



Hornsea Project Four: Environmental Statement (ES)

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Volume A1, Chapter 3 : Site Selection and Consideration of Alternatives

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Annex	Title
A4.3.1	Refinement of the Cable Landfall
A4.3.2	Selection and Refinement of the Offshore Infrastructure
A4.3.3	Selection and Refinement of the Onshore Infrastructure

Glossary

Term	Definition
BRAG Assessment	<p>An assessment based on quantitative assessment and expert judgement. The ranking is defined as:</p> <ul style="list-style-type: none"> • Black: Potential showstopper to development; • Red: High potential to constrain development; • Amber: Intermediate potential to constrain development; and • Green: Low potential to constrain development. <p>Black and red constraints are critical in determining features that should be avoided wherever possible to avoid consenting risk, reduce EIA complexity and reduce the cost of mitigation. Amber and green constraints are those that may be more readily minimised or managed by employing appropriate mitigation measures.</p>
Code of Construction Practice (CoCP)	<p>A document detailing the overarching principles of construction, contractor protocols, construction-related environmental management measures, pollution prevention measures, the selection of appropriate construction techniques and monitoring processes.</p>
Commitment	<p>A term used interchangeably with mitigation and enhancement measures. Commitments are Embedded Mitigation Measures. The purpose of Commitments is to reduce and/or eliminate Likely Significant Effects (LSEs), in EIA terms.</p> <p>Primary (Design) or Tertiary (Inherent) are both embedded within the assessment at the relevant point in the EIA (e.g. at Scoping, Preliminary Environmental Information Report (PEIR) or ES).</p> <p>Secondary commitments are incorporated to reduce LSE to environmentally acceptable levels following initial assessment i.e. so that residual effects are acceptable.</p>
Design Envelope	<p>A description of the range of possible elements that make up the Hornsea Project Four design options under consideration, as set out in detail in the project description. This envelope is used to define Hornsea Project Four for Environmental Impact Assessment (EIA) purposes when the exact engineering parameters are not yet known. This is also often referred to as the "Rochdale Envelope" approach.</p>
Developable Area Approach (DAA)	<p>A Hornsea Four internal process for consideration of Physical, Biological and Human constraints in refining the Agreement for Lease (AfL) area. The consideration balances consenting and commercial considerations with technical feasibility for construction. The output of the DAA gives due consideration to the size and location of the Final Project that will be taken forward to consent application.</p>
Development Consent Order (DCO)	<p>An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Projects (NSIP).</p>
Effect	<p>Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the</p>

Term	Definition
	importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
EIA Directive	European Union Directive 85/337/EEC, as amended by Directives 97/11/EC, 2003/35/EC and 2009/31/EC and then codified by Directive 2011/92/EU of 13 December 2011 (as amended in 2014 by Directive 2014/52/EU).
EIA Regulations	Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.
Energy balancing infrastructure (EBI)	The onshore substation includes energy balancing Infrastructure. These provide valuable services to the electrical grid, such as storing energy to meet periods of peak demand and improving overall reliability.
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Statement.
Environmental Statement (ES)	A document reporting the findings of the EIA and produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Export cable corridor (ECC)	The specific corridor of seabed (seaward of Mean High Water Springs (MHWS)) and land (landward of MHWS) from the Hornsea Project Four array area to the Creyke Beck National Grid substation, within which the export cables will be located.
Export cable corridor (ECC) search area	The broad offshore corridor of seabed (seaward of the MHWS) and land (landward of MHWS) from the Hornsea Project Four array area to the Creyke Beck National Grid substation considered within the Scoping Report, within which the refined ECC corridor will be located.
Electrical Infrastructure Study Area (EISA)	The study area between the onshore substation and offshore array area
Haul Road	The track along the onshore ECC which the construction traffic would use to access work fronts.
High Voltage Alternating Current (HVAC)	High voltage alternating current is the bulk transmission of electricity by alternating current (AC), whereby the flow of electric charge periodically reverses direction.
Hornsea Project Four Offshore Wind Farm	The proposed Hornsea Project Four Offshore Wind Farm project. The term covers all elements within the Development Consent Order (i.e. both the offshore and onshore components). Hereafter referred to as Hornsea Four.
HVAC booster station(s)	Offshore HVAC booster station(s) are required in HVAC transmission systems only; they are not required in HVDC transmission systems. If required for Hornsea Four, they would be located entirely offshore.
High Voltage Direct Current (HVDC)	High voltage direct current is the bulk transmission of electricity by direct current (DC), whereby the flow of electric charge is in one direction.
Landfall	The generic term applied to the entire landfall area between Mean Low Water Spring (MLWS) tide and the Transition Joint Bay (TJB) inclusive of all construction works, including the offshore and onshore ECC, intertidal working area and landfall compound. Where the offshore cables come ashore east of Fraisthorpe.

