cable crossings between the ScotWind Areas and the Marine Scheme will require the agreement and implementation of proximity and/or crossing agreements. Given the pre-planning status of the proposed developments, there is no information on the potential area of habitat loss; however, the greatest change in habitat and species composition will occur when external protection is placed on the seabed. The habitat type between KP91 and KP92 (ScotWind Area 1), where the Marine Scheme and the proposed development spatially overlap was identified as Rippled Offshore Circalittoral Sand with exposed underlying Circalittoral Rock and Occasional Megarippled Sandwaves. The habitat type between KP64 and KP73 (ScotWind Area 6), where the Marine Scheme and the proposed development spatially overlap was identified as Offshore Circalittoral Sand (NEXTGeosolutions, 2022). The magnitude of loss was appraised by the Marine Scheme to be negligible at this location compared to the size of this remaining habitat within the Marine Installation Corridor and wider North Sea area, combined with the medium sensitivity of this habitat. When the potential for additional habitat and species loss is considered as a result of the development of the ScotWind Areas, the potential for additive effects to become significant is considered unlikely due to the lack of sensitive habitats present at both crossing locations. Therefore the cumulative effect on this habitat and species is considered to be **negligible** and **not significant**.	***Excluded*** Increased SSC has been appraised as not significant effects in Chapter 8: Benthic Ecology. Any works would be spatially and temporally separated allowing any localised increases in SSC to disperse and dilute. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** EMF and thermal emissions have been appraised as resulting in no significant effects in Chapter 8: Benthic Ecology. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.		No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Dogger Bank C Export Cable / Sofia Export Cables	***Excluded*** Temporary habitat disturbance has been appraised as resulting in no significant effects in Chapter 8: Benthic Ecology in the area of the crossing between KP338 and KP339 in respect to the Dogger Bank C Export Cable / Sofia Export Cable. The habitat type at this location was identified as Circalittoral Muddy Sand with Patches of Offshore Circalittoral Mixed Sediment (NEXTGeosolutions, 2022). In this area, dominated by mixed sediments, which following a review of cable installation activities in similar habitats, found that these habitats typically recovered swiftly after disturbance, rapidly returning to pre-construction baselines and those of adjacent unimpacted areas (RPS, 2019). Therefore, no significant cumulative effects are anticipated to occur between the proposed developments and the Project Marine Scheme.	***Excluded*** Allowance has been made within the appraisal of potential effects in Chapter 8: Benthic Ecology for crossing both the Dogger Bank C Export Cable / Sofia Export Cable. The appraisal has considered that these projects will be constructed before the Marine Scheme, and therefore forms part of the future baseline, against which the potential effects of the Marine Scheme have been assessed. This therefore excludes the effects of these crossings from further consideration in the cumulative appraisal.	***Excluded*** Increased SSC has been appraised as not significant effects in Chapter 8: Benthic Ecology. Any works would be spatially and temporally separated allowing any localised increases in SSC to disperse and dilute. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** EMF and thermal emissions have been appraised as resulting in no significant effects in Chapter 8: Benthic Ecology. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.		No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

Project Name	Potential Impact Pathways that could interact with Marine Scheme					Proposed mitigation	Residual cumulative effect
	Temporary physical disturbance to benthic habitats and species	Permanent loss of benthic habitats and species	Increased SSC in subtidal habitats	EMF emissions	Thermal emissions		
NEP CO_2 Pipelines (Teesside and Humber)	***Excluded*** Temporary habitat disturbance has been appraised as resulting in no significant effects in Chapter 8: Benthic Ecology in the area of the crossing at KP380 in respect to the Northern Endurance Partnership Pipeline. The habitat type at KP380 was identified as Rippled Offshore Circalittoral Sand with Megarippled Waves and Occasional Patches of Offshore Circalittoral Mixed Sediment. In this area, dominated by mixed sediments, which following a review of cable installation activities in similar habitats, found that these habitats typically recovered swiftly after disturbance, rapidly returning to pre-construction baselines and those of adjacent unimpacted areas (RPS, 2019). Therefore, no significant cumulative effects are anticipated to occur between the proposed developments and the Marine Scheme.	***Excluded*** Allowance has been made within the appraisal of potential effects in Chapter 8: Benthic Ecology for crossing both the Northern Endurance Partnership Pipeline. The appraisal has considered that this project is constructed before the Marine Scheme, and therefore forms part of the future baseline, against which the potential effects of the Marine Scheme have been assessed. This therefore excludes the effects of this crossing from further consideration in the cumulative appraisal.	***Excluded*** Increased SSC has been appraised as not significant effects in Chapter 8: Benthic Ecology. Any works would be spatially and temporally separated allowing any localised increases in SSC to disperse and dilute. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** No likely pathway has been identified for combined EMF or thermal emissions between the Northern Endurance Partnership Pipeline and the Marine Scheme.		No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Hornsea Project Four (HOW04) - Offshore Wind Site Export Cable	Excluded Temporary habitat disturbance has been appraised as resulting in no significant effects in Chapter 8: Benthic Ecology in the area of Hornsea Project Four, which is in close proximity to the Marine Scheme between KP425 and KP431 on the approaches to the English landfall. The habitat type at this location was identified as medium to fine sand and gravel, pebbles and/or shingle. In these areas which are dominated by sediments, which following a review of cable installation activities in similar habitats, found that these habitats typically recovered swiftly after disturbance, rapidly returning to pre-construction baselines and those of adjacent unimpacted areas (RPS, 2019). Therefore, no significant cumulative effects are anticipated to occur between the proposed developments and the Project Marine Scheme.	Excluded Between KP425 and KP426.7, the Marine Scheme is proposing the use of the boulder plough and 100% rock cover to protect the cable. Thereafter to KP431, it is proposed that the cable is trenched using non-displacement techniques, which will allow the recolonisation and no permanent loss of benthic habitats and species. The potential for permanent habitat loss as a result of rock placement has been appraised by Chapter 8: Benthic Ecology as being of minor significance, which is considered not significant. Hornsea Project Four are proposing to use external rock placement for up to 10% of their cable route in addition to that required for crossings, hence there is potential for rock placement to be used in close proximity to the Marine Scheme. However, since the Marine Scheme, has committed to trenching the cables inshore of KP426.7, it is considered that there is limited potential for the effect on benthic habitats and species as a result of permanent loss to result in a significant cumulative effect.	Excluded Increased SSC has been appraised as not significant effects in Chapter 8: Benthic Ecology. Any works would be spatially and temporally separated allowing any localised increases in SSC to disperse and dilute. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	Excluded EMF and thermal emissions have been appraised as resulting in no significant effects in Chapter 8: Benthic Ecology. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.		No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

16.4.4.4 Fish and Shellfish

The potential fish and shellfish impact pathway interactions between the Marine Scheme and other projects are shown in Table 16-7.

Table 16-7: Matrix to identify potential fish and shellfish impact pathway interactions included in the cumulative effects appraisal

