




**Cambois Connection – Marine Scheme  
Environmental Statement – Volume 2  
ES Chapter 6: Route Appraisal and  
Consideration of Alternatives**

	<b>Cambois Connection – Marine Scheme</b>	Doc No:
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### Approval for Issue

**Sarah Edwards**

[Redacted]

**25/07/2023**

Prepared by:

**Xodus**

Prepared for:

**SSE Renewables**

Checked by:


**Anja Schoene**

Accepted by:

**Kerrie Craig**

Approved by:

**Sarah Edwards**

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## Acronyms

Acronym	Description
BBWF	Berwick Bank Wind Farm
BBWFL	Berwick Bank Wind Farm Limited
BRAG	Black, Red, Amber, Green (appraisal)
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CCUS	Carbon Capture, Usage and Storage
CfD	Contract for Difference
EIA	Environmental Impact Assessment
ES	Environmental Statement
GB	Great Britain
HDD	Horizontal Directional Drilling
HND	Holistic Design Network
HVDC	High Voltage Direct Current
IEMA	Institute of Environmental Management and Assessment
LPA	Local Planning Authority
MCZ	Marine Conservation Zone
MPA	Marine Protected Area
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MLA	Marine Licence application
MMO	Marine Management Organisation
MD-LOT	Marine Directorate Licensing and Operations Team
NCC	Northumberland County Council
NGESO	National Grid Electricity System Operator
NPS	National Policy Statement
NSL	North Sea Link
PEXA	Practice and Exercise Areas
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Specific Scientific Interest

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UK United Kingdom

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## Units


Acronym	Description
°C	Degree Celsius
GW	Gigawatts
km	Kilometres
nm	Nautical miles

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## 6. Route Appraisal and Consideration of Alternatives

### 6.1. Introduction

1. This chapter of the Environmental Statement (ES) provides a description of the route appraisal process and the alternative options which have been considered by the Applicant from the initial identification of a possible additional connection from the Berwick Bank Wind Farm (BBWF) to the existing National Grid substation in Blyth, North East England, through to the final Environmental Impact Assessment (EIA) design.
2. Specifically, this chapter considers the Offshore Export Cable route appraisal and consideration of alternatives associated with aspects of the Cambois Connection (the Project), which are seaward of Mean High Water Springs (MHWS) (the Marine Scheme). It also provides an appraisal of the associated Landfall options considered to date.
3. The current design for the Marine Scheme is the outcome of an iterative process that commenced when the need to develop an additional connection from BBWF to a landfall in England was initially identified with the objective to accelerate BBWF reaching its full generation capacity. The additional grid connection was confirmed by the National Grid Electricity System Operator (NGESO) in July 2022. A wide range of environmental, technical and commercial considerations have influenced the optioneering and design evolution process. Alongside this, the formal consultation process (including a formal request for a Scoping Opinion in November 2022 (BBWFL, 2022a)) and technical engagement with key stakeholders has informed the development of the Marine Scheme.
4. Route appraisal and assessment of alternatives has considered the Marine Scheme as a whole, i.e. no distinction has been made between the Marine Scheme in Scottish waters and the Marine Scheme in English waters. This holistic approach has been taken for greater consistency of design across the Marine Scheme. Accordingly, this chapter does not distinguish between the Marine Scheme in Scottish and English waters respectively and hence, is to be considered in its entirety. However, site-specific conditions and other factors have been considered as relevant as part of the route appraisal, as is explained in more detail throughout this Chapter.

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### 6.1.1. Project Objectives

5. The development of the Marine Scheme will enable the BBWF to reach its full generating capacity by 2030. The urgent need for the Project is encompassed by five clear objectives which the Marine Scheme will support:


- **Decarbonisation:** the Marine Scheme as part of the Cambois Connection will help deliver significant quantities of low-carbon electricity from BBWF’s full generation capacity as early as 2030, making a significant and timely contribution to both the Scottish target of achieving Net Zero by 2045 and the UK target for achieving Net Zero by 2050. This is in line with the UK’s Committee on Climate Change (CCC)’s recent identification of the need for urgent action to increase the pace of decarbonisation in the Great Britain (GB) electricity sector (CCC, 2023);
- **Wind generated electricity:** the Marine Scheme will help deliver greater energy generation from offshore wind; this is recognised by Government as being critical for helping to decarbonise the electricity system. Greater energy generation from offshore wind is critical for both the reduction of electricity related emissions as well as providing a timely contribution to a substantial increase in electricity demand due to electrification of transport, heat and industrial demand. The Cambois Connection would deliver electricity from BBWF and BBWF would make a significant contribution to delivering Scotland’s ambitions for 11 GW of offshore wind capacity to be in operation in Scottish waters by 2030 (Scottish Government, 2020) and UK targets of 50 GW of offshore wind by 2030 as set out in the British Energy Security Strategy (HM Government, 2022). This increase of 10 GW on the 40 GW by 2030 target established by the Ten Point Plan (HM Government, 2020) and committed to in the UK Offshore Wind Sector Deal (HM Government, 2019) reflects findings from National Grid ESO (NGESO)’s Future Energy Scenarios (FES) which detail that to achieve Net Zero targets, offshore wind capacities will be required at 40 – 51 GW in 2030, at 84 – 91 GW in 2040, and at 89 – 110 GW by 2050 (National Grid, 2021). In every scenario, a pathway to Net Zero includes a significant increase of offshore wind capacity beyond that predicated in the Sector Deal. The increased target also builds on the UK CCC’s 2019 Report, where they advise that consistently strong deployment of low-carbon generation in the lead up to 2050 will be required to meet Net Zero, including “...at least 75GW of offshore wind.” (CCC, 2019);
- **Energy security and resilience of the electricity system:** the Marine Scheme as part of the Cambois Connection will help deliver the significant contribution made by the BBWF to the UK’s energy security from 2030. By being connected at the transmission system level, the Marine Scheme will play an important role in the resilience of the GB electricity system from an adequacy and system operation perspective;
- **Energy at scale:** the Marine Scheme will be essential for the delivery of the Cambois Connection, a transmission project which represents a substantial infrastructure asset capable of delivering significant quantities of low-carbon electricity from the BBWF by 2030 to the benefit of all GB consumers; and
- **Competitive:** The Marine Scheme will help supply the UK network with competitive and non-volatile (to fuel price fluctuations) electricity from renewable energy (wind) compared to conventional low-carbon generated electricity. The competitive Contract for Difference (CfD) allocations up to 2022 saw offshore wind development costs falling by two thirds in the last five years, which accelerated the deployment of offshore wind.

## 6.2. Purpose of this Chapter

6. This chapter:

- Presents a summary of the legislative requirements for the consideration of alternative options for delivering the Marine Scheme objectives;
- Outlines how the Marine Scheme has evolved, including how the Offshore Export Cable Corridor from BBWF to a Landfall location has been appraised;



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- Provides a chronological record of the evolution of the Offshore Export Cable Corridor, including how consultation and feedback obtained during engagement with stakeholders has informed the process; and
- Provides a summary of the main reasons for why the Offshore Export Cable Corridor, subject to the Marine Licence applications and this ES has been selected, including consideration of various environmental, technical and commercial factors.


### 6.3. Grid Connections

7. The Applicant has three signed grid connection agreements with the network operator (NGESO). Two agreements are for connection at a point close to the existing Branxton cable sealing end compound in East Lothian, around 8 km south-west of Dunbar on the East Lothian coast with a third additional connection at the exiting National Grid substation in Blyth, Northumberland (referred to as the Cambois Connection). The Branxton grid connections were first secured in 2011.
8. The third additional connection agreement (the Cambois Connection) was confirmed in June 2022 following NGESO's Holistic Network Design (HND) Review (National Grid ESO, 2022). The Cambois Connection provides an earlier connection date than had initially been offered to Berwick Bank Wind Farm Limited (BBWFL) for a third connection in the Branxton area, therefore enabling the BBWF to reach full generating capacity by the early 2030s.
9. The BBWF and associated offshore transmission infrastructure associated with the Branxton grid connections are being consented separately and have been considered as cumulative projects with the Marine Scheme within this ES. It is the transmission infrastructure below MHWs (Landfall and Offshore Export Cables) that is required for the third connection (Cambois Connection) which is the subject of this chapter.

### 6.4. Legislation, Policy and Guidance

#### 6.4.1. Policy and Legislation

10. The Marine Works (Environmental Impact Assessment) Regulations 2007 (the EIA Regulations), section 12 (2) require that an environmental statement must include...*"a description of the reasonable alternatives studied by the applicant which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment."*
11. Schedule 3 (Paragraph 2) of the EIA Regulations also requires that an ES includes a 'description of the reasonable alternatives (for example, in terms of project design, technology, location, size and scale) studied by the applicant, which are relevant to the proposed project, the regulated activity and their specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects'.
12. The North-East Inshore and North-East Offshore Marine Plan (MMO, 2021) ('the north-east Marine Plan') does not include specific guidance setting out how cable route options should be appraised, nor does it set out specific requirements for the assessment of alternatives. However, the focus of the plan is on enabling the 'optimum use of space, highlighting the need and opportunities for coexistence in areas with high concentrations of activity, or where the geography of the area does not allow alternatives' and the best balance between a diverse number of receptors on the north-east coast. In relation to co-existence, the north-east Marine Plan also recognises the spatial pressures within the marine environment, encouraging developers to 'plan for and make efficient use of the space'.
13. Similarly, Scotland's National Marine Plan (Scottish Government, 2015) does not include explicit guidance on the route options appraisal process or consideration of alternatives. However, the need for robust route selection is recognised by the plan; this includes policy 'Cables 2' which sets out that 'Cables should be suitably routed to provide sufficient requirements for installation and

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cable protection'. Policy 'Cables 1' also encourages developers to 'engage with decision makers at the early planning stage to notify of any intention to lay, repair or replace cables before routes are selected and agreed'.


#### 6.4.2. Guidance

14. As outlined above, the legislative requirement is to include a description of alternatives and the main reasons for the option chosen accounting for a comparison of environmental effects.. Notwithstanding, a detailed route appraisal and assessment of alternatives is presented within this chapter informed by a range of guidance, industry best-practice, formal consultation and technical engagement.
15. As described, there is no single methodology for route appraisal and assessment of alternatives. The Institute of Environmental Management and Assessment (IEMA) publishes a suite of guidance associated with impact assessment. The IEMA impact assessment guide to shaping quality development (IEMA, 2015) states that:

*'[...] it is important that the ES describes the influence that the environment and consultation responses have had on design evolution, and how that led to the specific development proposal, thus meeting the EIA regulation requirements in respect of alternatives. One way of achieving this is via a chapter dedicated to the topic of the design evolution, which then can be referenced by other chapters'.*
16. Topic-specific guidance from IEMA on the consideration of alternatives provides further guidance, recommending that EIA practitioners consider aspects such as alternative locations and scales of development, alternative site layouts and access arrangements, different approaches to scheme design and alternative processes and alternative phasing of construction (IEMA, 2012). IEMA also recommend that EIA practitioners outline how the scheme has evolved since project inception, explain why alternative options have *not* been selected, assess the "do nothing" option (a scenario where development is not taken forward) and identify the main reasons (including environmental) for the final choice of the preferred alternative.
17. The Crown Estate has also developed guidance associated with the identification of cable route options and refinement thereof ahead of application for seabed lease. The guidance, published in December 2021, sets out a range of overarching principles that provide best practice guidance on the way in which cable route planning should be undertaken to ensure '*good management of land and seabed, and to minimise environmental impacts*' (The Crown Estate, 2021).
18. All of the aforementioned guidance has been considered when undertaking the route appraisal for the Marine Scheme.