Term	Definition
Mitigation	A term used interchangeably with Commitment(s) by Hornsea Four. Mitigation measures (Commitments) are embedded within the assessment at the relevant point in the EIA (e.g. at Scoping, PEIR or ES).
National Grid Electricity Transmission (NGET) substation	The grid connection location for Hornsea Four.
Offshore export cables	Cables that transfer power from the offshore substation(s) or the converter station(s) to shore.
Offshore substation(s)	One or more offshore substations to convert the power to higher voltages and/or to HVDC and transmit this power to shore.
Onshore export cables	Cables connecting the landfall first to the onshore substation and then on to the NGET substation at Creyke Beck.
Onshore substation (OnSS)	Comprises a compound containing the electrical components for transforming the power supplied from Hornsea Project Four to 400 kV and to adjust the power quality and power factor, as required to meet the UK Grid Code for supply to the National Grid. If a HVDC system is used the OnSS will also house equipment to convert the power from HVDC to HVAC.
Orsted Hornsea Project Four Ltd.	The Applicant for the proposed Hornsea Project Four Offshore Wind Farm Development Consent Order (DCO).
Transition Joint Bay (TJBs)	TJBs are pits dug and lined with concrete, in which the jointing of the offshore and onshore export cables takes place.
Trenchless Techniques	Also referred to as trenchless crossing techniques or trenchless methods. These techniques include Horizontal Directional Drilling (HDD), thrust boring, auger boring, and pipe ramming, which allow ducts to be installed under an obstruction without breaking open the ground and digging a trench.

Acronyms

Acronym	Definition
AfL	Area for Lease
BRAG	Black, Red, Amber, Green
DCO	Development Consent Order
EBI	Energy Balancing Infrastructure
ECC	Export Cable Corridor
ECR	Export Cable Route
EIA	Environmental Impact Assessment
EISA	Electrical Infrastructure Study Area
ERYC	East Riding of Yorkshire Council
ES	Environmental Statement
HDD	Horizontal Directional Drill
HVAC	High Voltage Alternating Current
LTP	Local Transport Projects Ltd
MCZ	Marine Conservation Zone
NGET	National Grid Electricity Transmission
OnSS	Onshore Substation
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
RAG	Red, Amber, Green
SoS	Secretary of State
TCE	The Crown Estate
UK	United Kingdom
ZAP	Zone Appraisal and Planning
ZDA	Zone Development Agreement

Units

Unit	Definition
GW	Gigawatt (power)
m	meter
km	kilometre
km ²	square kilometre
kV	kilovolt (electrical potential)
kW	kilowatt (power)
%	percentage

3.1 Introduction

- 3.1.1.1 This chapter of the Environmental Statement (ES) presents the results of the site selection and consideration of alternatives considered for the Hornsea Project Four offshore wind farm (hereafter 'Hornsea Four').
- 3.1.1.2 Orsted Hornsea Project Four Limited (the 'Applicant') is proposing to develop Hornsea Four. Hornsea Four will be located approximately 69 km from the East Riding of Yorkshire in the Southern North Sea and will be the fourth project to be developed in the former Hornsea Zone (please see [Chapter 1: Introduction](#) for further details on the Hornsea Zone). Hornsea Four will include both offshore and onshore infrastructure including offshore generating stations (wind turbines), electrical export cables to landfall and a connection to the electricity transmission network at National Grid's Creyke Beck substation and energy balancing infrastructure (EBI) (please see [Chapter 4: Project Description](#) for full details on the Project Design).
- 3.1.1.3 An important part of the Hornsea Four development process is the consideration of potential options, selection and the subsequent refinement of project infrastructure. Well informed decisions on the selection and siting of infrastructure are critical and Hornsea Four recognise the need to ensure consultees and stakeholders understand how such decisions have been made.
- 3.1.1.4 This chapter summarises the site selection process (including route planning), [a comparison] of alternatives considered and the reasons for selecting the chosen option). All information supporting the decision-making process is contained within the three technical annexes, included in [Volume 4](#) of the ES:
- [Annex A4.3.1: Refinement of the Cable Landfall](#);
 - [Annex A4.3.2: Selection and Refinement of the Offshore Infrastructure](#); and
 - [Annex A4.3.3: Selection and Refinement of the Onshore Infrastructure](#).

3.2 Consideration of Reasonable Alternatives

- 3.2.1.1 EU Directive 2011/92/EU, as amended by Directive 2014/52/EU on the assessment of environmental effects of certain public and private projects sets out the requirement for the EIA Report to provide information relating to reasonable alternatives in Annex IV:

"a description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects".

- 3.2.1.2 The need for offshore wind farm development within UK waters to replace more environmentally damaging energy options such as traditional (fossil fuel) power stations (notably in relation to climate change) is set out in [Volume A1, Chapter 2: Planning and](#)

Policy Context. UK energy policy sets the underlying and supporting framework for development of renewable energy and associated EBI.