Project Name	Potential Impact Pathways that could interact with Project Marine Scheme						Proposed mitigation	Residual cumulative effect
	Temporary physical disturbance to benthic habitats and species supporting fish and shellfish species	Permanent loss of spawning and nursery grounds	Increased SSC in subtidal habitats	Vessel Collision	EMF emissions	Thermal emissions		
Green Volt Floating Offshore Wind Farm Export Cable	***Included*** During installation or decommissioning of the Marine Scheme and the Green Volt Floating Offshore Wind Farm Export Cable, there is the potential that a small area of seabed will be disturbed on two separate occasions in quick succession at the intersection of the corridors. The ZoI for the Marine Scheme for temporary physical disturbance has been assumed by this appraisal as 50 m (boulder clearance plough swath of 25 m for separately laid cables). It is also assumed that the ZoI associated with temporary disturbance associated with the Green Volt Floating Offshore Wind Farm Export Cable would be comparable. The habitat type at KP4.5 was identified as Offshore Circalittoral Mixed Sediment with Patches of encrusting *Sabellaria spinulosa*. The benthic characterisation survey of the Marine Installation Corridor did not identify any prime or sub-prime herring or sandeel habitat (Greenstreet, et al., 2010). Consequently, the cumulative impact of disturbance is predicted to be of negligible magnitude. Combined within the medium sensitivity of demersal species, the cumulative effect is predicted to be **negligible**, which is considered to be **not significant**.	***Excluded*** This location is identified as an area of high intensity sandeel spawning and low intensity nursey in addition to high intensity herring spawning (Ellis, Milligan, Readdy, Taylor, & Brown, 2012). However, mobile demersal fish and shellfish species will be able to relocate away from the disturbance to utilise nearby alternative habitat during periods of installation and decommissioning activity and will return to the area once activity has ceased. The benthic characterisation survey of the Marine Installation Corridor did not identify any prime or sub-prime herring or sandeel habitat at KP 4.5 (Greenstreet, et al., 2010).	***Excluded*** Increased SSC has been appraised as resulting in not significant effects in Chapter 9: Fish and Shellfish, with no prime or sub-prime herring or sandeel habitat (Greenstreet, et al., 2010) being identified at KP 4.5 during the benthic survey which is potentially susceptible to increases in SSC. Any works would be spatially and temporally separated allowing any localised increases in SSC to disperse and dilute. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** Vessel collision risk has been appraised resulting in not significant effects in Chapter 9: Fish and Shellfish Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** EMF and thermal emissions have been appraised as resulting in not significant effects in Chapter 9: Fish and Shellfish Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.		No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area / Option Agreement 6	***Included*** During installation or decommissioning of the Project and the ScotWind Proposed Site Area / Option Agreement 6, there is the potential that a small area of seabed will be disturbed on two separate occasions in quick succession at the intersection of the corridors. The Marine Scheme overlaps with Site 6 between KP64 and KP73. This potential development is at pre-planning stage, with the Option Agreement obtained in January 2022. There is presently very limited information available on the potential timelines for this site, as well as information regarding potential environmental effects. This site has however been included within the Stage 3 appraisal as a worst-case, with the assumption that construction periods, and therefore ZoIs, overlap. The ZoI for the Marine Scheme for temporary physical disturbance has been assumed by this appraisal as 50 m (boulder clearance plough swath of 25m for separately laid cables). It is however assumed that the ZoI associated with temporary disturbance associated with the ScotWind Proposed Site Area / Option Agreement 1 would be greater in comparison to the Marine Scheme. For the purpose of this cumulative appraisal, it is assumed that the Project Marine Scheme would be considered a hard constraint during the planning for the location of proposed turbine foundations and that they would be located an agreed distance from the Project Marine Scheme outside of the ZoIs. In regard to the Marine Scheme, it is anticipated that between KP66.6 and KP68.5 external rock protection would be required along 50% of this area. Whilst in the vicinity of the prime sandeel habitat at KP69, there would be no requirement for the use of a boulder clearance plough and that the minimum depth of lowering could be achieved using non-displacement trenching techniques, and no rock placement is planned. The appraisal reported in Chapter 9: Fish and Shellfish Ecology and identified minor adverse impacts of increased SSC on sandeel, within the ZoI, identified as 1.5 km for fine sands (see Chapter 7: Physical Environment). It is assumed, therefore, that any inter-array or export cables associated with the ScotWind Proposed Site Area / Option Agreement 6 would be laid in a similar manner, the exception being the potential crossings of the Marine Scheme which would require the implementation of a crossing agreement between the Applicants and the developers of the ScotWind Proposed Site Area / Option Agreement 6. Where a crossing is required, it is assumed that external protection would be required, although there is presently no information available to suggest whether there would be potential crossings within the area identified as preferred (Prime) sandeel habitat at KP69 and therefore it is not possible to undertake a meaningful cumulative appraisal in regard to the permanent loss of sandeel habitat. Proximity and/or crossing agreements will be required to manage risks associated with SIMOPS, including necessary mitigation and controls including the application of trenching exclusion zones. As a result, any works would be spatially and temporally separated allowing any temporary and localised increases in SSC to disperse and dilute. Furthermore, the habitat type between KP64 and KP73 was identified as Offshore Circalittoral Sand, which is anticipated to recover swiftly following any temporary disturbance. Therefore, it is considered that there is very limited potential for these effects to accumulate sufficiently to result in a significant cumulative effect on the preferred (Prime) sandeel habitat at KP69. Consequently, the impact of temporary physical disturbance, loss of spawning and nursery grounds and increased SSC is predicted to be of low magnitude. Combined within the medium sensitivity of demersal species and spawning and nursery grounds, the cumulative effect is predicted to be **minor**, which is considered to be **not significant**.			***Excluded*** Vessel collision risk has been appraised resulting in not significant effects in Chapter 9: Fish and Shellfish Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** EMF and thermal emissions have been appraised as resulting in not significant effects in Chapter 9: Fish and Shellfish. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.		No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

Project Name	Potential Impact Pathways that could interact with Project Marine Scheme						Proposed mitigation	Residual cumulative effect
	Temporary physical disturbance to benthic habitats and species supporting fish and shellfish species	Permanent loss of spawning and nursery grounds	Increased SSC in subtidal habitats	Vessel Collision	EMF emissions	Thermal emissions		
ScotWind Proposed Site Area / Option Agreement 1	***Included*** During installation or decommissioning of the Marine Scheme and the ScotWind Proposed Site Area / Option Agreement 1, there is the potential that a small area of seabed will be disturbed on two separate occasions in quick succession at the intersection of the corridors. The Marine Scheme overlaps with Site 1 between KP91 and KP92. This potential development is at pre-planning stage, with the Option Agreement obtained in January 2022. There is presently very limited information available on the potential timelines for this site, as well as information regarding potential environmental effects. This site has however been included within the Stage 3 appraisal as a worst-case, with the assumption that construction periods, and therefore ZoIs, overlap. The ZoI for the Marine Scheme for temporary physical disturbance has been assumed by this appraisal as 50 m. It is however assumed that the ZoI associated with temporary disturbance associated with the ScotWind Proposed Site Area / Option Agreement 1 would be greater in comparison to the Marine Scheme. The habitat type at KP91 and KP92 was identified as Rippled Offshore Circalittoral Sand with exposed underlying Circalittoral Rock and Occasional Megarippled Sandwaves. The benthic characterisation survey of the Marine Installation Corridor did not identify any prime or sub-prime sandeel habitat between KP91 and KP92 (Greenstreet, et al., 2010). Furthermore, mobile fish and shellfish species will be able to relocate away from the disturbance to utilise nearby alternative habitat during periods of installation and decommissioning activity and will return to the area once activity has ceased. Consequently, the impact of disturbance is predicted to be of negligible magnitude. Combined within the medium sensitivity of demersal species, the cumulative effect is predicted to be **negligible**, which is considered to be **not significant.**	***Excluded*** The benthic characterisation survey of the Marine Installation Corridor did not identify any prime or sub-prime herring or sandeel habitat between KP91 and KP92 (Greenstreet, et al., 2010).	***Excluded*** Increased SSC has been appraised as resulting in not significant effects in Chapter 9: Fish and Shellfish, with no prime or sub-prime herring or sandeel habitat between KP91 and KP92 (Greenstreet, et al., 2010) being identified during the benthic survey which is potentially susceptible to increases in SSC. Any works would be spatially and temporally separated allowing any localised increases in SSC to disperse and dilute. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** Vessel collision risk has been appraised resulting in not significant effects in Chapter 9: Fish and Shellfish Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** EMF and thermal emissions have been appraised as resulting in not significant effects in Chapter 9: Fish and Shellfish Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.		No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Dogger Bank C / Sofia Export Cables	***Included*** During installation or decommissioning of the Marine Scheme and the Dogger Bank C Export Cable / Sofia Export Cable, there is the potential that a small area of seabed will be disturbed on two separate occasions in quick succession at the intersection of the corridors. The ZoI for the Marine Scheme for temporary physical disturbance has been assumed by this appraisal as 50 m (boulder clearance plough swath of 25m for separately laid cables). It is also assumed that the ZoI associated with temporary disturbance associated with the Dogger Bank C Export Cable/ Sofia Export Cable would be comparable. The habitat type at KP338 to KP339 was identified as Circalittoral Muddy Sand with Patches of Offshore Circalittoral Mixed Sediment. The benthic characterisation survey of the Marine Installation Corridor did not identify any prime or sub-prime herring or sandeel habitat (Greenstreet, et al., 2010) at this location and was only identified as being located in low intensity nursery grounds for herring and sandeel (Ellis, Milligan, Readdy, Taylor, & Brown, 2012). Furthermore, mobile fish and shellfish species will be able to relocate away from the disturbance to utilise nearby alternative habitat during periods of installation and decommissioning activity and will return to the area once activity has ceased. Consequently, the cumulative impact of disturbance is predicted to be of negligible magnitude. Combined within the medium sensitivity	***Excluded*** The benthic characterisation survey of the Marine Installation Corridor did not identify any prime or sub-prime herring or sandeel habitat between KP338 to KP339 (Greenstreet, et al., 2010).	***Excluded*** Increased SSC has been appraised as resulting in not significant effects in Chapter 9: Fish and Shellfish, with no prime or sub-prime herring or sandeel habitat between KP338 to KP339 (Greenstreet, et al., 2010) being identified during the benthic survey which is potentially susceptible to increases in SSC. Any works would be spatially and temporally separated allowing any localised increases in SSC to disperse and dilute. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** Vessel collision risk has been appraised resulting in not significant effects in Chapter 9: Fish and Shellfish Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** EMF and thermal emissions have been appraised as resulting in not significant effects in Chapter 9: Fish and Shellfish Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.		No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