### 6.5. Consultation and Technical Engagement

19. A summary of the key issues raised during consultation and technical engagement activities undertaken to date specific to the routeing appraisal and design is presented in Table 6.1.
20. In addition to the joint consultation of the MMO and MD-LOT on the Cambois Connection noted in Table 6.1, MD-LOT and NatureScot have been kept informed and consulted on the Cambois Connection and progress with associated activities, e.g. surveys, in bi-weekly calls for BBWF. Whilst BBWF is subject to a separate consenting process, as noted in section 6.3, there is considerable overlap in terms of the consultation and engagement undertaken for both projects due to their inherent link. Further information relating to consultation and engagement undertaken with various stakeholders regarding the Marine Scheme can be found in Volume 2, Chapter 4 Stakeholder Consultation and Engagement.


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**Table 6.1 Summary of Consultation and Technical Engagement**


Date	Consultee	Issue(s) Raised	Response to Issue Raised and/or Where Considered in this Chapter
<b>Pre-Scoping</b>			
13 January 2022	Northumberland County Council (NCC)	The Applicant held an introductory meeting with NCC, as the Local Planning Authority (LPA) for the Onshore Scheme of the Cambois Connection. Owing to the requirement for a landfall along the Cambois coastline, the approach to the impact assessment for this area was discussed (including in terms of specific sensitivities and any potential overlap in assessments for the Marine Scheme and the Onshore Scheme).	Advice from NCC was used to inform the Landfall selection process.
16 March 2022	MMO and the Marine Scotland Licensing Operations Team (MD-LOT)	The Applicant introduced the Cambois Connection to both relevant marine regulators for the Marine Scheme. The approach to the ensuing EIA and marine licence applications (MLAs) was presented, as well as the intended approach regarding MLA submissions in both Scotland and England.	Whilst constraints for a broad Offshore Export Cable Corridor identified at this time between BBWF and Cambois, encompassing two narrower corridor options, were presented (refer to Stage Two in Table 6.2) with the intention to take this broad corridor forward for Scoping, both MMO and MD-LOT did not raise any concerns regarding identified environmental constraints. As noted during the meeting, the Applicant agreed to seek further advice from Natural England on the broad Offshore Export Cable Corridor for further refinement.
24 April 2022	Natural England	The Applicant introduced the Cambois Connection and discussed a range of topics of relevance to ecology and nature conservation, as well as the intended approach and scope of the ensuing EIA and Habitats Regulations Appraisal / Assessment. The intended approach to the impact assessment for ornithology was discussed.	Following presentation of two Offshore Export Cable Corridor options identified at this stage within a broad Offshore Export Cable Corridor, Natural England recommended avoiding the Farnes East MCZ where possible and advised that if avoidance was not possible then further considerations would be needed. The Applicant noted that the corridor is very wide at this stage and that they would explore opportunities for avoiding the Farnes East MCZ.
19 May 2022	Forth and Tay Commercial Fisheries Working Group; Fishing Industry Representatives; individual	The Applicant carried out consultation with various fisheries stakeholders, seeking feedback on their fishing activities between a Landfall along the coastline at Cambois and the	Advice from fisheries engagement was used to inform the Offshore Export Cable Corridor selection process. Queries and potential concerns relating to the Marine Scheme were recorded by the Applicant.

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6 July 2022	fishermen; and national organisations. Natural England	<p>southern boundary of the BBWF array area, as well as their preferred Offshore Export Cable Corridor.</p> <p>The Applicant held a further meeting with Natural England to discuss the scope of and approach to a suite of surveys planned for 2022, including offshore geophysical and benthic surveys.</p> <p>Interactions of the Marine Scheme with relevant designated sites were discussed, as was the Applicant’s position with regards to overwintering bird surveys, including the proposed scope of the assessment, use of existing data and the need for supporting surveys. Based on the wealth of existing ornithological data in the area, the Applicant did not propose non-breeding (overwintering) bird surveys; Natural England were accepting of this but explained that a potential overwintering condition (interpreted to restrict licensable activities between 01 November and 31 March) would likely negate the need for non-breeding (overwintering) surveys. However, noting that if flexibility or work within this period would be required, Natural England explained that the Applicant should consider survey requirements further.</p>	<p>Advice from Natural England associated with a number of designated sites was used to inform the selection of a preferred Offshore Export Cable Corridor, in particular advice in relation to the Farnes East MCZ (refer to section 6.9.1).</p> <p>To ensure the required level of seasonal flexibility for the possible Landfall locations along the Cambois coastline, the Applicant commissioned a programme of non-breeding (overwintering) bird surveys. Natural England were consulted on the scope of and approach to surveys which were completed in winter 2022/23.</p>
<b>Scoping</b>			
November – February 2022	MMO and MD-LOT	EIA Scoping was carried out by the Applicant for the Marine Scheme, with a request for Scoping Opinion submitted alongside a Scoping Report in November 2022. A range of feedback was received, including advice associated with route appraisal and assessment of alternatives (refer to the following rows under the sub-heading Scoping in this table).	Informed by previous advice from Natural England and their representation during EIA Scoping, the Applicant refined the Offshore Export Cable Corridor to avoid the Farnes East MCZ (refer to Stage Three in Table 6.2).
21 December 2022	East Lothian Council	From the material supplied it appears that the Cambois link is intended to serve the Berwick Bank Offshore Windfarm project by exporting electricity to the national grid. [...] EIA is expected to examine reasonable alternatives. In this case, there may be different ways that the electricity could be exported from this windfarm, and this is likely to have different environmental impacts. The Council would therefore expect to see somewhere in the EIA of the Berwick Bank project overall a comparison of the reasonable alternatives for export of electricity considered	<p>An EIA was undertaken for BBWF and the Branxton Export Cable Corridor (BBWFL, 2022) which included a site appraisal and consideration of alternatives both for the array area and the Offshore Export Cable Corridor associated with the Branxton connection.</p> <p>It is not possible to export the electricity from the full generation capacity of the BBWF (4.1 GW) via the</p>

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		and their environmental impacts, and the reasons for the final choice made. In particular, would it be possible to export all of the electricity from this project via the Cambois link?	<p>Cambois Connection since the grid connection agreement for the Cambois Connection is limited to 1.8GW.</p> <p>As noted in section 6.3, the Cambois Connection provides an earlier connection date than had initially been offered to BBWFL for a third connection in the Branxton area, therefore enabling the BBWF to reach full generating capacity by the early 2030 and consequently to provide a significant contribution to delivering Scotland's target for 11 GW of offshore wind capacity to be in operation by 2030 (Scottish Government, 2020b) and UK targets of 50 GW of offshore wind by 2030 (HM Government, 2022).</p>
9 January 2023	Centre for Environment, Fisheries and Aquaculture Science (Cefas) – Specialist Marine Benthic Ecology Scientist	Recommend that the Applicant should consider avoiding the Farnes East MCZ and instead route the Offshore Export Cable Corridor outside the MCZ boundary.	The Applicant refined the Offshore Export Cable Corridor to avoid the Farnes East MCZ, as outlined further in section 6.96.9.1.
23 February 2023	MD-LOT	The EIA Report should describe the main reasons for selecting the chosen cable route over the alternatives considered, providing a clear robust justification for the option taken.	This narrative is provided within this ES chapter.
23 February 2023	MD-LOT	In considering alternative cable routes the Scottish Ministers advise the Applicant to engage with stakeholders including the Scottish Fishermen's Federation ("SFF"), and expect the Applicant to detail how stakeholder knowledge has been used as part of their consideration of alternatives.	The Applicant has consulted the SFF as well as other commercial fisheries stakeholders, as noted in this table. This chapter also details how feedback provided by fishermen has been used to inform the selection of the Offshore Export Cable Corridor.
23 February 2023	MD-LOT	Section 3.4.3.2 of the Scoping Report states that expected cable protection measures include concrete mattresses, rock placement, polyurethane/cast iron shells or sand/rock/grout bags. Where there is any potential for cable protection to be used to protect the cables, this must be assessed in the EIA Report including details on materials, quantities and location (including how much uncertainty may be associated with the figures presented).	Cable protection will only be used where it is not practicable to achieve minimum target burial depth of 0.5 m. Detailed information about the types of cable protection considered at this design stage is provided in Volume 2, Chapter 5 Project Description. The type of cable protection that will be used will be defined during detailed design, following further Offshore Export Cable Route investigations alongside further engineering which will inform the exact cable design, cable location within the consented corridor, cable installation and cable protection measures.
		The EIA Report should describe the main reasons for selecting	

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23 February 2023	MD-LOT	<p>the chosen cable protection over the alternatives considered, providing a clear robust justification for the options taken.</p> <p>The EIA Regulations require that the EIA Report include 'a description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the Applicant, which are relevant to the proposed works and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects'. The Scottish Ministers acknowledge section 1.4 of the Applicant's Scoping Report setting out the consideration of alternatives to date together with the planned activities that are proposed to inform the EIA Report further. The Scottish Ministers advise however that these considerations must include how decommissioning has been taken into account within the design options. The Scottish Ministers advise that this must be based on the presumption of as close to full removal as possible of all infrastructure and assets and should consider the methods and processes of doing so.</p>	<p>As noted in Volume 2, Chapter 5 Project Description, at the end of the operational lifetime of the Marine Scheme, the operator of the Marine Scheme will develop and agree a solution for the onward handling of the Offshore Export Cables with the regulator. This decision will be based on the advice from the marine regulator at the time and informed by the prevailing environmental regulatory requirements at that time, and relevant best-practice. The approach to decommissioning will align with regulatory guidance, requirements and industry good practice at the time of decommissioning and will be agreed with the relevant stakeholders and regulatory bodies. It is proposed that Offshore Export Cables will be removed where practicable and appropriate to do so. This approach will be reviewed at the time of decommissioning following the most up to date and best available guidance. For the purpose of this ES, the maximum design scenario has been assessed for each topic in the technical assessment chapters.</p> <p>A decommissioning plan and supporting decommissioning environmental management plan will be prepared prior to commencement of decommissioning and will be subject to its own environmental assessment. It is anticipated that this will be secured via a requirement of seabed leases from Crown Estate Scotland and The Crown Estate; decommissioning conditions are also anticipated to be secured on Marine Licences issued by MD-LOT and the MMO in Scottish and English waters respectively.</p>
23 February 2023	MD-LOT	<p>For the avoidance of doubt, the Scottish Ministers advise that the EIA Report must include an up to date consideration of the reasonable alternatives studied as the parameters of the Proposed Works have been refined. The Scottish Ministers expect this to comprise a discrete section in the EIA Report that</p>	<p>These requirements are addressed through this ES chapter.</p>


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Date	Consultee	Issue(s) Raised	Response to Issue Raised and/or Where Considered in this Chapter
		provides details of the reasonable alternatives studied across all aspects of the Proposed Works and the reasoning for the selection of the chosen option(s), including a comparison of the environmental effects.	
14 March 2023	MMO	The EIA process should detail the measures to be taken to ensure the project design will be of a high standard, as well as detail of layout alternatives together with justification of the selected option in terms of landscape impact and benefit.	<p>The Applicant noted in a letter to the MMO dated 29 March 2023 that, as outlined within the Scoping Report, once installed, all parts of the Marine Scheme will be entirely subsea with no infrastructure present or visible above the sea surface. The subsea cable installation works will be temporary at the Landfall and small in scale and will not constitute a material change from the baseline conditions of an open seascape where vessels of various sizes frequently operate.</p> <p>Given that there is no potential for any significant Seascape, Landscape and Visual Impacts (SLVI) across construction, operation and maintenance and decommissioning of the Marine Scheme, the Applicant proposed that SLVI is scoped out of the EIA for the Marine Scheme, as set out in the Scoping Report. This was further explained in a meeting with the MMO on 18 April 2023. The MMO confirmed through approval of the meeting minutes on 1 June 2023 that SLVI is scoped out and hence no layout alternatives are presented in this chapter.</p>
<b>Pre-Submission</b>			
16 January 2023	Natural England	BBWFL provided a general Project update, including on the selected Offshore Export Cable corridor which avoids the Farness East MCZ.	Natural England welcomed the Applicant's decision to avoid the Farness East MCZ.
7 February 2023	NCC	A meeting was held to discuss specific Landfall options at Cambois and environmental sensitivities associated with the Landfall area.	Advice from NCC was used to inform the onshore route selection process and the Landfall selection and its dependencies on onshore route selection parameters (this will be detailed in the Onshore Scheme ES).
20 April 2023	Scottish Fishermen's Federation	The Applicant outlined the project background and offshore infrastructure. It was explained that the offshore converter station	The Applicant has spoken to fishermen including the SFF and SWFPA, as well as other stakeholders, and the