- 3.2.1.3 Consideration has been given to reasonable alternatives throughout the process of developing Hornsea Four. This has formed a fundamental driver for decision making within the project, from the technical options within the engineering side to the micro-siting and route changes during the development of the cable routes.
- 3.2.1.4 For example, when identifying the cable landfall location, the “*Guiding Principles*” listed below were identified:
- Select the shortest route (hence reduce environmental impacts by minimising footprint and electrical transmission losses (most efficient project));
 - Avoid key sensitive features where possible and where not, seek to mitigate impacts;
 - Minimise disruption to sensitive receptors (e.g. populated areas) by the early adoption of primary (intrinsic design) commitments (see [Table 3.1](#) and Hornsea Four’s Commit, Consult, Design ethos, See [Section 3.5](#)): and
 - Find a site large enough to accommodate the connection technology outlined within the design envelope (see [Chapter 4: Project Description](#)).
- 3.2.1.5 Through consideration of these principles, by default all other reasonable alternatives were considered as part of the decision process and the best identifiable option selected.
- 3.2.1.6 In addition to this, when mapping the most appropriate route for the offshore export cables, a detailed list of physical and third-party constraints was put together (Table 3 of [Volume A4, Annex 3.2: Selection and Refinement of the Offshore Infrastructure](#)). This list sets out not only the constraints to be identified but also the mitigation measures associated with each constraint.
- 3.2.1.7 Consideration of these constraints, identification of the preferred option(s) and then comparison of the alternatives and the reasons for selecting the preferred option are set out in the Black Red Amber Green (BRAG) assessments (see [Paragraph 3.3.1.3](#)) that underpin the Hornsea Four site selection process. These can be found in the relevant technical annexes listed in [Paragraph 3.1.1.4](#).

3.3 Site Selection Methodology

- 3.3.1.1 The identification of suitable options for the landfall, OnSS, and onshore and offshore ECCs each followed a similar methodology, as summarised below.
- 3.3.1.2 A search area (EISA) was defined for which constraints data were collected and teams within Hornsea Four (i.e. Environment and Consents, Land and Property, Commercial, Technical and Electrical Installation) developed selection criteria for a Black, Red, Amber and Green (BRAG) appraisal to be undertaken.
- 3.3.1.3 The BRAG approach uses colour coded ratings to inform the site selection and consideration of alternatives and were defined as follows:
- **Black** - Potential showstoppers to development;
 - **Red** - High potential for the development to be constrained;
 - **Amber** - Intermediate potential for the development to be constrained; and
 - **Green** - Low potential for the development to be constrained.
- 3.3.1.4 The BRAG criteria was developed by the Applicant based on experience, with the definitions applied to black, red, amber and green applied consistently for both offshore and onshore infrastructure. Black and red constraints are critical in determining features that should be avoided wherever possible to avoid consenting risk, reduce EIA complexity and reduce the cost of mitigation. Hornsea Four has subsequently made commitments based on the avoidance of features that were rated as black and red constraints (e.g. national and international environmental designations). These commitments are set out in the Commitments Register ([Volume A4, Annex 5.2](#)) and Hornsea Four will continue to identify where commitments can be made to avoid constraints based on the site selection work in order to reduce project risk and deliver a proportionate EIA.
- 3.3.1.5 Amber and green constraints are those that may be more readily minimised or managed by employing appropriate mitigation measures. Based on the BRAG appraisal the number of options were reduced. The remaining options will continue to be reduced as preferred options and alternatives are identified and refined for the ES.

3.4 Proportionate EIA, Route Planning and Site Selection (RPSS) and Design Vision.

- 3.4.1.1 The Applicant has progressed a proportionate approach to undertaking the EIA in light of both PINS Advice Note Six: Preparation and Submission of Application Documents (PINS 2016), and industry guidance set out by the Institute of Environmental Management and Assessment (IEMA) (IEMA 2017). Development of the "Proportionate" approach has included production of key tools such as the Commitments Register ([Volume A4, Annex 5.2](#)) and Impacts Register ([Volume A4, Annex 5.1](#)).
- 3.4.1.2 Route planning and site selection has incorporated some fundamental commitments to avoid or reduce impacts by avoiding sensitive, important or valuable features early in project design and in so doing reduce any adverse impacts of Hornsea Four and contribute to proportionate EIA and the amount of assessment required. These commitments are all presented in the commitments register ([Volume A4, Annex 5.2](#)).
- 3.4.1.3 The design of key onshore Hornsea Four electrical infrastructure is captured in the Design Vision Statement ([Volume A4, Annex 4.6](#)), which incorporates the National Infrastructure Commission (2020) Design Principles of Climate, People, Places and Value. The Design Vision Statement provides an overview of the final design process and captures the thinking on design which is embedded at every step of Hornsea Four RPSS process, planning and DCO delivery. The Design Principles ensure an integrated RPSS and EIA process leads to a good design outcome.
- 3.4.1.4 The Design Vision Statement ([Volume A4, Annex 4.6](#)) helps to ensure sense of place is considered and integrated throughout the design process and adverse environmental effects are mitigated, using the BRAG and Impact Register approach to reduce or eliminate significant effects where possible. This is achieved through the integration of locally inspired design principles and engineering optimisation informed by Statutory and Non-statutory consultation (see [Chapter 6: Consultation](#)). Consultation forms an integral part of Hornsea Four's Commit, Consult, Design ethos.
- 3.4.1.5 Key design considerations identified through consultation include the avoidance of environmentally sensitive sites and residential receptors. The Design Vision Statement brings not only greater visual mitigation as part of Hornsea Four, but also integrates ecological (enhancement and mitigation via the EIA) and amenity (PRoW and signage) benefits.
- 3.4.1.6 Hornsea Four incorporates several commitments which have informed the site selection and routing process through avoidance of sensitive receptors (see [Table 3.1](#)). Such commitments include primary design principles inherent as part of the project (such as avoidance of sensitive sites, adoption of installation techniques and engineering designs/modifications included as part of their pre-application phase), to eliminate potentially significant impacts or reduce impacts as far as possible. Further commitments including the adoption of best practice guidance are embedded as an inherent aspect of the adopted Hornsea Four EIA process.