Project Name	Potential Impact Pathways that could interact with Project Marine Scheme						Proposed mitigation	Residual cumulative effect
	Temporary physical disturbance to benthic habitats and species supporting fish and shellfish species	Permanent loss of spawning and nursery grounds	Increased SSC in subtidal habitats	Vessel Collision	EMF emissions	Thermal emissions		
	of demersal species, the cumulative effect is predicted to be **negligible**, which is considered to be **not significant**.							
NEP CO_2 Pipelines (Teesside and Humber)	***Included*** During installation of both the Marine Scheme and the NEP Teesside pipeline, there is the potential that a small area of seabed will be disturbed on two separate occasions in quick succession at the intersection of the corridors. This potential development is at pre-application/ scoping stage, with the potential development aiming to be operational with mid-2030's capturing and storing carbon active (East Coast Cluster, 2022). The habitat type at KP380 was identified as Rippled Offshore Circalittoral Sand with Megarippled Waves and Occasional Patches of Offshore Circalittoral Mixed Sediment. The benthic characterisation survey of the Marine Installation Corridor did not identify any prime or sub-prime herring or sandeel habitat (Greenstreet, et al., 2010) at KP380 and was only identified as being located in low intensity nursery grounds for herring and sandeel (Ellis, Milligan, Readdy, Taylor, & Brown, 2012). Furthermore, mobile fish and shellfish species will be able to relocate away from the disturbance to utilise nearby alternative habitat during periods of installation and decommissioning activity and will return to the area once activity has ceased. Consequently, the impact of disturbance to is predicted to be of negligible magnitude. Combined within the medium sensitivity of demersal species, the cumulative effect is predicted to be **negligible**, which is considered to be **not significant**. .	***Excluded*** The benthic characterisation survey of the Marine Installation Corridor did not identify any prime or sub-prime herring or sandeel habitat between at KP380 (Greenstreet, et al., 2010).	***Excluded*** Increased SSC has been appraised as resulting in not significant effects in Chapter 9: Fish and Shellfish, with no prime or sub-prime sandeel habitat being identified at KP380 (Greenstreet, et al., 2010).which is potentially susceptible to increases in SSC. Any works would be spatially and temporally separated allowing any localised increases in SSC to disperse and dilute. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** Vessel collision risk has been appraised resulting in not significant effects in Chapter 9: Fish and Shellfish Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** No likely pathway has been identified for combined EMF or thermal emissions between the Northern Endurance Partnership Pipeline and the Marine Scheme.		No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Hornsea Project Four (HOW04) - Offshore Wind Site Export Cable	***Included*** During installation of the Marine Scheme and the Hornsea Project Four (HOW04) - Offshore Wind Site Export Cable, there is the potential that a small area of seabed will be disturbed on two separate occasions in quick succession at the intersection of the corridors. The ZoI for the Project Marine Scheme for temporary physical disturbance has been assumed by this appraisal as 50 m (boulder clearance plough swath of 25 m for separately laid cables). The ZoI associated with temporary disturbance associated with the Hornsea Project Four Offshore Wind Site Export Cable is 654 km length, 40 m width = 26,160,000 m^2 for boulder and sandwave clearance in offshore export cable. The habitat type at KP425 to KP431 was identified as medium to fine sand and gravel, pebbles and/or shingle. The benthic characterisation survey of the Marine Installation Corridor did not identify any prime or sub-prime herring or sandeel habitat (Greenstreet, et al., 2010) between KP425 to KP431 and was only identified as being located in low intensity nursery grounds for herring (Ellis, et al., 2012). Furthermore, mobile fish and shellfish species will be able to relocate away from the disturbance to utilise nearby alternative habitat during periods of installation and decommissioning activity and will return to the area once activity has ceased. Consequently, the cumulative impact of disturbance is predicted to be of negligible magnitude. Combined within the medium sensitivity of demersal species, the cumulative effect is predicted to be **negligible**, which is considered to be **not significant**.	***Excluded*** No likely pathway has been identified for permanent loss of spawning and nursery grounds between the Hornsea Four Offshore Wind Site Export Cable and the Marine Scheme.	***Excluded*** Increased SSC has been appraised as resulting in not significant effects in Chapter 9: Fish and Shellfish, with no prime or sub-prime herring or sandeel habitat between KP425 to KP431 (Greenstreet, et al., 2010) being identified during the benthic survey which is potentially susceptible to increases in SSC. Any works would be spatially and temporally separated allowing any localised increases in SSC to disperse and dilute. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** Vessel collision risk has been appraised resulting in not significant effects in Chapter 9: Fish and Shellfish Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.	***Excluded*** EMF and thermal emissions have been appraised as resulting in not significant effects in Chapter 9: Fish and Shellfish Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect.		No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

16.4.4.5 Marine Mammals

The potential marine mammal impact pathway interactions between the Marine Scheme and other projects are set out in Table 16-8.

Table 16-8: Matrix to identify potential marine mammals impact pathway interactions included in the cumulative effects appraisal

Project Name	Potential Impact Pathways that could interact with Marine Scheme		Proposed mitigation	Residual cumulative effect
	Underwater Sound	Vessel movement		
Green Volt Floating Offshore Wind Farm Export Cable	***Included*** If Installation Phase activities for the Marine Scheme and another identified project were to occur simultaneously, cumulative effects of underwater sound resulting from sound generating activities could occur. However, as detailed in Chapter 10: Marine Mammals, the only activities with the potential to cause injury or disturbance in marine mammals were associated with the operation of the sub-bottom profiler (SBP) and the Ultra Short Baseline (USBL) acoustic positioning system. However, injury thresholds were only met in very close proximity to the vessel and considering the adoption of JNCC measures for geophysical survey (JNCC, 2017) for SBP, and the very low density of cetaceans in the Marine Installation Corridor, injury was considered highly unlikely to occur. The estimated maximum distance for disturbance effects was determined to be approximately 5 km and so any effect would be highly localised to the sound source. In addition, as installation vessels for either project would only be at any particular location for short periods of time, and the area where they interact is very small for all projects, any period of cumulative sound would be very limited. Taking into account that the underwater sound emissions associated with the project do not have the potential to result in injury to marine mammals, and will only result in highly localized and minor disturbance. Where activities resulting in greater underwater noise emissions (such as piling) are used on other projects, this will effectively mask the sound from the Marine Scheme for this short period of time. Thus, the potential cumulative effect is considered to be **negligible** and therefore **not significant**.	***Included*** There will be a small number of vessels involved in the Installation Phase activities of the Marine Scheme and also it is assumed a small number associated with the other proposed developments. It should also be noted that project vessels will be slow moving and will adhere to the Scottish Marine Wildlife Watching Code (embedded Mitigation). Chapter 13: Shipping and Navigation reported that the increases in vessel numbers associated with the Marine Scheme would not a substantive change from baseline conditions. It is also therefore anticipated that the addition of vessels associated with the other proposed development would also not significantly increase vessel numbers above baseline. Therefore, this vessel activity is unlikely to significantly increase the risk of collision with marine mammals when considered against background shipping levels. Thus, the cumulative effect of these highly localised effects is considered to be **negligible** and therefore **not significant**.	No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area/ Option Agreement 6			No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area/ Option Agreement 1				
Dogger Bank C Export Cable / Sofia Export Cable				
NEP CO_2 Pipelines (Teesside and Humber)				
Hornsea Project Four (HOW04) - Offshore Wind Site Export Cable				

16.4.4.6 Ornithology

The potential ornithology impact pathway interactions between the Marine Scheme and other projects have been set out in Table 16-9.

Table 16-9: Matrix to identify potential ornithological impact pathway interactions included in the cumulative effects appraisal