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Date	Consultee	Issue(s) Raised	Response to Issue Raised and/or Where Considered in this Chapter
		platform locations are currently unknown, hence why the entire BBWF array area boundary is currently included within the Marine Scheme ES.	feedback received was to avoid potential inshore route options. It was outlined during the meeting that of the two potential route options within the optioneering corridor, fishers showed preference for the western corridor, however as a result of feedback from Natural England (and the MMO) due to the Farnes East MCZ the Applicant has proceeded with the Eastern corridor.
21 June 2023	Joint Nature Conservation Committee (JNCC)	The Applicant provided a general Project update, focussing on the Marine Scheme, including Offshore Export Cable Corridor selection (avoidance of the Farnes East MCZ), surveys and consultations undertaken, and ES approach and timescales. JNCC was satisfied and pleased that the Farnes East MCZ has been avoided during optioneering of the Offshore Export Cable Corridor.	The comment provided by JNCC on avoidance of the Farnes East MCZ has been considered in this chapter.



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## 6.6. Approach to Route Appraisal and Assessment of Alternatives

21. The approach taken to the assessment of alternatives for the Marine Scheme takes into account relevant legislation, policy and guidance discussed in Section 6.4 and reflects approaches adopted for similar marine infrastructure projects. This approach is summarised in Table 6.2.
22. The remainder of this chapter provides a detailed account of the route appraisal and assessment of alternatives structured around the staged process described in Table 6.2.


**Table 6.2 Approach to Route Appraisal and Assessment of Alternatives**

Stage Description	Summary
Consideration of the 'do nothing' scenario and 'proposed scenario'	<p>BBWFL cooperated with the ESO on a connection to Blyth substation (Cambois Connection) as part of the ESO's Holistic Network Design (HND) process which formed part of the UK Government's Offshore Transmission Network Review (OTNR) of the upcoming grid connections. Work commenced in 2021 resulting in a link between the BBWF and a grid connection at the Blyth substation to enable the BBWF to achieve full generation capacity already by the early 2030's (refer to Stage One row below).</p> <p>After detailed analysis by the ESO, no other grid connection points were offered to the Applicant. With sufficient capacity to support the connection of an export cable from BBWF within the project timescales required, this was therefore the only grid connection option taken forward.</p> <p>As part of the evaluation of the Cambois Connection as an option (the 'proposed scenario') it was necessary to consider this option against the 'do nothing' scenario and implications that 'do nothing' would have on enabling the BBWF to achieve key Project objectives (as set out in Section 6.1), in particular with regards to achieving Scottish and UK 2030 targets for offshore wind deployment, i.e. 11GW of offshore wind in Scottish waters (Scottish Government, 2020b) and 50 GW of offshore wind in UK waters (HM Government, 2022).</p>
Stage One: Identification of Landfall areas of search and Marine Scheme route / corridor options	<p>This stage focused on defining onshore and offshore 'areas of search' and the initial identification of potential 'options' associated with both areas of search.</p> <p>For the Onshore Scheme the areas of search focused on potential Landfall options, whose location was determined by proximity to the existing Blyth substation and land available for the potential location of the onshore converter station. A potential onshore area of search was identified in 2021 with a Landfall area of search extending from the Port of Blyth (southern boundary) to the River Wansbeck (northern boundary) and an onshore converter station location area of search in proximity to the existing Blyth substation. In 2022, this preferred Landfall area of search was extended further north to identify potential alternative locations for the onshore converter station (for further details refer to section 6.8.1).<sup>1</sup> It was however confirmed during Stage One that the originally preferred converter station location would be taken forward as the preferred option. It was therefore confirmed that the Landfall area of search would focus on the section of coast between the Port of Blyth and the River Wansbeck (for further details, refer to section 6.8.1).</p>

<sup>1</sup> Other considerations taken in exploring the wider onshore area of search (for example a further extension south of the River Blyth and to the west of the existing Blyth substation) are not directly of relevance for the route appraisal of the Marine Scheme, as these considerations did not influence the potential Landfall area of search and were purely onshore in nature. Therefore, these considerations for the Onshore Scheme are not discussed further within this Chapter and will be detailed within in the separate Onshore Scheme ES.

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Stage Description	Summary
	<p>The focus for the Marine Scheme was initial identification of Offshore Export Cable Corridor options connecting the BBWF to the preferred Landfall area of search. Following identification of the preferred Landfall Area of Search in 2021, three broad Offshore Export Cable Corridors were identified during Stage One (one nearshore and two offshore options). Various iterations / alternative route options (comprising a total of 16 route segments) were considered to allow for flexibility to connect at different points along the southern and south-eastern boundary of the BBWF array area as shown in Volume 4, Figure 6.2).</p>
<p>Stage Two: Appraisal and selection of preferred Offshore Export Cable Corridor options for surveys and EIA Scoping, and identification of the preferred broad Landfall location within the Landfall area of search</p>	<p>The initial Offshore Export Cable Route options and associated broad corridors identified during Stage One were evaluated from a technical, environmental and commercial perspective to identify preferred route / corridor options for the purpose of completing geophysical and benthic surveys and progressing with EIA Scoping, with the Scoping Report for the Marine Scheme submitted in November 2022 (BBWFL, 2022a).</p> <p>The outcome from Stage Two was the identification of two preferred Offshore Export Cable Corridor options (comprising a total of eight route segments; see Volume 4, Figure 6.3). The nearshore corridor and associated route segments were deselected due to technical feasibility constraints and crossing or being in proximity to designated sites. Commercial fisheries engagement carried out in 2022 also confirmed that any nearshore route were not preferable.</p> <p>Following confirmation of the preferred Landfall area of search during Stage One in 2022, a desktop study of the available historical, geological, environmental, anthropogenic, geophysical and geotechnical information within and in the immediate surrounding area of the Landfall area of search was undertaken to identify possible Landfall locations and potential onshore cable corridors. This constraints analysis and feasibility study identified a preferred broad Landfall location in the south of the Landfall area of search. In addition, a high-level options appraisal was undertaken for potential installation techniques for the identified southern Landfall (Cathie Associates, 2022).</p>
<p>Stage Three: Final preferred Offshore Export Cable Corridor selection and Landfall refinement</p>	<p>Following advice received during stakeholder consultation and EIA scoping on the proximity and potential interactions of the Marine Scheme with the Farnes East MCZ and the outcomes of a Black, Red, Amber, Green (BRAG) assessment of the two remaining corridor options (Xodus, 2022), the final preferred Offshore Export Cable Corridor (comprising five route segments; see Volume 4, Figure 6.6) was selected. The main reason for selecting this Offshore Export Cable Corridor was avoiding the Farnes East MCZ and thus avoiding and reducing potential significant environmental effects on the protected habitats and features of the MCZ (for further details refer to section 6.10 and section 6.12).</p> <p>For the Landfall, further optioneering was carried out to further refine the Landfall location and installation techniques, considering technical and environmental information. As a result, open-cut trenching as a Landfall installation technique was deselected and trenchless Landfall installation techniques have subsequently been assessed in this ES. In addition, the Marine Scheme boundary at the Landfall has been aligned to the Onshore Scheme boundary in the north (see Volume 4, Figure 6.7).</p>
<p>Marine Scheme design refinement and evolution of design parameters</p>	<p>The refinement of the design of the Marine Scheme and associated parameters is an ongoing process.</p>

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## 6.7. Consideration of the ‘Do Nothing’ Scenario and Proposed Scenario

23. The approach taken to Offshore Export Cable Corridor selection and subsequent assessment of alternative options for delivery of the Marine Scheme and the Cambois Connection as a whole has been based on the core objective of developing a viable connection between the BBWF and existing grid network to maximise export capacity, thereby delivering a significant volume of new low-carbon electricity as soon as possible, with a substantial contribution to the national grid before 2030.

### 6.7.1. ‘Do Nothing’ Scenario

24. The ‘do nothing’ option considers a scenario in which the Marine Scheme is not developed. In such a scenario, the Offshore Export Cables between the BBWF and the grid connection to the Blyth substation are not developed, meaning there is insufficient infrastructure in place to export all renewable electricity from the full generation capacity of BBWF, as required by the Applicant, and at the time required to enable BBWF to contribute meeting Scottish and UK Government targets for offshore wind deployment by 2030, as further set out below. This would not achieve the primary objective of the Cambois Connection, as described in section 6.1.1.

25. For the Cambois Connection, one of the key risks with the ‘do nothing’ scenario is being unable to contribute to addressing the climate change emergency and the resulting need for rapid decarbonisation. Climate change is the defining challenge of our time. Human-induced global warming has reached approximately 1°C above pre-industrial levels and without a significant and rapid decline in carbon emissions across all sectors, global warming is not likely to be contained (IPCC, 2021).


26. In response, Scotland, and the wider UK, have declared a global climate change emergency which, by definition, is a grave situation demanding an urgent response. Associated commitments and legal obligations are as follows:

- The United Nations Framework Convention on Climate Change led Paris Agreement (2015);
- The Climate Change Act 2008 (as amended) and the Glasgow Climate Pact (2021) (including Scotland and the UK); and
- Climate Change (Scotland) Act 2009 and the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019.

27. These legal instruments provide the commitments to become carbon neutral (i.e. to reach “Net Zero” by 2045 in Scotland and 2050 in the UK) with interim targets. However, review by the Committee on Climate Change (CCC) has reported that whilst the UK has so far outperformed its budgets, progress is slowing and the country is not on track to meet its future budgets or the overall reduction target, according to the most recent Progress Report to Parliament by the CCC (CCC, 2023).

28. Rapid decarbonisation is critical to tackling the climate emergency and the cost-of-living crisis by reducing Scotland’s and the UK’s reliance on natural gas. The BBWF is within one of the few remaining areas in Scottish waters where offshore wind can be delivered at scale and crucially, through the Cambois Connection, connect to the grid network in timescales that are essential for not just achieving but accelerating Scotland’s and the UK’s path to net zero and realising Scotland’s ambitions for 11 GW offshore wind connected to the grid by 2030 as set out in the Scottish Government’s Sectoral Marine Plan (SMP) for Offshore Wind (Scottish Government, 2020), and UK targets of 50 GW of offshore wind by 2030 as set out in the British Energy Security Strategy (HM Government, 2022).

29. Under the ‘do nothing’ scenario, any contribution which the Cambois Connection may have made towards tackling the global climate change emergency and any contribution that the Marine Scheme may have made towards UK targets of becoming Net Zero in all greenhouse gas emissions by 2050 for England and Wales, and 2045 for Scotland, would not be realised. As a further

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consequence, a tangible improvement to the efficiency of UK energy generation and transmission would not be delivered, leading (indirectly) to potential additional management challenges on the UK electricity grid (such as increased constraints and associated payments).