Table 3.1: Commitments which form an intrinsic part of Hornsea Four and applicable to site selection and consideration of alternatives.

Commitment	Description	Purpose	How it is secured
Co2	<p>A range of sensitive historical, cultural and ecological conservation areas (including statutory and non-statutory designations) have been directly avoided by the permanent Hornsea Four footprint, at the point of Development Consent Order Submission (DCO). These include, but are not restricted to: Listed Buildings (564 sites); Scheduled Monuments (30 sites); Registered Parks and Gardens (Thwaite Hall and Risby Hall); Onshore Conservation Areas (18 sites); Onshore National Site Network (one site); Offshore National Site Network (three sites); Offshore Marine Conservation Zones (two sites); Sites of Special Scientific Interest (two sites); Local Nature Reserves (none have been identified); Local Wildlife sites (33 sites); Yorkshire Wildlife Trust Reserves (none have been identified); Royal Society for the Protection of Birds (RSPB) Reserves (none have been identified); Heritage Coast; National Trust land; Ancient Woodland (10 sites and known Tree Preservation Orders (TPOs)); non-designated built heritage assets (334 sites); and historic landfill (none have been identified). Where possible, unprotected areas of woodland, mature and protected trees (i.e. veteran trees) have and will also be avoided.</p>	<p>To minimise effects upon the biological, human and built environment</p>	<p>DCO Works Plan – Offshore (Annex D1.4.1) DCO Works Plan – Onshore. (Annex D1.4.2)</p>
Co7	<p>The construction work area associated with onshore export cable corridor will be 80 m working width to minimise the construction footprint, except at the Network Rail Crossing near Beswick, the approach to landfall and the approach to the onshore substation. At the Network Rail Crossing the working width is extended up to 120 m to facilitate HDD of the railway line. The permanent onshore export cable corridor width will be 60m except where obstacles are encountered such as the Network Rail Crossing near Beswick (where the permanent footprint may be extended up to 120 m to facilitate HDD of the railway line), and on the approach to the landfall and onshore substation.</p>	<p>To minimise effects upon the biological, human and built environment</p>	<p>DCO Works Plan – Onshore. (Annex D1.4.2)</p>

Commitment	Description	Purpose	How it is secured
Co44	The Holderness Inshore Marine Conservation Zone (MCZ) will not be crossed by the offshore export cable corridor including the associated temporary works area.	To minimise effects upon the biological, human and marine environment	DCO Schedule 1, Part 1 Authorised Development, and DCO Works Plan – Offshore. (Annex D1.4.1).
Co45	The Holderness Offshore MCZ will not be crossed by the offshore export cable corridor including the associated temporary works area.	To minimise effects upon the biological, human and marine environment	DCO Schedule 1, Part 1 Authorised Development, and DCO Works Plan – Offshore. (Annex D1.4.1).
Co46	All intrusive construction activities will be routed and microsited to avoid any identified archaeological receptors pre construction, with buffers as detailed in the Marine Written Scheme of Investigation (WSI).	To minimise effects upon the historic environment	DCO Schedule 11, Part 2 - Condition 13(2) & 13(3) and; DCO Schedule 12, Part 2 - Condition 13(2) 13 (3) (Marine Written Scheme of Archaeological Investigation)
Co48	Habitats of principal importance (Section 41 of the 2006 Natural Environment and Rural Communities (NERC) Act) will be avoided where possible, informed through the undertaking of survey works pre-construction.	To minimise effects upon the marine environment	DCO Schedule 11, Part 2 - Condition 13(1)(a)(v) and; DCO Schedule 12, Part 2 - Condition 13(1)(a)(v) (Pre-construction plans and documentation)
Co49	There will be no permanent High Voltage infrastructure installed above surface within 110 m of residential properties and sub surface infrastructure (including the onshore export cable) within 50 m of residential properties.	To minimise effects upon the biological and human environment	DCO Requirement 7 (Detailed design approval onshore) DCO Works Plan – Onshore (Annex D1.4.2)
Co63	The haul road will be installed within the works area of the onshore Export Cable Corridor (ECC) to minimise impacts during construction on agricultural land. With the exception of a section of haul road at Beck Hill (south of Gembling House, YO25 8HS) and Miles Lane (Leconfield, HU17 7RB).	To minimise effects upon the biological, historic and human environment	DCO Requirement 17 (Code of construction practice) (Chapter F2.2)