Project Name	Potential Impact Pathways that could interact with Marine Scheme			Proposed mitigation	Residual cumulative effect
	Temporary disturbance and displacement from installation activities associated with sound, visual impacts, and presence from vessel and construction activity	Changes in prey availability	Reduction of water quality due to unplanned releases, accidental leaks and spills from vessels		
Green Volt Floating Offshore Wind Farm Export Cable	***Included*** This development is at the scoping stage and detailed environmental information to characterise the relevant ornithological receptors and potential impacts, along with the preferred export cable route, has not been confirmed. However, as a worst-case it is assumed that there is potential for ZoI to overlap and hence a more detailed appraisal has been undertaken. If Installation Phase activities for the Marine Scheme and another identified project were to occur simultaneously, cumulative effects of disturbance and displacement from construction activities could occur. The development will undergo Environmental Impact Assessment, and therefore it is assumed that any significant effects will be mitigated against, resulting in not significant residual effects. However, should potential impacts not be mitigated, it is considered possible that effects may range from minor to major adverse significance, depending on the value of the receptor being impacted. As appraised in Chapter 11: Ornithology, effects on ornithological receptors during the Installation Phase of the Marine Scheme are minor to negligible adverse and not significant. Therefore, it is considered unlikely that the potential cumulative effects between the potential developments are likely to cause any significant cumulative effects on ornithological receptors. Thus, the potential cumulative effect is considered to be, at worst, **minor** and therefore **not significant**.	***Excluded*** Mobile demersal fish and shellfish species will be able to relocate away from the disturbance to utilise nearby alternative habitat during periods of installation and decommissioning activity and will return to the area once activity has ceased. The benthic characterisation survey of the Marine Installation Corridor did not identify any prime or sub-prime herring or sandeel habitat. Increased SSC has been appraised as resulting in not significant effects in Chapter 9: Fish and Shellfish. Any works would be spatially and temporally separated allowing any localised increases in SSC to disperse and dilute. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect on prey availability.	***Excluded*** No significant effects have been predicted for reduction of water quality through the unplanned release of pollutants. Stringent control measures make it extremely unlikely that projects would individually have a spill of contaminants at the scale that would lead to a potential cumulative significant effect. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect on ornithological receptors.	No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area / Option Agreement 6	***Included*** These potential developments are at pre-planning stage and there is an absence of environmental information to characterise of relevant ornithological receptors and potential impacts; however, as a worst-case it is assumed that there is potential for ZoI to overlap and hence a more detailed appraisal has been undertaken. The potential developments listed will undergo Environmental Impact Assessment, and therefore it is assumed that any significant effects will be mitigated against, resulting in not significant residual effects. However, should potential impacts not be mitigated, it is considered possible that effects may range from minor to major adverse significance, depending on the value of the receptor being impacted. As appraised in Chapter 11: Ornithology, effects on ornithological receptors during the Installation Phase of the Marine Scheme are minor to negligible adverse and not significant. Therefore, it is considered unlikely that the potential cumulative effects between the potential developments are likely to cause any significant cumulative effects on ornithological receptors.			No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area/ Option Agreement 1				No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

Project Name	Potential Impact Pathways that could interact with Marine Scheme			Proposed mitigation	Residual cumulative effect
	Temporary disturbance and displacement from installation activities associated with sound, visual impacts, and presence from vessel and construction activity	**Changes in prey availability**	**Reduction of water quality due to unplanned releases, accidental leaks and spills from vessels**		
Dogger Bank C Export Cable / Sofia Export Cable	***Included*** During installation or decommissioning of the Marine Scheme and the Dogger Bank C Export Cable / Sofia Export Cable, there is the potential that a small area will be subject to disturbance on two separate occasions in quick succession at the intersection of the corridors. If Installation Phase activities for the Marine Scheme and another identified project were to occur simultaneously or in quick succession, cumulative effects of disturbance and displacement from construction activities could occur. The development will undergo Environmental Impact Assessment, and therefore it is assumed that any significant effects will be mitigated against, resulting in not significant residual effects. However, should potential impacts not be mitigated, it is considered possible that effects may range from minor to major adverse significance, depending on the value of the receptor being impacted. As appraised in Chapter 11: Ornithology, effects on ornithological receptors during the Installation Phase of the Marine Scheme are minor to negligible adverse and not significant. Therefore, it is considered unlikely that the potential cumulative effects between the potential developments are likely to cause any significant cumulative effects on ornithological receptors. Thus, the potential cumulative effect is considered to be negligible and therefore **not significant.**	***Excluded*** Mobile demersal fish and shellfish species will be able to relocate away from the disturbance to utilise nearby alternative habitat during periods of installation and decommissioning activity and will return to the area once activity has ceased. The benthic characterisation survey of the Marine Installation Corridor did not identify any prime or sub-prime herring or sandeel habitat. Increased SSC has been appraised as resulting in not significant effects in Chapter 9: Fish and Shellfish. Any works would be spatially and temporally separated allowing any localised increases in SSC to disperse and dilute. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect on prey availability.	***Excluded*** No significant effects have been predicted for reduction of water quality through the unplanned release of pollutants. Stringent control measures make it extremely unlikely that projects would individually have a spill of contaminants at the scale that would lead to a potential cumulative significant effect. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect on ornithological receptors.	No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
NEP CO_2 Pipelines (Teesside and Humber)	***Included*** This potential development is at pre-planning stage and there is an absence of environmental information to characterise relevant ornithological receptors and potential impacts; however, it is assumed that the ZoIs will overlap and hence a more detailed appraisal has been undertaken. This potential development will undergo Environmental Impact Assessment, and therefore it is assumed that any significant effects will be mitigated against, resulting in not significant residual effects. However, should potential impacts not be mitigated, it is considered possible that effects may range from minor to major adverse significance, depending on the value of the receptor being impacted. As appraised in Chapter 11: Ornithology, effects on ornithological receptors during the Installation Phase of the Marine Scheme are minor to negligible adverse and not significant. Therefore, it is considered unlikely that the potential cumulative effects between the potential developments are likely to cause any significant cumulative effects on ornithological receptors.			No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

Project Name	Potential Impact Pathways that could interact with Marine Scheme			Proposed mitigation	Residual cumulative effect
	Temporary disturbance and displacement from installation activities associated with sound, visual impacts, and presence from vessel and construction activity	**Changes in prey availability**	**Reduction of water quality due to unplanned releases, accidental leaks and spills from vessels**		
Hornsea Project Four (HOW04) - Offshore Wind Site Export Cable	***Included*** During installation or decommissioning of the Marine Scheme and the Hornsea Project Four Export Cable, there is the potential that a small area will be subject to disturbance on two separate occasions in quick succession at the intersection of the corridors. If Installation Phase activities for the Marine Scheme and this project were to occur simultaneously or in quick succession, cumulative effects of disturbance and displacement from construction activities could occur. Red-throated diver were modelled to occur in insignificant numbers within the Hornsea Project Four Offshore Wind Site Export Cable route zone of influence. This combined with the minor to negligible potential effects appraised as a result of the Marine Scheme (see Chapter 11: Ornithology), it is therefore considered unlikely for the potential effects of the proposed development and the Marine Scheme to result in a significant cumulative effect on ornithological receptors. Thus, the potential cumulative effect is considered to be, negligible and therefore **not significant.**	***Excluded*** Mobile demersal fish and shellfish species will be able to relocate away from the disturbance to utilise nearby alternative habitat during periods of installation and decommissioning activity and will return to the area once activity has ceased. The benthic characterisation survey of the Marine Installation Corridor did not identify any prime or sub-prime herring or sandeel habitat. Increased SSC has been appraised as resulting in not significant effects in Chapter 9: Fish and Shellfish. Any works would be spatially and temporally separated allowing any localised increases in SSC to disperse and dilute. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect on prey availability.	***Excluded*** No significant effects have been predicted for reduction of water quality through the unplanned release of pollutants. Stringent control measures make it extremely unlikely that projects would individually have a spill of contaminants at the scale that would lead to a potential cumulative significant effect. Therefore, it is considered that there is no potential for this effect to accumulate sufficiently to result in a significant cumulative effect on ornithological receptors.	No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

16.4.4.7 Marine Archaeology

The potential marine archaeology impact pathway interactions between the Marine Scheme and other projects have been identified in Table 16-10.

Table 16-10: Matrix to identify potential marine archaeology impact pathway interactions included in the cumulative effects appraisal