### 6.7.2. Proposed Scenario – Development of the Cambois Connection

30. Developing the Cambois Connection, as the proposed scenario, would enable the export of renewable electricity from BBWF to the national grid in order to provide green generation input to the electricity network to address the climate emergency at a substantially earlier date than the BBWF capacity would otherwise be able to reach the grid. Consideration has been given to alternative design options for delivering this connection between Scotland and England, including selection of the most appropriate technology for the Marine Scheme, a suite of different corridors for the Offshore Export Cables, and a range of potential Landfall options along the Northumberland coastline which would facilitate access to the grid connection at Blyth.
31. For these reasons the ‘do nothing’ alternative scenario is not considered appropriate, although it has been assessed as part of the baseline conditions in the ES. The ‘proposed scenario’ was taken forward by the Applicant and forms the basis for the remainder of this chapter.

## 6.8. Stage One: Defining Landfall Areas of Search and Offshore Export Cable Corridor Options


### 6.8.1. Defining Landfall Areas of Search

32. As discussed in Table 6.2, Stage One focused on defining ‘areas of search’ for both the Onshore and Marine Schemes and initial identification of potential ‘options’ associated with those areas of search.
33. Defining the Cambois Connection was an iterative process requiring consideration of both onshore and offshore options. For onshore options, this chapter focuses on the Landfall area of search along the Cambois coastline which is directly linked to the Marine Scheme and was determined by the ability to connect into the Blyth substation and the potential location of the onshore converter station. A description of the complete onshore area of search and its refinements, including those elements that are not related to the Marine Scheme, will be included in the Onshore Scheme ES.
34. Stage One commenced in 2021, prior to the Marr Bank and Berwick Bank array areas being combined into the single Berwick Bank Wind Farm array area during the second half of 2021 (further detail regarding this can be found in the BBWFL EIA Report, Volume 2, Chapter 4: Site Selection and Consideration of Alternatives (BBWFL, 2022c)). At this stage the main focus for the Project was to identify a potential onshore converter station area of search that would facilitate a connection into National Grid’s substation at Blyth, and to identify a suitable Landfall area of search in close proximity to the potential onshore converter station area of search. This involved input from both the Applicant’s onshore and offshore teams, with the identification of the Landfall area of search influenced by potential Offshore Export Cables Corridor / Route options that would link the Landfall area of search to the BBWF array area (which in 2021 comprised the Marr Bank and Berwick Bank array areas; refer to section 6.8.2).
35. During Stage One, which was an iterative process, a total of four Landfall areas of search were identified and considered, influencing the width of the Offshore Export Cable area of search at the Landfall; these areas of search are illustrated in Volume 4, Figure 6.1:
  - **2021** – Original Onshore and Landfall area of search – Landfall area of search extending from the Port of Blyth (southern boundary) to the River Wansbeck (northern boundary). Initial Offshore Export Cable corridors were subsequently identified at this stage (refer to section 6.8.2).

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- **April 2022** – Extended Onshore and Landfall area of search – Landfall area of search extending from the Port of Blyth to a location south of Lynemouth (north of the River Wansbeck and Newbiggin-by-the-Sea).
  - **May 2022** – Revised Onshore and Landfall area of search – Landfall area of search extending from the Port of Blyth to North Seaton near Newbiggin-by-the-Sea (south of Lynemouth and north of the River Wansbeck). The Offshore Export Cable Corridor at the Landfall was extended to largely match the revised onshore area of search. The extended onshore area of search (identified in April 2022) was subsequently discounted, and the Cambois Connection placed on hold while the HND process was finalised and the NGESO concluded its holistic network review through which the additional connection for BBWF to the Blyth substation was formally confirmed.
  - **June 2022** – Refined Landfall and onshore area of search (largely the same at the Landfall as the initial Cambois area of search). The Marine Scheme area of search at the Landfall remained extended in the north to North Seaton to largely correspond with the Landfall area of search identified in May 2022 due to ongoing licensing for the then planned 2022 surveys.
36. The basis for the extended onshore area of search in the north was to identify further potential locations for the onshore converter station<sup>2</sup>. The Marine Scheme area of search was adjusted to largely correspond to the revised onshore and Landfall area of search after the furthest extension of this area of search was discounted following the initial extension. This resulted in alternative Landfall areas initially being considered from an offshore perspective, in particular along the stretch of the coastline between the River Wansbeck and Newbiggin-by-the-Sea. However, it quickly became apparent that, while potential Landfall locations may exist within the extended area of search, any Landfall to the north of the River Wansbeck would require construction of a far longer and more complex onshore cable route which would interact with a number of conurbations, roads, other infrastructure and would require crossing of the River Wansbeck in order to access the existing Blyth substation which is located in the south-west of the onshore areas of search considered.
37. Through ongoing discussions with landowners, it emerged that one of the onshore converter station locations in the initial Cambois area of search could be taken forward as a preferred site for the Onshore Scheme's onshore convertor station. Therefore the Landfall area of search was refocused on the section of the Cambois coastline between the Port of Blyth and the River Wansbeck closer to the identified converter station site, with the Landfall areas of search north of the River Wansbeck removed from consideration.
38. Key environmental and technical factors associated with selecting the refined Landfall area of search are summarised below:
- Whilst within a number of designated sites which include protected habitats, such as the Coquet to St. Mary's MCZ, the actual seabed conditions on the approach to the Landfall were considered likely to be favourable for burial of the Offshore Export Cables (being primarily sand, silt and mud);
  - Although the Landfall area of search is within designated sites such as the Berwick to St Mary's MCZ and the Northumberland Marine Special Protection Area (SPA) and Ramsar site, these are designated for ornithological features. Based on the nature of the Marine Scheme (i.e. a subsea cable) and the activities required in the nearshore area, industry best-practice and mitigation were considered highly likely to adequately mitigate potential impacts;
  - The Cambois coastline has been previously used as a landfall for a number of comparable infrastructure projects; this includes the North Sea Link (NSL) interconnector (Statnett and National Grid, 2013) and the export cables for the Blyth Offshore Demonstrator Project;

<sup>2</sup> Please refer to Footnote 2 for details on other extension of the onshore area of search.

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- The refined Landfall area of search would mean a short onshore cable route from the coastline to a converter station location within the Cambois onshore area of search (an area bounded by the River Wansbeck to the north, the Cambois coastline to the west and the River Blyth / Sleek Burn to the south) avoiding crossing these watercourses; and
- Early discussions with both the MMO and NCC indicated that the refined Landfall area of search at Cambois would constitute a viable option for bringing the Offshore Export Cables to shore (and as described above, has been demonstrated as being effective before).

39. Key environmental and technical factors associated with removing any potential Landfall to the north of the River Wansbeck were as follows:

- A Landfall to the east of North Seaton would likely require an approach to the north-east of the River Wansbeck. In this area, there are understood, to be larger volumes of intertidal rock meaning that installation of the Offshore Export Cables would be far more technically challenging;
- The selection of a method of Landfall installation would likely be more restricted at this location; owing to engineering considerations such as the cliff to the east of Sandy Bay caravan park, trenchless technologies such as Horizontal Directional Drilling (HDD) would be considered challenging;
- The onshore cable route from the Landfall would require a river crossing over the River Wansbeck resulting in significant additional technical complexity, cost and the need for additional construction activity on the north and south banks of the River Wansbeck to facilitate a river crossing; and
- Any Landfall to the north of the River Wansbeck would require construction of a far longer and more complex onshore cable which would interact with a number of conurbations, roads and other infrastructure.

### 6.8.2. Initial Offshore Export Cable Corridor identification

40. Following identification of the initial onshore and Landfall area of search in 2021, the Applicant carried out an assessment of the area of sea between the BBWF array area and the Cambois Landfall area of search to identify initial Offshore Export Cable routes / corridors (Cathie Associates, 2021). It should be noted that the assessment was completed prior to the creation of the single BBWF array area (based on Marr Bank and Berwick Bank as two separate offshore wind farm sites).
41. The aim of the assessment was to provide initial information on the geological, geotechnical and site conditions in the marine areas of interest to identify and assess the key surface and sub surface related risks and constraints which would potentially influence the locations of Offshore Export Cable corridor options. The results of this initial assessment informed the assessment of route suitability and helped identify the most favourable locations for the development of the Marine Scheme.
42. In total, three broad corridor options were identified (one nearshore corridor option and two offshore corridor options). Various iterations / alternative route options (comprising 14 route segments) were considered to form the three broad corridor options and to allow for flexibility to connect at different points along the southern boundary of the original Marr Bank array area. Following creation of the single BBWF array area during the second half of 2021, two route segments were added in the north-east of the most Eastern Offshore Export Cable Corridor option, resulting in a total of 16 route segments allowing to also connect into the BBWF array area via the southern boundary of the original Berwick Bank Wind Farm array area (see Volume 4, Figure 6.2).
43. The segments noted in paragraph 42 were approximately 1 km wide and were identified based on a number of hard constraints whilst also avoiding soft constraints as far as possible, such as environmental designations and areas of limited quaternary deposit thickness for example (Cathie Associates, 2021).

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#### 6.8.2.1. COMMERCIAL FISHERIES ENGAGEMENT

44. As part of Stage one, the Applicant carried out consultation with various fisheries stakeholders in early 2022 which helped inform the production of a commercial fisheries assessment (Brown and May Marine (BMM), 2022).
45. Consultation was carried out with various fisheries stakeholders including the Forth and Tay Commercial Fisheries Working Group, Fishing Industry Representatives, individual fishermen, and national organisations. Engagement with these stakeholders is detailed in Volume 2, Chapter 4: Stakeholder Engagement and Consultation and Volume 3, Appendix 12.1: Commercial Fisheries Engagement Report.
46. Mobile fishermen generally preferred the route options which were closer to shore, given that they would avoid identified *Nephrops* grounds. However, it was noted that the central corridor option (Option 1, specifically segment 11) passed through a small section of *Nephrops* grounds only (avoiding a portion of the identified *Nephrops* grounds to the south; segment 12). Fisheries engagement led to the suggestion that inshore route options (i.e. route segments 02, 10, 14 and 16 in Volume 4, Figure 6.2) would avoid the majority of *Nephrops* grounds.
47. Nearshore cable installation (i.e. route segments 01, 02, 10, 13 and 14) would largely affect static fishermen/potters under 10 m. By avoiding these areas, it was considered that the Applicant may be able to reduce the extent of interaction with local potting and trapping effort.
48. Engagement with the fishing industry also identified concerns related to the seabed around the nearshore and Landfall area (specifically segments 13 and 14), notably the presence of hard material on the approach to the Landfall area at Cambois (meaning cable burial may be difficult, requiring more cable protection in this nearshore and Landfall area). The preference of both mobile and static fishers was to use the most southern of the options approaching the Landfall (specifically segments 15 and 16), which comes almost due west into Cambois as it makes landfall.
49. Vessel monitoring system (VMS) data in conjunction with responses obtained during the fisheries engagement process suggested that the easternmost route option (labelled segment 12; Option 2) crosses through important *Nephrops* trawling grounds; this was identified as a source of potential disruption during construction. The Applicant is committed to address any such concerns through close and ongoing stakeholder engagement with fishermen and fisheries stakeholders during specific Project works, as outlined in Volume 2, Chapter 13: Commercial Fisheries.
50. The VMS data obtained suggested that the northern extent of the cable corridor options connecting to the BBWF array area should ideally be further offshore as there is relatively little fishing activity in this area. The main fishing activity identified in this area was scallop dredging which is highly seasonal and undergoes multi-annual rotations.
51. When taking fisheries activity and feedback from consultation into consideration, the optimal route was considered to be a combination of sections 04, 11, 15 and 16 (see Volume 4, Figure 6.2), largely comprising corridor Option 1. This option was considered likely to avoid key potting areas in the nearshore area (corridor Option 3) and avoid most of the *Nephrops* grounds further offshore (corridor Option 2).