Commitment	Description	Purpose	How it is secured
Co78	All ponds identified during the route planning and site selection processes have been avoided, where possible. During construction any newly identified ponds will be avoided through micro-siting of the onshore export cables where practicable.	To minimise effects upon the biological environment	DCO Requirement 10 (Ecological Management Plan) (Chapter F2.3)
Co86	The offshore export cable corridor and cable landfall (below MHWS) will not cross the Greater Wash SPA, Flamborough & Filey Coast SPA and the Flamborough Head SAC.	To minimise effects upon the biological and marine environment	DCO Schedule 1, Part 1 Authorised Development
Co87	Proposed developable area has been selected and refined from the larger Hornsea Four Agreement for Lease (AfL) area to avoid areas of shipping and navigation activity and areas with the highest concentrations of birds (kittiwake, gannet, guillemot and razorbill) that are more likely to be displaced by the construction activities, and birds that are more likely to fly at heights that brings them within the rotor swept zone and hence at risk of collision.	To minimise effects upon the biological environment	DCO Schedule 1, Part 1 Authorised Development
Co134	Cable installation works at the landfall area will be located at least 200 m from residential receptors.	To minimise effects upon the human environment	DCO Works Plan - Onshore (Annex D1.4.2)
Co135	Temporary construction highway access points along the onshore export cable corridor (ECC) will be located at least 150 m from residential receptors, with the exception of three receptors: Bridge Farm Holiday Cottages; Arms Farm and Elm Tree Farm, in Brigham, Driffield.	To minimise effects upon the human environment	DCO Requirement 18 (Construction traffic management plan)
Co143	The landfall site will avoid the Barmston Main Drain.	To minimise effects upon the biological and human environment	DCO Works Plan - Onshore (Annex D1.4.2)
Co150	A new temporary and permanent access for the onshore substation and temporary construction access for the onshore export cable corridor will be taken directly from the A1079, to route construction, and operation and maintenance traffic way from Cottingham and Dunswell.	To minimise effects upon the human environment	DCO Requirement 18 (Construction traffic management plan)

3.4.1.7 All the commitments adopted by Hornsea Four are set out in [Volume A4, Annex 5.2: Commitments Register](#). Further discussion of the identification and use of Commitments is provided as part of [Chapter 3: EIA Methodology](#).

3.5 Consultation

- 3.5.1.1 Consultation is a key part of the DCO application process and helps refine the project through wider spatial, design and process considerations discussed in broader forums, both through Evidence Plan meetings or through public events. Further details on the consultation undertaken for Hornsea Four can be found in [B.1: Consultation Report](#). Further targeted statutory Section 42 consultation was undertaken, and further details of this are recorded in [Volume B1, Annex 1.27: Targeting Statutory Consultation under Section 42 of the Planning Act 2008](#).
- 3.5.1.2 The Applicant has developed a 'Commit, Consult, Design' ethos as part of the approach to proportionate EIA, with commitments integrated into the project design via consultation. The aim of the ethos is to integrate consultation at all stages of the design evolution and minimise adverse environmental effects. This ethos is embedded in the staged approach to route planning and site selection via consultation, as evidenced through the function of the Onshore Substation Consultation Group (OSCG). 14 key changes have been made to Hornsea Four, which demonstrate the 'Commit, Consult, Design' ethos – these changes are embedded into this chapter and accompanying annexes and summarised in [B.1: Consultation Report](#).
- 3.5.1.3 The Applicant has actively sought feedback through statutory and non-statutory consultation with landowners, occupiers and statutory consultees, at Scoping, PEIR, Section 42 and 47 consultation and through informal landowner and occupier engagement, respectively. This consultation engagement has been diverse in its nature and has taken place in the form of landowner meetings, questionnaires, letters, Evidence Plan Technical Panel meetings, working groups, parish council meetings, and both formal and informal public consultation events. The Applicant has had material consideration for all feedback received, resulting in changes being made to route planning and site selection of Hornsea Four. Further information of these changes can be found in [B1.1: Consultation Report](#) and in [Volume A4, Annex 3.1 – Annex 3.3](#).
- 3.5.1.4 In addition to designing a technically feasible project, the Applicant further aims to avoid or reduce impacts by assimilating information received from landowners, occupiers and statutory consultees, while committing to avoid the most sensitive, important or valuable features early in the project design. For example, this has resulted in updates to BRAG criteria (see [Volume A4, Annex 3.1, Annex 3.2 and Annex 3.3](#)), and in so doing reducing the scope of the Hornsea Four EIA and the amount of assessment required. Further details of the approach and the tools used is provided in [Chapter 5: EIA Methodology](#).
- 3.5.1.5 A summary of the project consultation process and mechanisms are presented within [Chapter 6: Consultation](#) along with a summary of the key issues raised during the consultation process. A summary of statutory consultee consultation in relation to site selection is given in [Table 3.2](#). and are not discussed further within this chapter.

Table 3.2: Details of Consultation Undertaken Relevant to Site Selection.

Date	Attendees	Purpose	Summary
23 May 2018	East Riding of Yorkshire Council (ERYC)	Overview of the RPSS and site selection criteria	Introduction to Hornsea Four's development aspirations in East Riding
22 June 2018	ERYC	Introduction to the RPSS Process and overview of key findings to date	Presentation of the RPSS employed by Hornsea Four in relation to selecting a suitable landfall, onshore ECC and substation site.
02 October 2018	ERYC	RPSS Roadshow	Presentation of early findings of the RPSS for landfall options, onshore ECC development and substation site options.
21 November 2018	ERYC	Onshore substation (OnSS) Traffic considerations	Presentation of early feedback from Local Information Events (LIEs) and implications for OnSS site selection and access requirements
18 December 2018	The Crown Estate (TCE)	Developable Area Approach (DAA)	Presentation and discussion on Hornsea Four's development aspirations and discussion on potential reduction of the Agreement for Lease (Afl) in line with key environmental constraints and potential consent risks.
31 January 2019	Maritime and Coastguard Agency (MCA) and Trinity House Lighthouse Service (THLS)	Developable Area Approach	Presentation/discussion on Hornsea Four's development aspirations and discussion on human environment constraints and potential reduction of the Afl in line with key constraints and potential consent risks.
07 February 2019	Natural England and RSPB	Developable Area Approach - Workshop	Presentation/discussion on Hornsea Four's development aspirations and discussion on ornithological constraints and potential reduction of the Afl in line with key potential consent risks.
12 March 2019	OSCG	Create a consultation forum - focusing on the key areas of interest for respective Parish Councils and local communities in relation to the Hornsea Four OnSS.	Discussion methods of best practice and aspirational approaches that will guide the future development of all onshore infrastructure. To be captured in Design Vision Statement sets out.
31 January 2019	ERYC	OnSS site selection and design	Hornsea Four presented an introduction to the EBI and provided a summary and update on the OnSS site selection process between Scoping and PEIR, including consultation on the OSCG.