Project Name	Potential Impact Pathways that could interact with Marine Scheme			Proposed mitigation	Residual cumulative effect
	Direct disturbance to the seabed causing damage	Direct damage due to use of anchors by vessels	Indirect changes to hydrodynamic and sediment transport regimes		
Green Volt Floating Offshore Wind Farm Export Cable	***Excluded*** Direct cumulative effects on marine archaeological receptors have the potential to occur where the cable intersects the Marine Scheme at KP4.5. The Marine Scheme has identified 55 A2 anomalies between KP4 and KP5. The potential Green Volt Floating Offshore Wind Farm is at the scoping stage, and it is assumed that any known seabed features will be avoided through the EIA process, as these will constitute engineering hazards. It is assumed that the potential development will undergo EIA, and therefore any significant direct impacts will likely be mitigated against, resulting in negligible adverse significance.		***Excluded*** Changes in local scouring and sedimentation patterns may lead to increased exposure or burial of marine archaeological assets but this potential impact has been assessed to be negligible. Therefore, no adverse cumulative effect would occur as a result of additive effects from the Marine Scheme and the Green Volt Floating Offshore Wind Farm Export Cable.	No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area / Option Agreement 6	***Excluded*** Direct cumulative effects on marine archaeological receptors have the potential to occur where the Marine Scheme and the potential developments overlap. The Marine Scheme has identified nine A2 anomalies between KP64 and KP73 associated with ScotWind Proposed Site Area / Option Agreement 6 and two A2 anomalies between KP91 and KP92 associated with ScotWind Proposed Site Area / Option Agreement 1. These potential developments are at pre-planning stage and hence it is assumed that any known seabed features would have been avoided during the development process, as these would constitute engineering hazards. It is assumed that the potential developments will likely undergo EIA, and therefore any significant direct impacts will likely be mitigated against, resulting in negligible adverse significance. However, should direct impact occur, it could range from low to major adverse significance, depending on the value of the receptor being impacted. The Marine Scheme has committed to avoiding these anomalies where possible through micro-routeing or additional investigation as outlined in a Written Scheme of Investigation (WSI) to be submitted post-consent.		***Excluded*** Changes in local scouring and sedimentation patterns may lead to increased exposure or burial of marine archaeological assets but this potential impact has been assessed to be negligible. Therefore, no adverse cumulative effect would occur as a result of additive effects from the Project Marine Scheme and the ScotWind Proposed Site Area / Option Agreement 6.	No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area / Option Agreement 1	The cables for the Marine Scheme will not be trenched at sufficient depth to directly disturb pre-historic sediments and it is assumed that the potential developments will also follow similar trenching depths and therefore, cumulative effects on this receptor are unlikely to occur. Discrete archaeological sites and unknown sites encountered by chance during installation of the Marine Scheme or the potential development, will be too small to be subject to impact interactions arising from combined effects of the Project Marine Scheme with other developments and activities in the area. Additionally, the Marine Scheme has also committed to include a Protocol for Archaeological Discoveries (PAD) to mitigate against any unknown sites discovered during installation. As a result of the embedded mitigation and commitment to avoid the identified A2 anomalies wherever possible or to undertake additional investigation to determine its archaeological potential, direct effects as a result of the Project Marine Scheme will be avoided. Therefore, cumulative effects between the Marine Scheme and the ScotWind Proposed Site Areas 6 and 1 will also be avoided.		***Excluded*** Changes in local scouring and sedimentation patterns may lead to increased exposure or burial of marine archaeological assets but this potential impact has been assessed to be negligible. Therefore, no adverse cumulative effect would occur as a result of additive effects from the Project Marine Scheme and the ScotWind Proposed Site Area / Option Agreement 1.	No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Dogger Bank C Export Cable / Sofia Export Cable	***Excluded*** Direct cumulative effects on marine archaeological receptors have the potential to occur where the Marine Scheme and the Dogger Bank C / Sofia Export Cable overlap between KP338 and KP339. The cables for the Project Marine Scheme will not be trenched to a depth that would directly disturb pre-historic sediments and it is assumed that the Dogger Bank C Export Cable / Sofia Offshore Export Cable will be trenched to a similar depth. Therefore, it is considered that cumulative effects on this receptor would not occur. The Marine Scheme recorded two A2 anomalies (of possible anthropogenic origin) between KP338 and KP339. The Marine Scheme has committed to avoiding these anomalies where possible through micro-routeing or additional investigation as outlined in a Written Scheme of Investigation (WSI) to be submitted post-consent. Discrete archaeological sites and unknown sites encountered by chance during installation of the Marine Scheme or the Dogger Bank C Export Cable / Sofia Export Cable, will be too small to be subject to impact interactions arising from combined effects of the Project Marine Scheme with other developments and activities in the area. Additionally, the Marine Scheme has also committed to include a Protocol for Archaeological Discoveries (PAD) to mitigate against any unknown sites discovered during installation. As a result of the embedded mitigation and commitment to avoid the identified A2 wherever possible or to undertake additional investigation to determine its archaeological potential will avoid direct effects as a result of the Marine Scheme. Therefore, cumulative effects between the Marine Scheme and Dogger Bank C Export Cable / Sofia Export Cable will be avoided.		***Excluded*** Changes in local scouring and sedimentation patterns may lead to increased exposure or burial of marine archaeological assets but this potential impact has been assessed to be negligible. Therefore, no adverse cumulative effect would occur as a result of additive effects from the Project Marine Scheme and the Dogger Bank C Export Cable / Sofia Export Cable.	No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

Project Name	Potential Impact Pathways that could interact with Marine Scheme			Proposed mitigation	Residual cumulative effect
	Direct disturbance to the seabed causing damage	Direct damage due to use of anchors by vessels	Indirect changes to hydrodynamic and sediment transport regimes		
NEP CO_2 Pipelines (Teesside and Humber)	***Excluded*** Direct cumulative effects on marine archaeological receptors have the potential to occur where the Marine Scheme and the potential developments overlap. The Marine Scheme not identified any at KP380 associated with the NEP CO_2 Teesside Pipeline. This potential development is at pre-application/ Scoping stage and hence it is assumed that any known seabed features would have been avoided during the route development process, as these would constitute engineering hazards. This potential development will undergo EIA (East Coast Cluster, 2022b), and therefore any significant direct impacts will likely be mitigated against, resulting in negligible adverse significance. However, should direct impact occur, it could range from low to major adverse significance, depending on the value of the receptor being impacted. The Marine Scheme has committed to avoiding these anomalies where possible through micro-routeing or additional investigation as outlined in a Written Scheme of Investigation (WSI) to be submitted post-consent. The cables for the Marine Scheme will not be trenched at sufficient depth to directly disturb pre-historic sediments and it is assumed that the potential developments will also follow similar trenching depths and therefore, cumulative effects on this receptor are unlikely to occur. Discrete archaeological sites and unknown sites encountered by chance during installation of the Marine Scheme or the potential development, will be too small to be subject to impact interactions arising from combined effects of the Project Marine Scheme with other developments and activities in the area. Additionally, the Marine Scheme has committed to include a Protocol for Archaeological Discoveries (PAD) to mitigate against any unknown sites discovered during installation. As a result of the embedded mitigation and commitment to avoid the identified A2 wherever possible or to undertake additional investigation to determine its archaeological potential, direct effects as a result of the Project Marine Scheme will be avoided. Therefore, cumulative effects between the Marine Scheme and the NEP CO_2 pipelines will also be avoided.		***Excluded*** Changes in local scouring and sedimentation patterns may lead to increased exposure or burial of marine archaeological assets but this potential impact has been assessed to be negligible. Therefore, no adverse cumulative effect would occur as a result of additive effects from the Project Marine Scheme and the Net Zero Teesside.	No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Hornsea Project Four (HOW04) - Offshore Wind Site Export Cable	***Excluded*** The Hornsea Project Four Offshore Wind Site Export Cable and the Marine Scheme do not spatially overlap therefore there is no potential for cumulative effects to occur as a result of direct effects.		***Excluded*** Changes in local scouring and sedimentation patterns may lead to increased exposure or burial of marine archaeological assets but this potential impact has been assessed to be negligible. Therefore, no adverse cumulative effect would occur as a result of additive effects from the Project Marine Scheme and Hornsea Project Four Offshore Wind Site Export Cable.	No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

16.4.4.8 Shipping and Navigation

The potential shipping and navigation impact pathway interactions between the Marine Scheme and other projects have been identified in Table 16-11.

Table 16-11: Matrix to identify potential shipping and navigation impact pathway interactions included in the cumulative effects appraisal

Project Name	Potential Impact Pathways that could interact with Marine Scheme						Proposed mitigation	Residual cumulative effect
	Vessel-to-vessel collision	Deviation from established and identified vessel routes and areas	Interaction with vessel anchors and anchoring activity	Interaction with fishing gear	Reduction in under keel clearance	EMF results in magnetic compass deviation		
Green Volt Floating Offshore Wind Farm Export Cable	***Included*** As the Marine Scheme is largely trenched below the seabed, the potential for combined navigational effects resulting from its presence is appreciably limited. If installation activities overlap with construction activities associated with any of these projects, a temporary increase in vessel-to-vessel collision and vessel deviations is considered possible, particularly at or near the landfalls. All nine identified potential developments represent the likely requirement for future cable or pipeline crossings, largely due to the parallel alignment with the coast, rather than perpendicular alignment of most subsea cable cases. The continued development of offshore wind farms (as with other developments in the North Sea) presents an ongoing increase in the number of subsea and surface infrastructure features, and therefore cables, making landfall on the east coast of the UK. The number of cable crossings and therefore seabed features which may cause a hazard to shipping and navigation may increase over time. Any potential risk will be mitigated through consultation with the relevant project developers to confirm installation and operation dates, and otherwise rationalise activity schedules. Irrespective, it is not envisaged that the concurrent activities of these shortlisted projects and the Marine Scheme will affect the risk categorisation presented in Chapter 13: Shipping and Navigation. Taking this into account **no significant** cumulative effects are anticipated.		***Excluded*** No likely pathways identified.				No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area/ Option Agreement 6							No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area/ Option Agreement 1							No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Seagreen 1A (Bravo) Offshore Wind Farm							No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Berwick Bank Offshore Wind Farm							No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Dogger Bank C Export Cable / Sofia Export Cable							No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
NEP CO_2 Pipelines (Teesside and Humber)							No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Hornsea Project Four (HOW04) - Offshore Wind Site Export Cable							No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

16.4.4.9 Commercial Fisheries

The potential commercial fisheries impact pathway interactions between the Marine Scheme and other projects have been set out in Table 16-12.