## 6.9. Stage Two: Appraisal and Selection of Preferred Offshore Export Cable Corridor and Identification of Preferred Landfall Location

### 6.9.1. Appraisal and Selection of Preferred Offshore Export Cable Corridor

52. The range of possible corridors for the Offshore Export Cables discussed in section 6.8.2 were further rationalised in 2022 to inform the identification of geophysical and benthic survey boundaries as well as a Scoping boundary for the Marine Scheme.


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53. As part of this process, the nearshore Offshore Export Cable Corridor option (comprising route segments 01, 02, 03, 08, 09, 10, 13 and 14) were deselected at this stage based on environmental, technical and commercial criteria.
54. The main reasons for deselection were technical feasibility constraints (see paragraph 55) and crossing or being in proximity to designated sites for ornithological features. Commercial fisheries engagement carried out in 2022 also confirmed that the nearshore Offshore Export Cable Corridor option was not preferable from a fisheries perspective. Further information is provided in section 6.12.
55. Furthermore, sedimentary coverage increases with depth in the inshore area, meaning that the Offshore Export Cable Corridor options further offshore have a lower associated ground risk and as a result a lower execution risk. Route segments 01, 02, 10 and 14 were identified as having the highest ground risk (Cathie Associates, 2021), therefore, the innermost Offshore Export Cable Corridor option was least favourable from an engineering perspective. The two remaining Offshore Export Cable Corridor options were generally considered to have a limited difference in ground risk.
56. Further details on the environmental and technical risks associated with the deselected nearshore Offshore Export Cable Corridor are presented in section 6.12 which contains a high-level assessment of the three Offshore Export Cable Corridor options identified at Stage One.
57. The two remaining preferred Offshore Export Cable Corridor options were subsequently referred to as:
  - Option 1 (central corridor) which comprises route segments 04, 06, 11, 15 and 16: and
  - Option 2 (Eastern corridor) comprising route segments 05, 07, 12, 15 and 16.
58. These two corridor options and their route segments are presented in Volume 4, Figure 6.3.
59. The two Offshore Export Cable Corridor options (and associated route segments) were encompassed by the Marine Scheme scoping boundary provided as part of a formal request for a Scoping Opinion in November 2022 (BBWFL, 2022a).
60. The Applicant carried out geophysical and benthic surveys on Option 1 (central corridor) and Option 2 (Eastern Corridor) to investigate the potential route options in further detail and provide baseline benthic and geophysical information to inform the ensuing ES in support of Marine Licence Applications for the Marine Scheme in Scottish and English waters. These surveys included:
  - Offshore geophysical survey from July to September 2022, consisting of multibeam echosounder (providing backscatter and side scan data) and sub-bottom profiler, as well as nearshore and shallow bathymetric mapping; and
  - Offshore benthic survey in September/October 2022 and February/March 2023, comprising grab samples for particle size analysis (PSA) as well as macrofauna and contaminant analysis and acquiring seabed imagery using drop-down video (DDV) and/or a towed camera.
61. As detailed within Volume 2, Chapter 8: Benthic Subtidal and Intertidal Ecology and Volume 2, Chapter 7: Offshore Physical Environment and Seabed Conditions, the scope and specification of the offshore surveys was discussed and agreed with key stakeholders, such as Natural England and NatureScot.
62. Following completion of the geophysical and benthic surveys, the boundary for the Marine Scheme at the Landfall area to the north of the River Wansbeck was reduced in Q1 2023 to fully align with the Onshore Scheme boundary in the north, as shown in Volume 4, Figure 6.4.

### 6.9.2. Identification of Preferred broad Landfall location

63. Following confirmation of the preferred onshore and Landfall area of search in Q2 2022, a desktop study of the available historical, geological, environmental, anthropogenic, geophysical and geotechnical information within and in the immediate surrounding area of the Landfall area of search was undertaken to identify possible Landfall locations and potential onshore cable corridors.




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This constraints analysis and feasibility study identified a preferred broad Landfall location in the south of the Landfall area of search (Cathie Associates, 2022). This Southern Landfall Area and the deselected Northern Landfall Area are shown on Figure 6.5 in Volume 4. A summary of the main environmental and technical factors and constraints considered in the decision-making for both broad Landfall areas is set out in Table 6.3 below.

**Table 6.3 Key Environmental and Technical Factors and Constraints for the Landfall Areas**

Landfall Area	Key Environmental and Technical Factors and Constraints
Northern Landfall Area	<ul style="list-style-type: none"> <li>• The Northumberland Marine SPA, Berwick to St Mary's MCZ, Coquet to St Mary's MCZ, and Northumberland Shore Site of Special Scientific Interest (SSSI) are present.</li> <li>• River Wansbeck estuary (statutory main river) is located in the northern area.</li> <li>• The area hosts more residential properties than the Southern Landfall Area. The Landfall and cable route could potentially intersect residential properties.</li> <li>• The area is susceptible to high coastal erosion and beach mobility. Trenched Landfall technologies are vulnerable to these coastal processes, hence trenchless cable installation techniques would be preferable to open-cut trenching (refer to paragraph 65 for further information).</li> <li>• A landfall within this area would intersect with the local railway lines and the North Sea Link (NSL) landfall and intersect the NSL onshore cable multiple times.</li> <li>• Longer onshore cable route to converter station and grid connection than from the Southern Landfall Area, and therefore likely increased environmental impacts.</li> <li>• Higher development risk due to coal mining related hazards.</li> <li>• Underground utilities are present including sewage pipes, telecommunications, water mains and pressurised gas pipes.</li> <li>• Beach, National Cycle Network Route 1, and public rights of way are present in the area.</li> <li>• A Biodiversity Net Gain Area is present to the north. Onshore cables could potentially intersect the land requiring reinstatement.</li> <li>• Requirement for onshore cable routing to cross and run alongside the A189.</li> <li>• No cultural heritage assets are present in the area.</li> </ul>
Southern Landfall Area	<ul style="list-style-type: none"> <li>• The Northumberland Marine SPA, Berwick to St Mary's MCZ, Coquet to St Mary's MCZ, Northumberland Shore SSSI and Sand Dune Priority Habitat are present.</li> <li>• The cables would cross the NSL onshore cables and NSL offshore cables.</li> <li>• Fewer residential properties are located in the Southern Landfall Area and are located to the south, therefore less overall risk of disturbance.</li> <li>• This area of coastline has fewer hard constraints from an engineering perspective.</li> <li>• No known mineshafts or associated high risk areas for development.</li> <li>• Issues with coastal erosion, as for the Northern Landfall Area. Trenchless cable installation techniques would be preferable to open-cut trenching (refer to paragraph 65 for further information).</li> <li>• Shorter onshore cable route to converter station and grid connection than from the Northern Landfall Area, and therefore likely reduced environmental impacts.</li> <li>• Underground utilities are present including sewage pipes, telecommunications, water mains and pressurised gas pipes.</li> <li>• Area of Pulverised Fuel Ash (PFA) located in the onshore area.</li> <li>• Beach, National Cycle Network Route 1 and public rights of way are present in the area.</li> <li>• Grade 2 listed building (Cambois war memorial) is located in the area.</li> <li>• Cambois Primary School and playing fields are located in the area.</li> <li>• Allotments and a local church are located in the area.</li> <li>• Historic mapping has shown an old reservoir is located in the area.</li> </ul>

64. In summary, the Southern Landfall Area is less populated with residential properties, there is sufficient space for Landfall and Onshore Cable routing infrastructure and is overall less constrained than the Northern Landfall Area, such as various utilities onshore and the offshore cable route intersecting the North Sea Link multiple times. The area would result in a shorter cable

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route to the selected Converter Station site. Environmental constraints, namely designations, are generally similar between the Northern and Southern Landfall Areas.

65. In addition, a high-level options appraisal was undertaken for potential cable installation techniques for the identified southern Landfall (Cathie Associates, 2022), with both trenchless installation techniques, such as HDD, and open-cut trenching being proposed. Only trenchless techniques have been retained for the Cambois Connection. Refer to Volume 2, Chapter 5 Project Description for further details.
66. The Applicant has carried out the following surveys in the intertidal and Landfall area to inform the Marine Scheme ES:
- Intertidal benthic walkover in November 2022, contributing to the baseline understanding for benthic and subtidal ecology;
  - Overwintering (non-breeding) bird surveys in winter 2022/23, contributing to baseline understanding of ornithological receptors in the intertidal and Landfall area; and
  - Intertidal archaeological walkover survey in May 2023.
67. The intertidal and Landfall surveys as well as the offshore surveys noted in section 6.9.1 provided data which has been used to inform many of the technical assessments contained within the ES for the Marine Scheme.

## 6.10. Stage Three: Final Preferred Offshore Export Cable Corridor Selection and Landfall Refinement


### 6.10.1. Selection of the Final Preferred Offshore Export Cable Corridor

68. Within the preferred broad corridor which formed the basis for a request for Scoping Opinion (BBWFL, 2022a) described in section 6.9, the two Offshore Export Cable Corridor options identified during Stage Two were taken forward for refinement by the Applicant; they are summarised within Volume 4, Figure 6.3. A RAG Assessment was undertaken, the results of which are presented in section 6.12 and summarised below.
69. Each of the four potential Offshore Export Cable Route options within the two Offshore Export Cable Corridor options were assessed using a multicriteria comparison, focusing on risk for potential significant adverse environmental effects. As part of this desk-based exercise, a range of different topics were taken into consideration, which are those that are relevant to large scale offshore and subsea transmission cable projects such as the Marine Scheme; these include:
- Constraints due to seabed conditions (e.g., slopes derived from bathymetry, sediments);
  - Environmentally designated sites;
  - Benthic habitats (e.g. those that act as nursery grounds and spawning grounds for fish);
  - Other sea users (e.g., other offshore development, military, and recreational use);
  - Marine archaeology (e.g., ship wrecks);
  - Commercial fisheries;
  - Aquaculture; and
  - Shipping and navigation.
70. Interactions of the Marine Scheme with a number of key designated sites were considered, informed by information obtained through a desk-based assessment on their specific habitats and features.
71. The designated sites topic for Offshore Export Cable route segments 04 and 06 (both being part of corridor Option 1), and the nearshore area and Landfall corridor section (which is identical for both corridor Options 1 and 2 and comprising segments 15 and 16) received a lower rating (i.e., higher risk). These route options had direct overlap with multiple designated sites with protected benthic features. This was especially true for the nearshore area and Landfall Offshore Export Cable

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Corridor section where there are a number of designated sites present along the Northumberland coast. In this area, physical features such as hard substrates and Annex I reefs were initially considered to represent an increased risk of adverse environmental effects.