Date	Attendees	Purpose	Summary
24 September 2019	OSCG	Drop in and update session post PEIR and Section 42 consultation	Hornsea Four presented the design vision for the OnSS building design and colour, including plans for SKID16 public right of way (PRoW) permanent division, the permanent access track from A1079, flood risk, and the refinement of the 400 kV grid connection area. Hornsea Four discussed working with East Riding of Yorkshire Council and the Ramblers groups on right of way management and diversions.
26 November 2019	OSCG	Update and discussion on work undertaken since last meeting in March 2019	Agreement was reached on the routing for the two permanently impacted rights of way around the OnSS. Hornsea Four presented the updated works areas which included landscaping and an attenuation area with the OnSS site, and the permanent access track which had been moved away from Birkhill Wood ancient woodland. The commitment to use colour was also presented.
30 January 2020	Natural England	To seek clarification on Section 42 comments received from Natural England on the status of the Smithic Bank sandbank (Figure 3.9) as an Annex 1 feature.	Natural England confirmed that Smithic Bank is not considered a designated feature or potential Annex 1 feature.
06 July 2020	DFDS, Chamber of Shipping,	Developable Area Approach – to coexist and cooperate with shipping and navigation interests that may potentially be impacted by the development of Hornsea Four	Site reduction to reduce to implement a shipping gap (Structures Exclusion Zone (SEZ)) between Hornsea Project Two and Four that facilitates coexistence and cooperation. The SEZ was subsequently formalised as an Order limits change.
15 March 2021	Natural England	Developable Area Approach – to further reduce potential auk (guillemot and razorbill) impacts.	Further site reduction to reduce the potential impacts upon the guillemot and razorbill. The AfL reduction was subsequently formalised as an Order limits change.

3.6 Site Selection Process

3.6.1.1 Site selection for Hornsea Four has been progressed through five separate processes each relating to different parts of the project, which although linked due to the spatial connections between them, have been progressed in parallel and in full knowledge of interconnections and interdependencies. These five processes are listed below and discussed in more detail in the following sections of this chapter:

- Stage 1: Identification of the AfL and Grid Connection ([Section 3.7](#));
- Stage 2: Identification of the Electrical Infrastructure Study area ([Section 3.8](#));
- Stage 3: Identification of the Landfall ([Section 3.9, Volume A4, Annex 3.1](#));
- Stage 4: Identification of the OnSS site ([Section 3.10, Volume A4, Annex 3.3](#)); and
- Stage 5: Development and refinement of the Offshore and Onshore Export Cable Corridor (ECC) and associated infrastructure (including offshore array refinement) ([Section 3.1.1, Volume A4, Annex 3.2](#) and [Annex 3.3](#)).

3.6.1.2 The development timelines of some of these discrete, but inter-dependent aspects of Hornsea Four are presented in [Figure 3.1](#) (landfall), [Figure 3.2](#) (OnSS), [Figure 3.3](#) (AfL refinement), [Figure 3.4](#) (offshore ECC), [Figure 3.5](#) (onshore ECC).