Table 16-12: Matrix to identify potential commercial fisheries impact pathway interactions included in the cumulative effects appraisal

Project Name	Potential Impact Pathways that could interact with Marine Scheme					Proposed mitigation	Residual cumulative effect
	Loss or restricted access to fishing grounds	Displacement of fishing activity into other areas	Interference with fishing activities	Snagging risk – loss or damage to fishing gear	Impacts on fishing as a result of impacts on commercial species		
Green Volt Floating Offshore Wind Farm Export Cable	***Included*** Construction works associated with the Green Volt Floating Offshore Wind Farm Export Cable in relation to commercial fisheries, may result in additional loss of grounds to commercial fisheries and associated displacement of fishing activities to other areas. Similarly, they could result in additional interference to fishing activities and increased snagging risk and associated loss or damage to fishing gear. Any temporary loss of fishing grounds and associated displacement resulting from construction works would be localised and short to medium term, being limited to areas where safety zones/recommended clearance zones may be in place at a given time. Similarly, potential interference to fishing activities and increased snagging risk would also be expected to be short to medium term and localised, being predominantly related to vessel transit routes and areas around sections of cables awaiting trenching or protection. This potential development would be expected to implement similar good practice embedded mitigation measures to those proposed by the Marine Scheme alone, such as a Fisheries Liaison and Co-existence Plan[2]. Cumulative effects during the Installation Phase are therefore considered to not exceed those identified for the Marine Scheme alone, which were appraised in Chapter 14: Commercial Fisheries as being **minor** and therefore **not significant**. During the Operation and Maintenance Phase of the Marine Scheme, there would be potential additional long-term loss of fishing grounds and associated displacement as well as increased snagging risk. Loss of grounds and associated displacement and increased snagging risk associated with cable projects would, for the most part, be limited to discrete areas where cable protection may be required. Although limited, recommended clearance zones may be in place at a given time around repair works or vulnerable sections of cables, which may also contribute to the overall cumulative effects. Loss of grounds and associated displacement and increased snagging risk would arise from the presence of project infrastructure (i.e., foundations, scour protection, cable protection) as well as recommended clearance zones that may be required at times during the Operation and Maintenance Phase. Potential cumulative impacts during the Operation and Maintenance Phase would be long term; however, in all cases, the areas affected would be very localised. In addition, embedded mitigation measures relating to maintenance and repair works, similar to those proposed by the Marine Scheme, would be expected to be implemented. Cumulative effects during the Operation and Maintenance Phase are therefore considered to not exceed those identified for the Marine Scheme, which were appraised in Chapter 14: Commercial Fisheries as being **minor** and therefore **not significant**. Regarding the Decommissioning Phase, as described previously in the appraisal of the Marine Scheme alone, it is considered that effects will be equivalent to the effects associated with the Installation Phase. As such, the impacts identified in the cumulative appraisal undertaken in respect of the Installation Phase are considered to also apply to decommissioning activities. There may also be potential for this development to have a cumulative effect with the Marine Scheme on fish and shellfish species, which could in turn indirectly affect the productivity of the commercial fisheries that depend upon them. A cumulative appraisal of the impact on fish and shellfish ecology during the Installation, Operation and Maintenance, and Decommissioning Phases of the Marine Scheme cumulatively with other plans and projects is provided in Section 16.4.4.4. This cumulative appraisal did not identify any cumulative impacts above minor significance on fish and shellfish species. Consequently, any impacts associated with this on the commercial fisheries that target them are also expected to not exceed m**inor** significance and are therefore **not significant**.					No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area/ Option Agreement 6	***Included*** Construction works related to the potential projects identified in relation to commercial fisheries, may result in additional loss of grounds to commercial fisheries and associated displacement of fishing activities to other areas. Similarly, they could result in additional interference to fishing activities and increased snagging risk and associated loss or damage to fishing gear.					No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area/ Option Agreement 1	It should be noted that the construction programme for some the potential developments, especially those at pre-planning stage, is currently not well defined and therefore, it is difficult to ascertain the degree to which there may be overlap, if any, between construction works at these projects and Installation Phase activities of the Marine Scheme. Any temporary loss of fishing grounds and associated displacement resulting from construction works associated with these potential developments would be localised and short to medium term, being limited to areas where safety zones/recommended clearance zones may be in place at a given time. Similarly, potential interference to fishing activities and increased snagging risk would also be expected to be short to medium term and localised, being predominantly related to vessel transit routes and areas around sections of cables awaiting trenching or protection. These potential developments would be expected to implement similar good practice embedded mitigation measures to those proposed by the Marine Scheme alone, such as a Fisheries Liaison and Co-existence Plan. Cumulative effects during the Installation Phase are therefore considered to not exceed those identified for the Marine Scheme alone, which were appraised in Chapter 14: Commercial Fisheries as being **minor** and therefore **not significant**. During the Operation and Maintenance Phase of the Marine Scheme, there would be potential for these projects to result in additional long-term loss of fishing grounds and associated displacement as well as increased snagging risk. Loss of grounds and associated displacement and increased snagging risk associated with cable projects would, for the most part, be limited to discrete areas where cable protection may be required. Although limited, recommended clearance zones may be in place at a given time around repair works or vulnerable sections of cables, which may also contribute to the overall cumulative effects. Loss of grounds and associated displacement and increased snagging risk from developing these areas would arise from the presence of project infrastructure (i.e., foundations, scour protection, cable protection) as well as recommended clearance zones that may be required at times during the Operation and					No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

[2] Note that this will be a single document that will perform the role of other fisheries liaison plans, for instance, a Fisheries Management and Mitigation Strategy.

Project Name	Potential Impact Pathways that could interact with Marine Scheme					Proposed mitigation	Residual cumulative effect
	Loss or restricted access to fishing grounds	Displacement of fishing activity into other areas	Interference with fishing activities	Snagging risk – loss or damage to fishing gear	Impacts on fishing as a result of impacts on commercial species		
	Maintenance Phase. Potential cumulative impacts during the Operation and Maintenance Phase would be long term; however, in all cases, the areas affected would be very localised. In addition, embedded mitigation measures relating to maintenance and repair works, similar to those proposed by the Marine Scheme, would be expected to be implemented by the other potential developments considered in this appraisal. Cumulative effects during the Operation and Maintenance Phase are therefore considered to not exceed those identified for the Marine Scheme, which were appraised in Chapter 14: Commercial Fisheries as being **minor** and therefore **not significant**. Regarding the Decommissioning Phase, as described previously in the appraisal of the Marine Scheme alone, it is considered that effects will be equivalent to the effects associated with the Installation Phase. As such, the impacts identified in the cumulative appraisal undertaken in respect of the Installation Phase are considered to also apply to decommissioning activities. There may also be potential for these developments to have a cumulative effect with the Marine Scheme on fish and shellfish species, which could in turn indirectly affect the productivity of the commercial fisheries that depend upon them. A cumulative appraisal of the impact on fish and shellfish ecology during the Installation, Operation and Maintenance, and Decommissioning Phases of the Marine Scheme cumulatively with other plans and projects is provided in Section 16.4.4.4. This cumulative appraisal did not identify any cumulative impacts above minor significance on fish and shellfish species. Consequently, any impacts associated with this on the commercial fisheries that target them are also expected to not exceed m**inor** significance and are therefore **not significant**.						
Potential for the implementation of closures to fishing within the Firth of Forth Banks Complex MPA	***Included*** Proposed potential closures to commercial fishing in the Firth of Forth Banks Complex MPA, if implemented in the future, would result in a minimal contribution to cumulative impacts on fishing as these relate to prohibitions on scallop dredging and demersal trawling only and these two activities occur at very low levels in the area where closures have been proposed. As such, cumulative effects during the Installation, Operation and Maintenance, and Decommissioning Phases associated with this are considered to not exceed those identified for the Marine Scheme, which were appraised in Chapter 14: Commercial Fisheries as being **minor** and therefore **not significant**.		***Excluded*** No likely pathways identified.			No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Seagreen 1A (Bravo) Offshore Wind Farm	***Included*** Construction works related to the potential projects identified in relation to commercial fisheries, may result in additional loss of grounds to commercial fisheries and associated displacement of fishing activities to other areas. Similarly, they could result in additional interference to fishing activities and increased snagging risk and associated loss or damage to fishing gear. Any temporary loss of fishing grounds and associated displacement resulting from construction works associated with these potential developments would be localised and short to medium term, being limited to areas where safety zones/recommended clearance zones may be in place at a given time. Similarly, potential interference to fishing activities and increased snagging risk would also be expected to be short to medium term and localised, being predominantly related to vessel transit routes and areas around sections of cables awaiting trenching or protection. In all cases, these potential developments would be expected to implement similar good practice embedded mitigation measures to those proposed by the Marine Scheme alone, such as a Fisheries Liaison and Co-existence Plan. Cumulative effects during the Installation Phase are therefore considered to not exceed those identified for the Marine Scheme alone, which were appraised in Chapter 14: Commercial Fisheries as being **minor** and therefore **not significant**. During the Operation and Maintenance Phase of the Marine Scheme, there would be potential for all the projects listed above to result in additional long-term loss of fishing grounds and associated displacement as well as increased snagging risk. Loss of grounds and associated displacement and increased snagging risk associated with cable projects would, for the most part, be limited to discrete areas where cable protection may be required. Although limited, recommended clearance zones may be in place at a given time around repair works or vulnerable sections of cables, which may also contribute to the overall cumulative effects. In the case of Seagreen 1A (Bravo), Berwick Bank Offshore Wind Farm and Hornsea Project Four loss of grounds and associated displacement and increased snagging risk would arise from the presence of project infrastructure (i.e., foundations, scour protection, cable protection) as well as recommended clearance zones that may be required at times during the Operation and Maintenance Phase. Potential cumulative impacts during the Operation and Maintenance Phase would be long term; however, in all cases, the areas affected would be very localised. In addition, embedded mitigation measures relating to maintenance and repair works, similar to those proposed by the Marine Scheme, would be expected to be implemented by the other potential developments considered in this appraisal. Cumulative effects during the Operation and Maintenance Phase are therefore considered to not exceed those identified for the Marine Scheme, which were appraised in Chapter 14: Commercial Fisheries as being **minor** and therefore **not significant**. Regarding the Decommissioning Phase, as described previously in the appraisal of the Marine Scheme alone, it is considered that effects will be equivalent to the effects associated with the Installation Phase. As such, the impacts identified in the cumulative appraisal undertaken in respect of the Installation Phase are considered to also apply to decommissioning activities. There may also be potential for these developments to have a cumulative effect with the Marine Scheme on fish and shellfish species, which could in turn indirectly affect the productivity of the commercial fisheries that depend upon them. A cumulative appraisal of the impact on fish and shellfish ecology during the Installation, Operation and Maintenance, and Decommissioning Phases of the Marine Scheme cumulatively with other plans and projects is provided in Section 16.4.4.4. This cumulative appraisal did not identify any cumulative impacts above minor significance on fish and shellfish species. Consequently, any impacts associated with this on the commercial fisheries that target them are also expected to not exceed m**inor** significance and are therefore **not significant**.					No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Berwick Bank Offshore Wind Farm						No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Dogger Bank C Export Cable / Sofia Export Cable						No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
NEP CO_2 Pipelines (Teesside and Humber)						No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Hornsea Project Four (HOW04) - Offshore Wind Site Export Cable						No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