72. Whilst this is the case, further investigation of specific data associated with seabed features identified that for the majority of the approach to the Landfall area at Cambois, the seabed was characterised by intertidal sand and muddy sand (A2.2), intertidal sand and muddy sand / intertidal mud (A2.2 / A2.3) and intertidal mud (A2.3) (refer to Volume 2, Chapter 8: Benthic Subtidal and Intertidal Ecology for further details). Based on the nature of the anticipated construction process for the Offshore Export Cables and the recoverability of these habitats, environmental impacts were considered to be manageable through implementing available mitigation measures during construction. This prediction was subsequently cross-checked with recent cable operations in the area, i.e. North Sea Link (Statnett and National Grid, 2019).
73. Offshore Export Cable Corridor Option 1 was considered to have increased environmental and technical / engineering risks because of its overlap with the eastern edge of the Farnes East MCZ (route segment 11). Furthermore, during technical engagement with Natural England, in discussions with the MMO and in Cefas' Scoping representation the Applicant was strongly encouraged to avoid this designated site (refer to section 6.5). Corridor Option 2 to the east was considered to be of lower risk for likely significant environmental effects in comparison to Option 1 as there was no overlap with the Farnes East MCZ.
74. While designated sites were the primary driver of the risk rating for both Offshore Export Cable Corridor options, the primary driver of the risk rating in segment 12 (part of Corridor Option 2) was the moderate to high intensity and value of offshore demersal fisheries in the region and high fishing vessel activity. Additionally, the following were considered to be additional drivers:
- Overlap with X5641: Forth Outer Military area by segments 04 (Option 1) and segment 05 (Option 2);
  - Overlap with high intensity nursery grounds, high intensity spawning grounds, and high probability of aggregations of less than one-year old fish by segments 06 (Option 1) and segment 07 (Option 2);
  - A moderate to high intensity and value of demersal offshore fisheries for segment 11 (Option 1);
  - Overlap with D513: Druridge Bay Military area by segment 12 (Option 2); and
  - A moderate to high intensity and value of demersal offshore fisheries for the nearshore area and Landfall Corridor section, i.e. segments 15 and 16 (Options 1 and 2).
75. Ultimately this process resulted in the recommendation to proceed with segment 12 (and its associated branch segments 05 and 07) as the furthest offshore corridor, i.e. Option 2, as presented in Volume 4, Figure 6.6. Whilst this Offshore Export Cable Corridor option does interact with the northern edge of an area identified by fishers as a key *Nephrops* fishing zone, it does avoid notable interactions with the Farnes East MCZ. Informed by pre-application discussions with Natural England and their level of concern associated with routing through the MCZ, it was avoided and Option 2 was selected as the preferred and final Offshore Export Cable Corridor subject to the Marine Scheme ES.
76. Where the Marine Scheme reaches the array area for the BBWF, the Offshore Export Cables will connect into Offshore Converter Station Platforms (OCSPs). The exact location for the connection into OCSPs is not currently known however a 1 km wide corridor within the array area has been assumed. The alignment of this corridor within the BBWF array area cannot yet be determined and for this reason, the boundary presented for the Marine Scheme does not only include the selected Offshore Export Cable Corridor, but the BBWF array area.
77. The selected Offshore Export Cable Corridor for the Marine Scheme currently contains two route options to connect into the BBWF array area. These two route options allow for flexibility for the Offshore Export Cables to connect into OCSPs located within different parts of the BBWF array area. Once the locations of the OCSPs are confirmed, following detailed design post-consent and

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pre-construction, the Offshore Export Cable Corridor within the BBWF array area will be defined and the boundary of the Marine Scheme within the BBWF array area reduced.

78. Once appointed, the installation contractor(s) will carry out a comprehensive appraisal of seabed conditions and carry out detailed route development within the Offshore Export Cable Corridor. Informed by this process, and any further pre-installation surveys (see paragraph 83), the alignment of cables within the Offshore Export Cable Route will then be determined and be subject to micro routeing. This process will allow for optimisation of the Offshore Export Cables and refinement to minimise interaction with localised technical and environmental constraints.

### 6.10.2. Landfall Refinement


79. The Marine Scheme boundary in the north has been further reduced to align with the extent of the selected Southern Landfall Area, as presented in Volume 4, Figure 6.7<sup>3</sup>. Due to the remaining extension in the south, the Offshore Export Cable Corridor approach to the Landfall is wider than 1km. This allows for sufficient flexibility for detailed design using trenchless installation techniques, considering interactions with other utilities and ground conditions, and to provide sufficient width for offshore cable installation vessels to manoeuvre and anchor safely.
80. Further optioneering is being carried out to refine and identify the specific Landfall location in the Southern Landfall Area identified during Stage Two, considering technical and environmental information. This process is ongoing and any further outcomes of this process will be part of an iterative design process.

## 6.11. Design Refinement and Evolution of Project Design Parameters

81. Alongside the refinement of the boundary for the Marine Scheme, there have been a number of refinements made to the Project Design Envelope (PDE)<sup>4</sup> since the Applicant made a formal request for a Scoping Opinion to the MMO and MD-LOT, and subsequently submitted a Habitats Regulations Appraisal/Assessment screening request to Natural England (for the Marine Scheme in English waters) and MD-LOT (for the Marine Scheme in Scottish waters). These refinements are summarised below:
- Avoidance of the Farnes East MCZ and selection of Offshore Export Cable Corridor / Route options to the east of this designated site;
  - Removal of potential Landfall areas to the north of the River Wansbeck; and
  - Reduction in the Landfall area of the Marine Scheme to align with the boundary of the Onshore Scheme.
82. In addition, following selection of the preferred Offshore Export Cable Corridor and as informed by the geophysical survey completed in 2022, an Indicative Cable Burial Appraisal was carried out for the Offshore Export Cable Corridor utilising the Carbon Trust DNV Methodologies (Global Maritime, 2023). The main objective of this initial appraisal was to ensure that based on the available data (including survey outputs) the required cable burial could be achieved using a range of different subsea installation tools along as much of the preferred Offshore Export Cable Corridor as possible. The Indicative Cable Burial Appraisal was also carried out to identify zones of the seabed where cable burial was considered to be unlikely based on the understanding of the seabed conditions at

<sup>3</sup> As shown on Figure 6.7 in Volume 4, the Southern Landfall Area and hence eastern Onshore Scheme boundary has also been reduced in the south, and further amendments of the Onshore Scheme boundary have been made in the north, west and south. These refinements of the Onshore Scheme boundary will be detailed in the Onshore Scheme ES.

<sup>4</sup> The Project Design Envelope refers to the set of parameters specific to the Marine Scheme which form the basis of the EIA process. In order to ensure the EIA is as robust as possible, technical assessments have been carried out based on a set of worst-case maximum design parameters. Please refer to Volume 2, Chapter 5: Project Description which explains and justifies this approach in further detail.


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this stage. Zones of the Offshore Export Cable Corridor classified with a high risk of insufficient burial are noted within the Indicative Cable Burial Appraisal. In such zones, additional forms of cable protection may be required to protect the Offshore Export Cables from environmental loading and anthropogenic risk (such as anchors and fishing activity). Further detail is provided in Volume 2, Chapter 5: Project Description.

83. To inform detailed design work such as the specific Offshore Export Cable routes within the current Marine Scheme boundary and the final Landfall location, a number of pre-installation surveys will be required along the length of the Offshore Export Cable Corridor. Further details on pre-installation surveys are included in Volume 2, Chapter 5: Project Description.

## 6.12. Assessment of Offshore Export Cable Corridor Alternatives

84. This section provides supporting information to that previously outlined in sections 6.8 to 6.10 above.
85. As outlined previously, a Red / Amber / Green (RAG) methodology was used to carry out a high-level assessment of the three Offshore Export Cable corridors considered between the BBWF array area boundary and the Landfall at Cambois as described in Stages Two and Three above (sections 6.9 and 6.10). This risk-based approach was considered appropriate for this assessment, given the ability to capture and classify the main differentiating issues in three fundamental risk categories. A RAG assessment of this type enabled a clear and direct comparison between each Offshore Export Cable Route / Corridor.
86. This RAG assessment was informed by the constraints analysis carried out to identify initial Offshore Export Cable Corridors (Cathie Associates, 2021; refer to Table 6.6) and the Black / Red / Amber / Green (BRAG) assessment (Xodus, 2022) which was undertaken prior to selecting the preferred Offshore Export Cable route subject to the Marine Scheme ES. It was further informed by stakeholder consultation undertaken for the Marine Scheme (as outlined in section 6.5 and BMM (2022)).
87. The development considerations (or constraints / risk areas) captured within the RAG assessment included the following in accordance with the topics used for the BRAG assessment (Xodus, 2022); these topics are the relevant environmental and technical topics for large scale offshore and subsea transmission cable projects such as the Marine Scheme:
- Constraints due to seabed conditions (e.g., slopes derived from bathymetry, sediments);
  - Environmentally designated sites;
  - Benthic habitats (e.g. those that act as nursery grounds and spawning grounds for fish);
  - Other sea users (e.g., other offshore developments, military, and recreational use);
  - Marine archaeology (e.g., ship wrecks);
  - Commercial fisheries;
  - Aquaculture; and
  - Shipping and navigation.
88. Each development consideration was given a score of Red / Amber / Green. These scores indicated the adverse or positive attributes to development respectively. The specific definition of each Red / Amber / Green risk category is presented in Table 6.5. The definition of these risk categories was guided by the key route selection and hence fundamental design principles for the Marine Scheme included in Table 6.4. These principles were developed based on professional experience and judgement of environmental, technical, commercial and social risk, as well as stakeholder engagement.

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**Table 6.4 Key Site Selection Principles**


Key Site Selection Principles	Definition
Avoidance of areas that, based on high-level characterisation, are anticipated to present challenging consenting or technical difficulties for installation and/or maintenance of cable burial depths	Offshore considerations, including but not limited to, steep seabed slopes, challenging geology, bedrock, mobile sediment, seabed scars/depressions, pockmarks, Annex 1 reefs <sup>5</sup> and hard substrates, cognisance of other sea users.
Avoidance of areas such as anchorage, dredging, military practice and exercise areas	Areas with third party equipment to be avoided as far as practicable.
Avoidance of wrecks or site(s) of archaeological significance	Areas of wrecks or marine archaeological significant sites to be avoided, and a suitable separation distance maintained.
Avoidance of environmental designated areas	Offshore designation, including, but not limited to Marine Protected Areas (MPA), MCZ, Special Area of Conservation (SAC), SPA, Ramsar and SSSIs to be considered and avoided where practicable. Where there is overlap, direct (shortest) routes to cross these areas to be considered.

**Table 6.5 RAG Assessment Scoring Criteria**

Risk Category	Definition
Low	No or small risk for any likely significant adverse environmental effects or technical risks to occur following the use of best industry practice and standard methods.
Moderate	Potential for significant adverse environmental effects or technical risks to occur, the use of standard mitigation measures may reduce effects and risk to acceptable levels (not significant effects or low risk) but could require further mitigation measures.
High	High probability of significant adverse environmental effects or technical risks occurring resulting in design alterations, potential stakeholder objections, further mitigation measures being introduced and potential delay to the Marine Scheme. The potential alterations required may not be commercially or technically viable.


89. The assessment considered all of the identified development considerations equally, i.e. there was no weighting of different development considerations relative to each other. Whilst any weighting is not incorporated in the RAG assessment findings, professional judgement, guidance and feedback through the consultation process was taken into consideration to inform decisions.
90. The RAG assessment presented in Table 6.6. was undertaken for each of the following three Offshore Export Cable corridor options and their respective route segments, apart from the nearshore and Landfall segments (refer to paragraph 91) as defined in Volume 4, Figure 6.2.
- Option 1 (central corridor) – Route segments 04 or 06 or 08 (via 01) for connecting to the BBWF array area boundary, and segment 11;

<sup>5</sup> Annex 1 reefs refers to marine habitats protected under Annex 1 of the European Union Habitats Directive 92/43/EEC transposed into Scottish and English Law by various regulations.

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- Option 2 (Eastern corridor; selected) – Route segments 05 or 07 or 09 (via 01) for connecting to the BBWF array area boundary, and segment 12; and
- Option 3 (nearshore corridor) – Route segments 01 and 02, or 03 for connecting to the BBWF array area boundary, and segment 10.