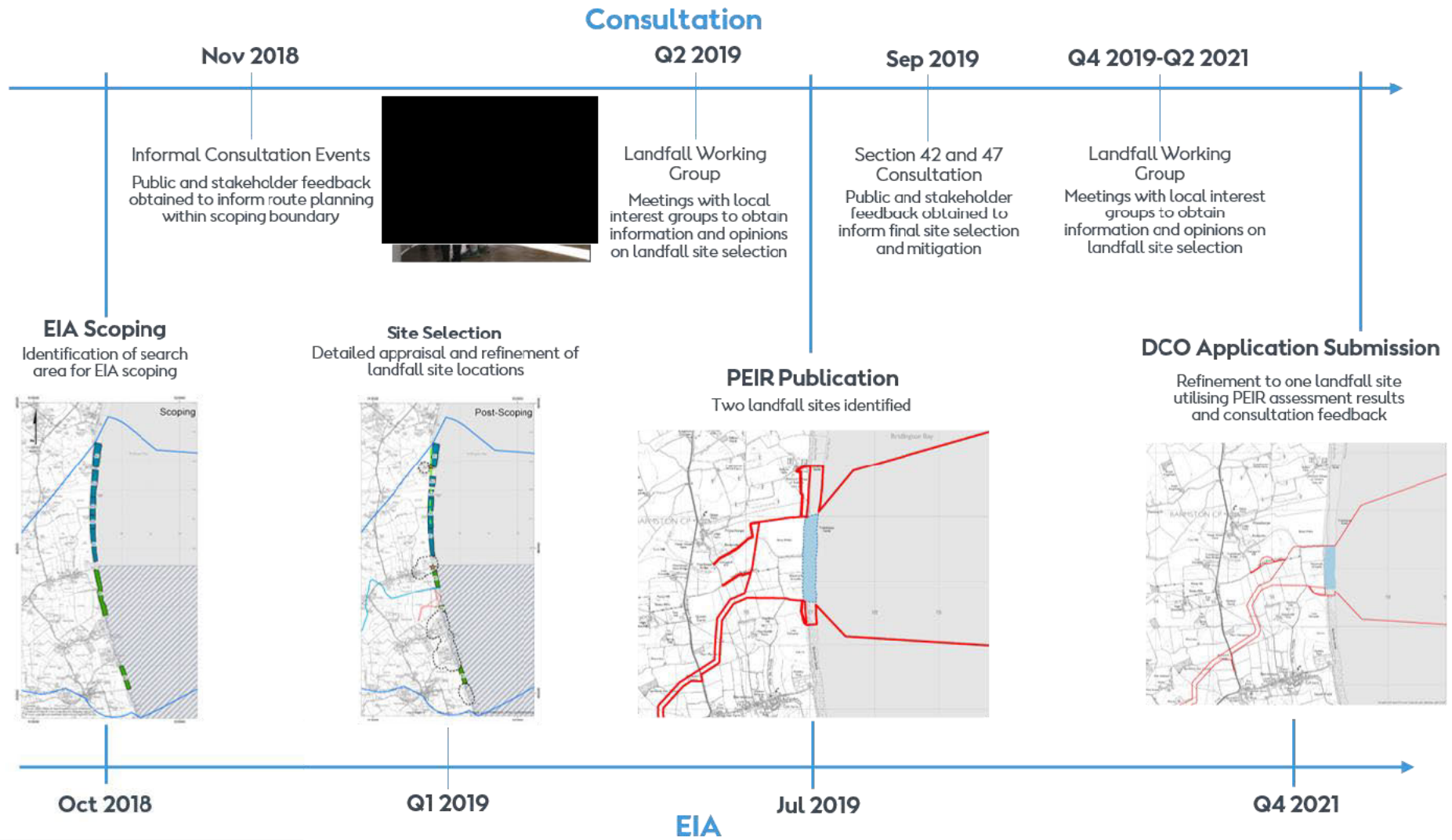


Figure 3.1: Site Selection Timeline – Landfall.