16.4.4.10 Other Sea Users

The potential other sea users impact pathway interactions between the Marine Scheme and other projects are set out in Table 16-13.

Table 16-13: Matrix to identify potential other sea users impact pathway interactions included in the scoped into cumulative effects appraisal

Project Name	Potential Impact Pathways that could interact with Marine Scheme			Proposed mitigation	Residual cumulative effects
	Disturbance to marine recreational users (up to MHWS)	Disruption to vessel routeing and access to other sea users working area	Risk of damage to or interference with a third-party cable or pipeline asset		
Green Volt Floating Offshore Wind Farm Export Cable	***Included*** Construction of this project is planned to overlap with the Installation Phase of the Marine Scheme, therefore marine recreational users, particularly at the Scottish Landfall, could be displaced from the area of spatial overlap, including any recommended clearance zones. Potentially displaced marine recreational activities include inshore sailing, swimming, surfing, wind and kite surfing, paddle boarding, canoeing and kayaking, and shoreline angling. Offshore sailing, boat-based angling, and tour boats could also be affected. There is risk of project vessels associated with either project colliding with recreational vessels, with potential to cause physical harm to people and financial loss. This is considered further in Section 16.4.4.8: Shipping and Navigation. There is also potential for recreational users to lose access to certain areas they would normally utilise or travel through for recreational purposes, primarily during the Installation Phases of both the Marine Scheme and the proposed development. There is also the possibility for occasional loss of access during the Operation and Maintenance Phase where the Marine Scheme and the export cable interact. The appraisal of potential effects determined the effect as being not significant. Whilst there may be a slight increase in potential interruption to recreational activities as a result of both developments occurring cumulatively, the magnitude of impact is still considered to be low. Notice(s) will be given to marine recreational users in the area via the use of Notices to Mariners, Kingfisher Bulletins, NAVTEX, and/or broadcast warnings. The sensitivity of these users has been assessed as negligible. This is because the activities associated with the Marine Scheme and Green Volt Floating Offshore Wind Farm will only disrupt recreational users in the short term and they will be able to use other areas in close proximity during those periods. Therefore, the cumulative effect is **negligible**, which is **not significant**.	***Excluded*** The potential for cumulative effects as a result of the Marine Scheme and the potential developments is considered in Section 16.4.4.8: Shipping and Navigation. Therefore, they have been excluded from consideration as part of the Other Sea Users cumulative effects appraisal.	***Excluded*** No additional crossings have been identified in the vicinity of the crossings detailed in Chapter 15: Other Sea Users and therefore there is no potential for the Marine Scheme and the proposed developments to result in cumulative effects.	No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area/ Option Agreement 6	***Included*** Should construction of any of the potential developments be undertaken concurrently with that of the Marine Scheme, marine recreational users could be displaced from the area of spatial overlap, including any recommended clearance zones. However, these proposed developments are unlikely to interact with recreational activities in the nearshore areas in proximity to the Marine Scheme (i.e., activities such as inshore sailing, swimming, surfing, wind and kite surfing, paddle boarding, canoeing and kayaking, and shoreline angling). Therefore, cumulative effects on these receptors as a result of the Marine Scheme can be excluded. As such, it is assumed that only offshore sailing, boat-based angling, and tour boats will be affected for these projects. There is risk of project vessels associated with either project colliding with recreational vessels, with potential to cause physical harm to people and financial loss. This is considered further in Section 16.4.4.8: Shipping and Navigation. There is also potential for recreational users to lose access to certain areas they would normally utilise or travel through for recreational purposes, primarily during the Installation Phase. There is also possibility for occasional loss of access during the Operation and Maintenance where the Marine Scheme and the potential developments interact. The magnitude of impact has been assessed as low. Notice(s) will be given to marine recreational users in the area via the use of Notices to Mariners, Kingfisher Bulletins, NAVTEX, and/or broadcast warnings. The sensitivity of these users has been assessed as negligible. This is because the activities associated with the Marine Scheme and these potential developments will only disrupt recreational users in the short term and they will be able to use other areas in close proximity during those periods. Therefore, the cumulative effect is **negligible**, which is **not significant**.	***Excluded*** The potential for cumulative effects as a result of the Marine Scheme and the potential developments is considered in Section 16.4.4.8: Shipping and Navigation. Therefore, they have been excluded from consideration as part of the Other Sea Users cumulative effects appraisal.	***Excluded*** No additional crossings have been identified in the vicinity of the crossings detailed in Chapter 15: Other Sea Users and therefore there is no potential for the Marine Scheme and the proposed developments to result in cumulative effects.	No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
ScotWind Proposed Site Area/ Option Agreement 1				No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Dogger Bank C Export Cable / Sofia Export Cable				No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
NEP CO_2 Pipelines (Teesside and Humber)				No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.
Hornsea Project Four (HOW04) - Offshore Wind Site Export Cable	***Included*** Construction of this project is planned to overlap with the Installation Phase of the Marine Scheme, therefore marine recreational users, particularly at the English Landfall, could be displaced from the area of spatial overlap, including any recommended clearance zones. Potentially displaced marine			No additional mitigation is required above that previously identified in the relevant appraisals.	No significant cumulative effects are expected to occur.

Project Name	Potential Impact Pathways that could interact with Marine Scheme			Proposed mitigation	Residual cumulative effects
	Disturbance to marine recreational users (up to MHWS)	Disruption to vessel routeing and access to other sea users working area	Risk of damage to or interference with a third-party cable or pipeline asset		
	recreational activities include inshore sailing, swimming, surfing, wind and kite surfing, paddle boarding, canoeing and kayaking, and shoreline angling. Offshore sailing, boat-based angling, and tour boats could also be affected. There is risk of project vessels associated with either project colliding with recreational vessels, with potential to cause physical harm to people and financial loss. This is considered further in Section 16.4.4.8: Shipping and Navigation. There is also potential for recreational users to lose access to certain areas they would normally utilise or travel through for recreational purposes, primarily during the Installation Phase. There is also the possibility for occasional loss of access during the Operation and Maintenance Phase where the Marine Scheme and the export cable interact. The magnitude of impact has been assessed as low. Notice(s) will be given to marine recreational users in the area via the use of Notices to Mariners, Kingfisher Bulletins, NAVTEX, and/or broadcast warnings. The sensitivity of these users has been assessed as negligible. This is because the activities associated with the Marine Scheme and this development will only disrupt recreational users in the short term and they will be able to use other areas in close proximity during those periods. Therefore, the cumulative effect is **negligible**, which is **not significant**.				