91. Given that the nearshore and Landfall corridor segments are identical for Options 1 and 2 (segments 13, 14 and 16, as well as 15 and 16) and that segments 14 and 16 are also identical with the Landfall corridor segments for Option 3, these Offshore Export Cable Corridor segments were not included within the RAG assessment as they do not assess alternatives for the three Offshore Export Cable Corridor options. As such they did not contribute to drawing conclusions on a preferred corridor option. The key risks associated with these Offshore Export Cable Corridor segments in the nearshore and at the Landfall are presented in Table 6.7, based on the BRAG Assessment (Xodus, 2022) and the constraints analysis that identified the initial Offshore Export Cable Corridors (Cathie Associates, 2021).
92. It should be noted technical designs were not considered for either Offshore Export Cable Corridor option since design parameters, such as the number and type of cables, would be the same for Options 1 and 2. Option 3 had been discounted for technical and environmental (commercial fisheries and designated sites) reasons at an early stage and therefore this level of design detail is not required to undertake a comparison of environmental effects. It is not considered that technical differences, other than routing and hence the location of the Offshore Export Cable Corridor options, are material in carrying out the RAG assessment and deriving conclusions on the alternative Offshore Export Cable Corridors.
93. It can be concluded from the high-level RAG assessment presented in Table 6.6 that Option 2 is the preferred alternative for the Offshore Export Cable Corridor from an environmental and technical perspective, as outlined in section 6.10. Both the BRAG assessment (Xodus, 2022) and the constraints analysis carried out to identify initial Offshore Export Cable Corridors (Cathie Associates, 2021) also recommended that the selected Eastern route (Option 2) is considered the most suitable Offshore Export Cable Corridor option.

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**Table 6.6 RAG Assessment Informed by Xodus, 2022; Cathie Associates, 2021; and BMM, 2022**


Consideration	Option 1 (central corridor)	Option 2 (Eastern corridor)	Option 3 (nearshore corridor)
Technical constraints – constraints due to seabed conditions	<p>The thickness of the majority of quaternary deposits are between 5 m to 20 m; however, there are hard substrates present with a thickness of quaternary deposits of &lt;5 m. Whilst the 5 -20 m thickness should provide adequate burial for a cable, the hard substrate present may result in potential technical constraints.</p> <p>This option has some potential Annex I reefs, but micro-siting could be utilised to reduce impact. The presence of these reefs could pose a technical constraint to cable burial, and therefore will require additional planning in advance of construction.</p> <p>The risk rating is moderate for this corridor option due to the presence of some hard substrate.</p>	<p>The thickness of the majority of quaternary deposits are 5 m to 20 m, which should provide adequate burial for a cable. There are also some sections of hard substrate present, which may result in potential technical constraints.</p> <p>This option has some potential Annex I reefs, but micro-siting could be utilised to reduce impact. The presence of these reefs could pose a technical constraint to cable burial, and therefore will require additional planning in advance of construction.</p> <p>The risk rating is moderate for this corridor option due to the presence of some hard substrate.</p>	<p>Most of the southern half of the option (along segment 10) and a small area of the northern half of the corridor option (segment 02) pass through quaternary deposits with a thickness of less than 5 m, with hard substrates present along the entire corridor option, in particular in the southern half. This represents a high execution risk and hence the risk rating is high for this corridor option.</p>
Environmentally designated sites	<p>This option crosses the Farnes East MCZ (designated for benthic features) which poses a risk for likely significant environmental effects and which Natural England and Cefas have advised to avoid (refer to section 6.5). Hence the risk rating for this corridor option is high.</p> <p>It also crosses the Firth of Forth Banks Complex MPA (designated for benthic features); however risk is considered low for that site as the MPA Assessment carried out for the BBWF EIA concluded that none of the assessed impacts were predicted to lead to a significant risk of hindering the achievement of the conservation</p>	<p>This option is within proximity to the Farnes East MCZ but does not cross it and hence for likely significant environmental effects on the site is considered low.</p> <p>The corridor option crosses the Firth of Forth Banks Complex MPA (however risk is considered low for the MPA as noted for Option 1).</p> <p>It does not pass through any sites designated for ornithological features (SPAs) or seal conservation areas. Note this RAG does not consider the landfall/nearshore area as this is</p>	<p>This option crosses the following designated sites:</p> <ul style="list-style-type: none"> <li>• Firth of Forth Banks Complex MPA (risk is considered low for the MPA as noted for Option 1);</li> <li>• Outer Firth of Forth and St Andrews Bay Complex MPA and SPA;</li> <li>• Coquet Island SPA</li> <li>• Northumberland Marine SPA; and</li> <li>• Northumbria Coast SPA.</li> </ul> <p>It also passes along the Eastern boundary of the Farnes East MCZ and along the Berwickshire and North Northumberland Coast SAC.</p>




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Consideration	Option 1 (central corridor)	Option 2 (Eastern corridor)	Option 3 (nearshore corridor)
	<p>objectives for any protected features of the Firth of Forth Banks Complex MPA (BBWFL, 2022b).</p> <p>This corridor option does not pass through any sites designated for ornithological features (SPAs) or seal conservation areas. Note this RAG does not consider the landfall/nearshore area as this is consistent across all three cable corridor options and therefore a comparison is not required.</p>	<p>consistent across all three cable corridor options and therefore a comparison is not required.</p> <p>Overall, the risk is considered low for this option.</p>	<p>Due to this corridor option crossing several designated sites for the majority of its length, the risk rating for this corridor option is moderate.</p> <p>Note this RAG does not consider the landfall/nearshore area as this is consistent across all three cable corridor options and therefore a comparison is not required.</p>
<p>Benthic habitats (e.g. nursery grounds and spawning grounds for fish)</p>	<p>There are some potential Annex I reefs present in the Farnes East MCZ which this option passes through. Micro-siting could be utilised to prevent any overlap with these reefs.</p> <p>The option overlaps with high intensity nursery grounds for cod, herring, and whiting. It is noted that lemon sole, haddock, <i>Nephrops</i>, and sprat also have nursery grounds in this area, but the intensity of the nursery grounds are undetermined. There are also spawning grounds present for <i>Nephrops</i> and sprat, but the intensity of the spawning grounds is undetermined. There is a moderate probability (0.2 – 0.4%) of aggregations of less than one-year old Norway pout, haddock, and whiting.</p> <p>Given the overlap with nursery grounds and spawning grounds for various species, and aggregations of less than one-year old fish the risk rating is moderate for this option.</p>	<p>There are some potential Annex I reefs present in the Farnes East MCZ and just outside the corridor option, however this route does not overlap with the Farnes East MCZ. Additionally, there are some Annex I reefs on the edge of the corridor which could potentially be impacted. Micro-siting could be utilised to prevent overlap with the reefs.</p> <p>This option overlaps with high intensity nursery grounds for cod, herring, and whiting, and low intensity nursery grounds for anglerfish, blue whiting, European hake, ling, mackerel, plaice, sandeel, spurdog, spotted ray and tope shark (both mainly in Scottish waters). There are also nursery grounds present for lemon sole, haddock, <i>Nephrops</i>, and sprat, but the intensity of the nursery grounds are undetermined. There are high intensity spawning grounds present for sandeel (mainly in Scottish waters) and low intensity spawning grounds for plaice, sandeel (mainly in English waters) whiting and cod (mainly in Scottish waters). Whilst there are also spawning grounds for <i>Nephrops</i>, sprat, lemon sole, and herring (in English nearshore waters)</p>	<p>Not applicable as the corridor option was discounted at an early stage due to commercial fishing constraints, constraints arising from crossing environmental designations and technical considerations, and consequently no information on benthic habitats was analysed.</p>

Consideration	Option 1 (central corridor)	Option 2 (Eastern corridor)	Option 3 (nearshore corridor)
		<p>their intensity is undetermined (also see Volume 2, Chapter 9: Fish and Shellfish Ecology).</p> <p>While there is still overlap with spawning and nursery grounds, this corridor option does not overlap with the Farnes East MCZ which brings the risk rating down to low compared to Option 1.</p>	
Other sea users	<p>This corridor option does not overlap with any renewable energy assets, oil and gas assets, dredge disposal or aggregate sites, cables, Carbon Capture, Usage and Storage (CCUS) sites or significant areas of marine recreation.</p> <p>This corridor option will overlap with the D513: Druridge Bay military and defence practice and exercise areas (PEXA) and X5641: Forth Outer PEXA; however based on consultation with the MoD there are likely to be solutions available for managing this overlap (refer to section 6.5), and hence the risk rating is low for this option.</p>	<p>This corridor option does not overlap with any renewable energy assets, oil and gas assets, dredge disposal or aggregate sites, cables, CCUS sites or significant areas of marine recreation.</p> <p>This corridor option will overlap with the D513: Druridge Bay PEXA and X5641: Forth Outer PEXA; however based on consultation with the MoD there are likely to be solutions available for managing this overlap (refer to section 6.5), and hence the risk rating is low for this option.</p>	<p>This corridor option does not overlap with any renewable energy assets, oil and gas assets, dredge disposal or aggregate sites, cables, CCUS sites or significant areas of marine recreation.</p> <p>This corridor option will overlap with the X5641: Forth Outer PEXA however based on consultation with the MoD there are likely to be solutions available for managing this overlap (refer to section 6.5) and hence the risk rating is low for this option.</p>
Marine archaeology	<p>There are three non-dangerous wrecks located in this cable route corridor option, all located approximately within 2 km. There are no protected wrecks or further marine archaeology features within the corridor option. Micro-siting can be utilised to avoid any wrecks and hence the risk rating is low for this option.</p>	<p>There are four non-dangerous wrecks located in this corridor option, all located approximately within 4 km. There are no protected wrecks within the corridor option. There is also a foul ground approximately within 2 km of the corridor option. Micro-siting can be utilised to avoid any wrecks and archaeological exclusion zones can be used to avoid any impacts to any other marine archaeological features during construction, maintenance and decommissioning activities. Hence the risk rating is low for this option..</p>	<p>Not applicable as the corridor option was discounted at an early stage due to commercial fishing constraints, constraints arising from crossing environmental designations and technical considerations, and consequently no information on marine archaeology and cultural heritage was analysed.</p>
Commercial fisheries	<p>Fishing vessel tracks (AIS) are low to moderate throughout this corridor option.</p>	<p>Fishing vessel tracks are low to moderate throughout this corridor option.</p>	<p>This nearshore corridor option would largely affect potters under 10 m during construction and</p>

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Consideration	Option 1 (central corridor)	Option 2 (Eastern corridor)	Option 3 (nearshore corridor)
	<p>Effort (hours/days) by UK vessels and average VMS value of landings using dredges is low - moderate along the length of the corridor option. Effort (hours/days) by UK vessels and average VMS value of landings using demersal gear is moderate - high and increases as the corridor option approaches the inshore area. Monetary value for inshore fisheries is low across this corridor option. The number of inshore vessels is low to moderate along this corridor option.</p> <p>Potential for temporary loss, displacement or restricted access to fishing grounds due to construction on creeling / potting in English waters. This is mainly in relation to the high activity by creelers / potters along the Northumberland coast and the potential requirement for the removal or relocation of gear during the construction phase. Where this a case secondary mitigation could be proposed for affected vessels in the form of an evidence-based approach, through the establishment of co-operation agreements. Additionally, across all the corridor options there is a prohibited fishing area for sandeels, which means that all corridor options will not impact any sandeel fisheries. Due to the moderate to high landings by demersal gear, high intensity of fishing activity, and the potential for adverse impacts on fishers, the risk rating for this cable route option has been determined as high.</p>	<p>Effort (hours/days) by UK vessels and average VMS value of landings using dredges is low - moderate along the length of the corridor option. Effort (hours/days) by UK vessels and average VMS value of landings using demersal gear is moderate - high and increases as the corridor approaches the inshore area. Monetary value for inshore fisheries is low across this cable route option. The number of inshore vessels is low to moderate along this corridor option.</p> <p>Potential for temporary loss, displacement or restricted access to fishing grounds due to construction on creeling / potting in English waters. This is mainly in relation to the high activity by creelers / potters along the Northumberland coast and the potential requirement for the removal or relocation of gear during the construction phase. Where this a case secondary mitigation could be proposed for affected vessels in the form of an evidence-based approach, through the establishment of co-operation agreements. Additionally, across all the corridor options there is a prohibited fishing area for sandeels which means that the corridor options will not impact any sandeel fisheries. Due to the moderate to high landings by demersal gear, high intensity of fishing activity, and the potential for adverse impacts on fishers the risk rating for this cable route option has been determined as high.</p>	<p>any pre- and post-construction surveys. Feedback from fishermen strongly suggested to avoid this nearshore corridor option and hence the risk rating is high.</p>