16.5 Appraisal of In-Combination Effects

In-combination effects are where receptors could be affected by more than one type of impact. Where a receptor has been identified as only experiencing one effect or where only one topic has identified effects on that receptor, there is no potential for in-combination effects.

Table 16-14 summarises how the receptor groups interact between chapters. This screening exercise demonstrates that there are no resources or receptors common to more than one environmental topic and therefore the resources or receptors have been wholly assessed Chapter 7 to Chapter 15 of this EAR. It is therefore considered that there is no further requirement for the consideration of potential in-combination effects.

Table 16-14: Screening for interaction between receptor groups and technical chapters

Receptors	Technical Chapters								
	Chapter 7 Physical Environment	Chapter 8 Benthic Ecology	Chapter 9 Fish and Shellfish	Chapter 10 Marine Mammals	Chapter 11 Ornithology	Chapter 12 Marine Archaeology	Chapter 13 Shipping and Navigation	Chapter 14 Commercial Fisheries	Chapter 15 Other Sea Users
Seabed and bedforms	✓								
Seabed morphology	✓								
Water column	✓								
Sea water quality	✓								
Metocean regime	✓								
Benthic Habitats – Subtidal sands and gravels		✓							
Subtidal mixed and coarse sediments		✓							
Mud habitats in deep water		✓							
Annex I Sandbanks		✓							
Seapens and burrowing megafauna		✓							
Annex 1 Reef: stony, bedrock and *Sabellaria spinulosa*		✓							
Ocean quahog		✓							
Pelagic fish species			✓						

Receptors	Technical Chapters								
	Chapter 7 Physical Environment	Chapter 8 Benthic Ecology	Chapter 9 Fish and Shellfish	Chapter 10 Marine Mammals	Chapter 11 Ornithology	Chapter 12 Marine Archaeology	Chapter 13 Shipping and Navigation	Chapter 14 Commercial Fisheries	Chapter 15 Other Sea Users
Demersal fish species			✓						
Elasmobranch			✓						
Migratory Species			✓						
Shellfish			✓						
Harbour porpoise				✓					
Bottlenose dolphin				✓					
White-beaked dolphin				✓					
Minke whale				✓					
Habour seal				✓					
Grey seal				✓					
Kittiwake					✓				
Guillemot					✓				
Fulmar					✓				
Shag					✓				
Herring gull					✓				
Gannet					✓				
Razorbill					✓				
Red-throated diver					✓				
Known and potential seabed prehistory receptors						✓			
Known and recorded maritime receptors and aviation receptors						✓			
Geophysical anomalies of possible anthropogenic origin						✓			

Receptors	Technical Chapters								
	Chapter 7 Physical Environment	Chapter 8 Benthic Ecology	Chapter 9 Fish and Shellfish	Chapter 10 Marine Mammals	Chapter 11 Ornithology	Chapter 12 Marine Archaeology	Chapter 13 Shipping and Navigation	Chapter 14 Commercial Fisheries	Chapter 15 Other Sea Users
Currently unknown archaeological sites and artefacts						✓			
Shipping and Navigation							✓		
Demersal trawlers								✓	
Pelagic trawlers								✓	
Potter/creelers								✓	
Scallop dredgers								✓	
Static gear fishing								✓	
Mobile fisheries								✓	
Recreational boaters									✓
Sea anglers									✓
Marine recreational users									✓
Oil and gas block owners									✓
MOD									✓
Dredging and disposal site owners/ operators									✓
Cable and pipeline asset owners									✓

16.6 Conclusion

The appraisal of cumulative effects resulting from the Marine Scheme and those projects identified in Section 16.4.2 has been appraised in accordance with the methodology laid out in Section 16.3 The cumulative effects identified through this appraisal have ranged from negligible to minor effects, which are considered to be not significant.

16.7 References

Dogger Bank Wind Farm. (2022). Retrieved from https://doggerbank.com/joint-dogger-bank-c-and-sofia-application/

East Coast Cluster. (2022a). Retrieved from https://eastcoastcluster.co.uk/

East Coast Cluster. (2022b). Retrieved from https://eastcoastcluster.co.uk/wp-content/themes/nep/report.pdf

EDF Renewables. (2022). Retrieved from https://nngoffshorewind.com/?msclkid=d22d4db7aaac11ec9eca81edcb1e5283

Ellis, J., Milligan, S., Readdy, L., Taylor, N., & Brown, M. (2012). *Spawning and nursery grounds of selected fish species in UK waters. (Science Series Technical Report No.147)*. Lowestoft: Centre for Environment, Fisheries and Aquaculture Science.

Greenstreet, P., Holland, G., Guirey, E., Armstrong, E., Fraser, H., & Gibb, I. (2010). Combining hydroacoustic seabed survey and grab sampling techniques to assess “local” sandeel population abundance. *ICES Journal of Marine Science*, 971-984.

HM Government . (2021). *Marine Plans in England*. Retrieved from https://www.gov.uk/government/collections/marine-planning-in-england

HM Government. (2011). *UK marine policy statement*. Retrieved from https://www.gov.uk/government/publications/uk-marine-policy-statement

HM Government. (2014). *East Inshore and East Offshore Marine Plans*. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/312496/east-plan.pdf

Inch Cape Offshore Limited. (2022). Retrieved from https://www.inchcapewind.com/?msclkid=d3dcf7afaaab11ec9bf637e217f0f2bf

KIS-ORCA. (2021). *KIS-ORCA - Offshore Renewables and Cable Awarness - Map*. Retrieved from https://kis-orca.org/map/

Marine Scotland. (2018). *Offshore wind, wave and tidal energy applications: consenting and licensing manual*. Retrieved from https://www.gov.scot/publications/marine-scotland-consenting-licensing-manual-offshore-wind-wave-tidal-energy-applications/

Marine Scotland. (2022). *All applications.* https://marine.gov.scot/marine-licence-applications.

MMO. (2014). *A strategic framework for scoping cumulative effects (MMO 1055)*. Retrieved from https://www.gov.uk/government/publications/a-strategic-framework-for-scoping-cumulative-effects-mmo-1055

MMO. (2022). Retrieved from https://marinelicensing.marinemanagement.org.uk/mmofox5/fox/live/MMO_LOGIN/login

National Infrastructure Planning. (2022). *Welcome to National Infrastructure Planning*. Retrieved from https://infrastructure.planninginspectorate.gov.uk/

NEXTGeosolutions. (2022). *EASTERN LINK MARINE SURVEY – LOT 2. FINAL ENVIRONMENTAL BASELINE & HABITAT ASSESSMENT SURVEY REPORT (VOLUME 5).*

NorthConnect. (2022). Retrieved from https://northconnect.co.uk/?msclkid=1a86d2a8aaad11ecbb8e5fb288bad5a8

Northern Endurance Partnership. (2022). Retrieved from https://www.netzeroteesside.co.uk/northern-endurance-partnership/?msclkid=3c7865cdaaad11ec816d99a016ffe8ea; https://www.zerocarbonhumber.co.uk/?msclkid=6a535b44aaad11ec8e52b5bdf3268274

NS Energy Business. (2021). *SSE to merge Berwick Bank and Marr Bank offshore wind farms in Scotland*. Retrieved from https://www.nsenergybusiness.com/news/sse-renewables-berwick-bank-wind-farm/

OGA. (2021). *Offshore Oil and Gas Activity Map*. Retrieved from https://www.arcgis.com/apps/webappviewer/index.html?id=f4b1ea5802944a55aa4a9df0184205a5

Orsted. (2022). Retrieved from https://hornseaprojects.co.uk/hornsea-project-four?msclkid=979c79daaaac11ecb0119c98b3a2b4fc

Scottish Government. (2015). *Scotland's National Marine Plan*. Retrieved from https://www.gov.scot/publications/scotlands-national-marine-plan-9781784128555/

SeaGreen. (2022). *Building Scotland's largest offshore wind farm*. Retrieved from https://www.seagreenwindenergy.com/

SSE. (2020). *Berwick Bank Wind Farm Offshore Scoping Report*. Retrieved from https://static1.squarespace.com/static/60e8221b22cc6d086da292de/t/60f03b2c79f953043cc172f7/1626356557120/berwick-bank-wind-farm-offshore-scoping-report-RD.pdf

SSE Renewables. (2022). Retrieved from https://www.berwickbank.com/project?msclkid=81dbbd19aaab11ecbfb36d66e12e0612

Statnett and National Grid. (2022). Retrieved from https://www.northsealink.com/?msclkid=87a726e7aaad11ecbd65d9e40f2aa3e0

The Crown Estate. (2021). *The Crown Estate - Assets Map WebViewer*. Retrieved from https://thecrownestate.maps.arcgis.com/apps/webappviewer/index.html?id=b7f375021ea845fcabd46f83f1d48f0b

The Crown Estate Scotland. (2022). Retrieved from https://www.crownestatescotland.com