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Consideration	Option 1 (central corridor)	Option 2 (Eastern corridor)	Option 3 (nearshore corridor)
Aquaculture	The corridor option does not overlap with any aquaculture lease areas or sites and the risk rating is therefore low for this option.	The corridor option does not overlap with any aquaculture lease areas or sites and the risk rating is therefore low for this option.	The corridor option does not overlap with any aquaculture lease areas or sites and the risk rating is therefore low for this option.
Shipping and navigation	The average weekly vessel density (based on AIS data) is moderate ranging from <5 - 25 vessel tracks per 4 km <sup>2</sup> across this corridor option. There is a moderate to high density of tanker and cargo vessel tracks recorded as crossing this corridor option from the Firth of Forth, Aberdeen harbour, and Newcastle harbour. Fishing vessel tracks are high throughout the corridor option. Recreational, passenger, military, dredging, port service craft and high speed craft vessel tracks are low across the entire corridor option. There are no ports/harbour limits or IMO routing measures which cross this corridor option. Overall the risk is considered moderate for this option.	The average weekly vessel density (based on AIS data) is moderate ranging from <5 - 25 vessel tracks per 4 km <sup>2</sup> across this corridor option. There is a moderate to high density of tanker and cargo vessel tracks recorded as crossing this corridor option from the Firth of Forth, Aberdeen harbour, and Newcastle harbour. Fishing vessel tracks are high throughout the corridor option. Recreational, passenger, military, dredging, port service craft and high speed craft vessel tracks are low across the entire corridor option. There are no ports/harbour limits or IMO routing measures which cross this corridor option. Overall the risk is considered moderate for this option.	Not applicable as the corridor option was discounted at an early stage due to commercial fishing constraints, constraints arising from crossing environmental designations and technical considerations, and consequently no information on shipping and navigation was analysed.

**Table 6.7 Key Risks Associated with the Nearshore and Landfall Offshore Export Cable Corridor Options 1, 2 and 3, Informed by Xodus, 2022; Cathie Associates, 2021; and BMM, 2022**


Consideration	Risk description
Technical constraints	<p>The thickness of quaternary deposits is less than 5 m near the Landfall with large sections of hard substrates present in the final 1 km, which could present risks to cable installation and operation, which is being reviewed by the Applicant. The nearshore area comprises of a very gentle sloping bathymetry that decreases from approximately 50 m to 0 m across the final 10 km, not exceeding a five degree slope.</p> <p>There is a high density of Annex I reefs present in the nearshore area with the density increasing towards the Landfall connection; however, these reefs should be avoidable through micro-siting. The presence of these reefs could pose a technical constraint to cable burial, and therefore will require additional planning in advance of installation.</p>
Designated Sites / Seal Haul Out Sites	<p>This nearshore and Landfall corridor section will cross the following designated sites:</p> <ul style="list-style-type: none"> <li>Coquet to St Marys MCZ (designated for benthic features);</li> </ul>

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Consideration	Risk description
	<ul style="list-style-type: none"> <li>Berwick to St Mary's MCZ (designated for ornithological features); and</li> <li>Northumberland Marine SPA (designated for ornithological features).</li> </ul> <p>This corridor section does not pass through any seal conservation areas.</p>
Benthic habitats (e.g. nursery grounds and spawning grounds for fish)	<p>This cable route section has a high density of Annex I reefs present in the final 6 km and a couple of further reefs past 6 km, but micro-siting could be utilised to avoid any overlap.</p> <p>The nearshore and Landfall corridor sections overlap with high intensity nursery grounds for cod, herring, and whiting, and low intensity nursery grounds for anglerfish, ling, mackerel, plaice, sandeel and spurdog. There are also nursery grounds present for lemon sole, <i>Nephrops</i> and sprat, but the intensity of the nursery grounds is undetermined. There are also low intensity spawning grounds for plaice and sandeel. Whilst there are also spawning grounds for <i>Nephrops</i>, herring and lemon sole, their intensity is undetermined (also see Volume 2, Chapter 9: Fish and Shellfish Ecology).</p>
Other sea users	<p>The nearshore option will overlap with the Blyth Demonstrator Wind Farm, specifically its offshore export cables (installed for Phase 1; planned for Phase 2), and the North Sea Link and Scotland to England Green Link (SEGL) 1 power cable assets. This will require mitigation measures as part of the Marine Scheme in the form of crossing and proximity agreements to ensure third party assets are protected.</p> <p>This corridor section does not overlap with any oil and gas or military PEXA assets.</p> <p>This corridor section does not overlap with any dredge disposal/aggregate assets, but is within 1 km of three dredge disposal sites (North Tyne (TY070), Blyth Offshore Wind Farm Demo (TY043), and Blyth A + B (TY042)).</p> <p>Marine recreational activities occur at higher intensity within the inshore areas, but is considered to be manageable through stakeholder engagement.</p>
Marine archaeology	<p>There are ten marine archaeology features located within and up to 500m around of the corridor section in the nearshore area, including five wrecks, but here are no protected wrecks or other features present. Micro-siting and archaeological exclusion zones can be used to prevent any overlap and to avoid any impacts from construction, maintenance or decommissioning activities.</p>
Commercial fisheries	<p>Fishing vessel tracks (AIS) are moderate throughout this corridor section.</p> <p>Effort (hours/days) by UK vessels and average VMS value of landings using dredges is low – moderate along this corridor section.</p> <p>Effort (hours/days) by UK vessels and average VMS value of landings using demersal gear is moderate – high and increases as the corridor section approaches inshore waters.</p> <p>Effort (hours/days) by UK vessels using passive gear is not recorded along the length of this corridor section. Average VMS value of landings using passive gear is low.</p>


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Consideration	Risk description
	<p>Monetary value for inshore fisheries is low across this corridor section. Number of inshore vessels is low to moderate.</p> <p>Potential for temporary loss, displacement or restricted access to fishing grounds due to construction on creeling / potting in English waters. This is mainly in relation to the high activity by creelers / potters along the Northumberland coast and the potential requirement for the removal or relocation of gear during the construction phase. Where this a case secondary mitigation could be proposed for affected vessels in the form of an evidence-based approach, through the establishment of co-operation agreements.. Additionally, across all the corridor options there is a prohibited fishing area for sandeels, which means that all corridor options will not impact any sandeel fisheries. Due to the moderate to high landings by demersal gear, high intensity of fishing activity, and the potential for adverse impacts on fishermen, the risk rating for this cable route option has been determined as high.</p>
Aquaculture sites	The cable route option does not overlap with any aquaculture lease areas or sites. There is an area of strategic sustainable aquaculture production established along the coastline that the nearshore area will overlap with (MMO, 2019). The risk rating is however considered to be low.
Shipping and Navigation	<p>The average weekly density (AIS vessel tracks) is moderate across this corridor section.</p> <p>There is a high density of tanker and cargo vessel tracks recorded as crossing this corridor section from the Firth of Forth, Aberdeen harbour, and Newcastle harbour. Fishing vessel tracks are moderate throughout the corridor section.</p> <p>Recreational vessels tracks are moderate in the inshore waters near the Landfall and then become low after approximately 6 km.</p> <p>Passenger, military, dredging, port service craft and high speed craft vessel tracks are low across the corridor section.</p> <p>There are no ports/harbour limits or IMO routing measures which cross this cable route option.</p>

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## 6.13. Summary


94. The approach taken to Offshore Export Cable Corridor appraisal and subsequent assessment of alternative options for delivery of the Cambois Connection has been based on the objective of developing a viable connection between the BBWF and existing grid network in order to maximise export capacity, thereby delivering a significant volume of new low-carbon electricity as soon as possible, with a substantial contribution to the national grid by 2030.
95. An appraisal considering reasonable alternative Offshore Export Cable Corridor and Landfall options has been carried out for the Marine Scheme, considering potential environmental effects and technical constraints of the alternatives reviewed.
96. The design for the Marine Scheme subject to the Marine Licence applications is the outcome of an iterative process that commenced when the need to develop an additional connection from BBWF to a Landfall in North-East England was identified with the objective to not just enable, but to accelerate BBWF reaching its full generation capacity.
97. The appraisal of the Marine Scheme determined that not developing the Cambois Connection and thus the Marine Scheme would not have assisted in rapidly tackling the global climate change emergency by contributing to achieving Scottish and UK targets set in response. The Marine Scheme will help deliver significant quantities of low-carbon electricity from BBWF's full generation capacity as early as 2030, making a significant, necessary and timely contribution to the Scottish and UK targets of achieving Net Zero by 2045 and 2050 respectively, as well as the Scottish and UK targets of having 11 GW and 50 GW of offshore wind operating in Scottish and UK waters respectively by 2030. This early connection and important contribution to rapid decarbonisation and associated increase of electricity output from offshore wind would not have been achievable by BBWF with the additional grid connection originally offered at the Branxton substation in East Lothian, where BBWF will export the remaining electricity to. The additional grid connection at Blyth substation in North-East England was confirmed by the National Grid Electricity System Operator (NGESO) in July 2022 in their Holistic Network Design Review.
98. Following determination that the Marine Scheme is needed, a wide range of environmental, technical and commercial considerations have influenced the optioneering and design evolution process of the Offshore Export Cable Corridor and the Landfall. Alongside this, the formal consultation process (including a formal request by BBWFL for a Scoping Opinion in November 2022) and engagement with key stakeholders, including but not limited to MD-LOT, the MMO, Natural England and fishermen, has informed the development of the Marine Scheme.
99. Three Offshore Export Cable Corridor options, encompassing a total of 16 route segments, were assessed during the development of the Marine Scheme. The appraisal of these alternatives concluded that the most Eastern Offshore Export Cable Corridor is the most suitable alternative from an environmental and technical perspective. It avoids the Farnes East MCZ, in accordance with advice received from stakeholders, and thus avoids likely significant environmental effects on this designated site. It also does not pose the potential technical execution risks which the nearshore corridor option presented.
100. The Landfall area of search options extended from the Port of Blyth in the south up to Lynemouth north of Newbiggin-by-the-Sea and the River Wansbeck. However, it quickly became apparent that any Landfall to the north of the River Wansbeck would require construction of a far longer and more complex onshore cable route to the Blyth substation, which would interact with a number of conurbations, roads, other infrastructure and would require crossing of the River Wansbeck, resulting in significant additional technical complexity, cost and the need for additional construction activity on both river banks. A Landfall north of the River Wansbeck where cliffs are present may also be challenging for using trenchless Landfall installation technologies, which have been selected by the Applicant and have the advantage of avoiding and reducing potential environmental effects at the Landfall. An appraisal of the remaining Landfall area of search between the Port of

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Blyth and the River Wansbeck concluded that the preferred Landfall would be located in the south of this coastal stretch.

101. This route appraisal and consideration of alternatives chapter explains the process that has informed the Marine Scheme design presented in Volume 2, Chapter 5: Project Description and shown in Volume 4, Figures 6.1 to 6.7. The design and parameters set out in Chapter 5: Project Description and the Marine Scheme area shown in Volume 4, Figure 6.6 have been taken forward for assessment within technical chapters.



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