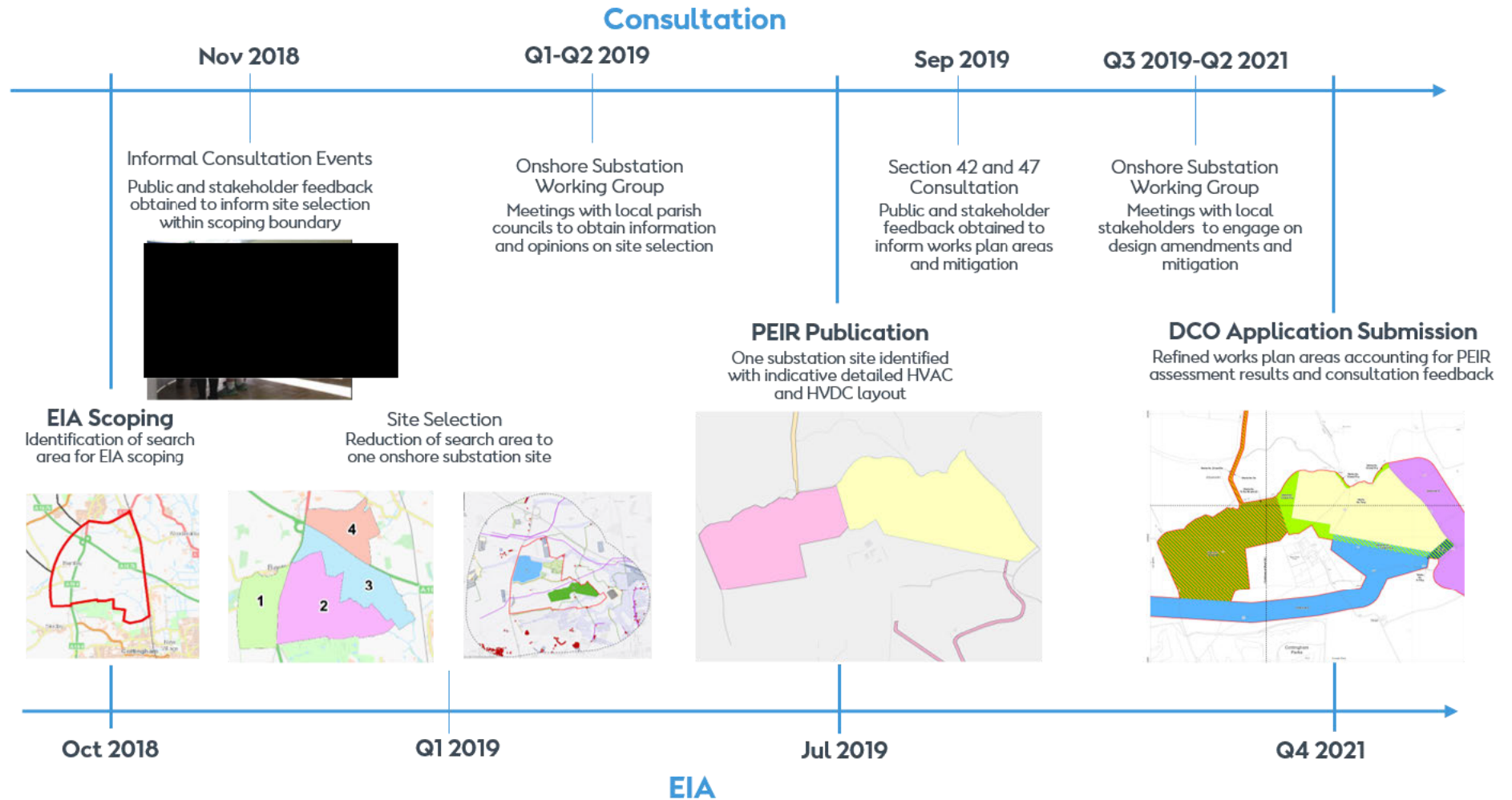


Figure 3.2: Site Selection Timeline – OnSS.

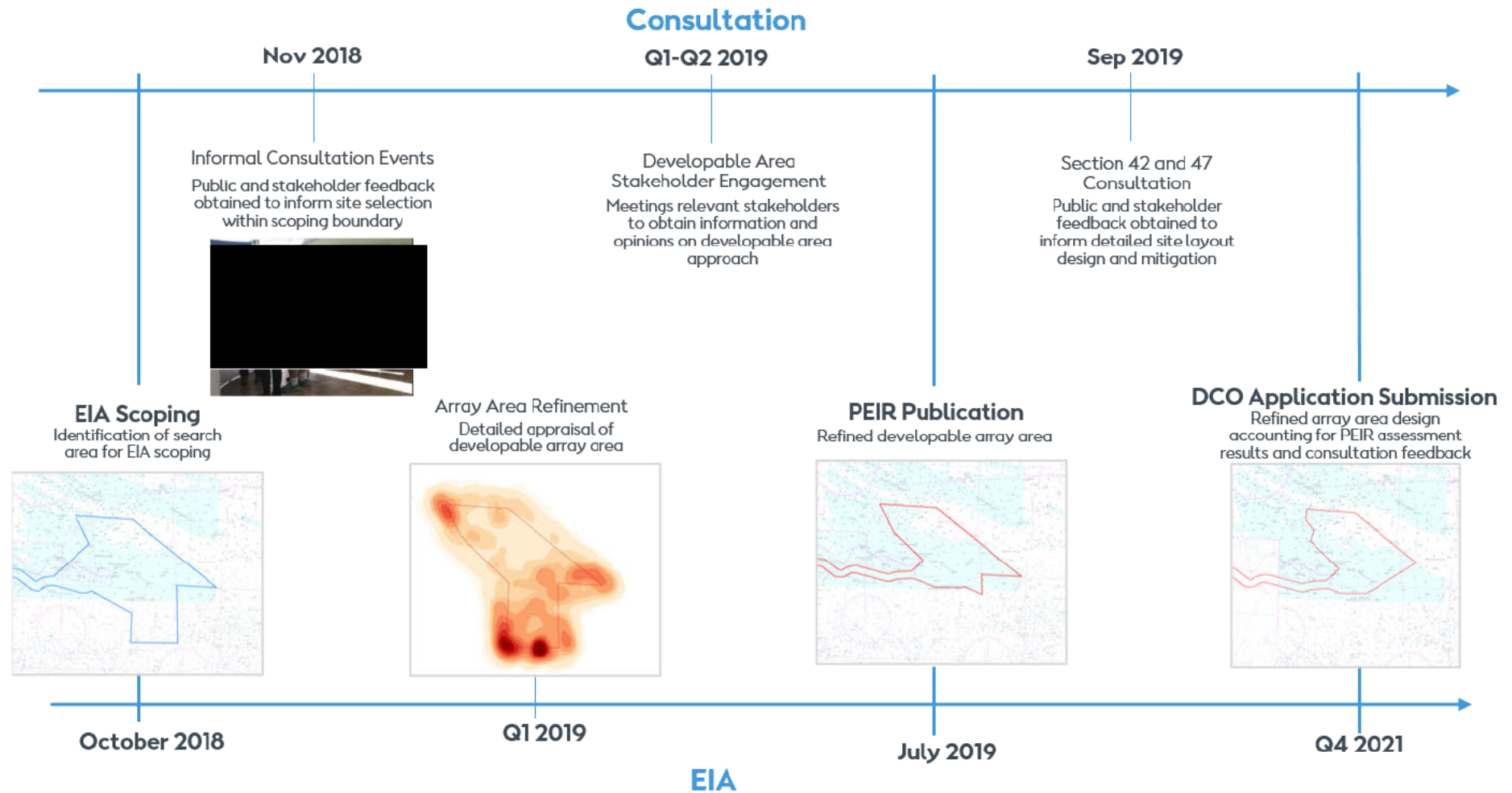


Figure 3.3: Site Selection Timeline – Offshore Array.

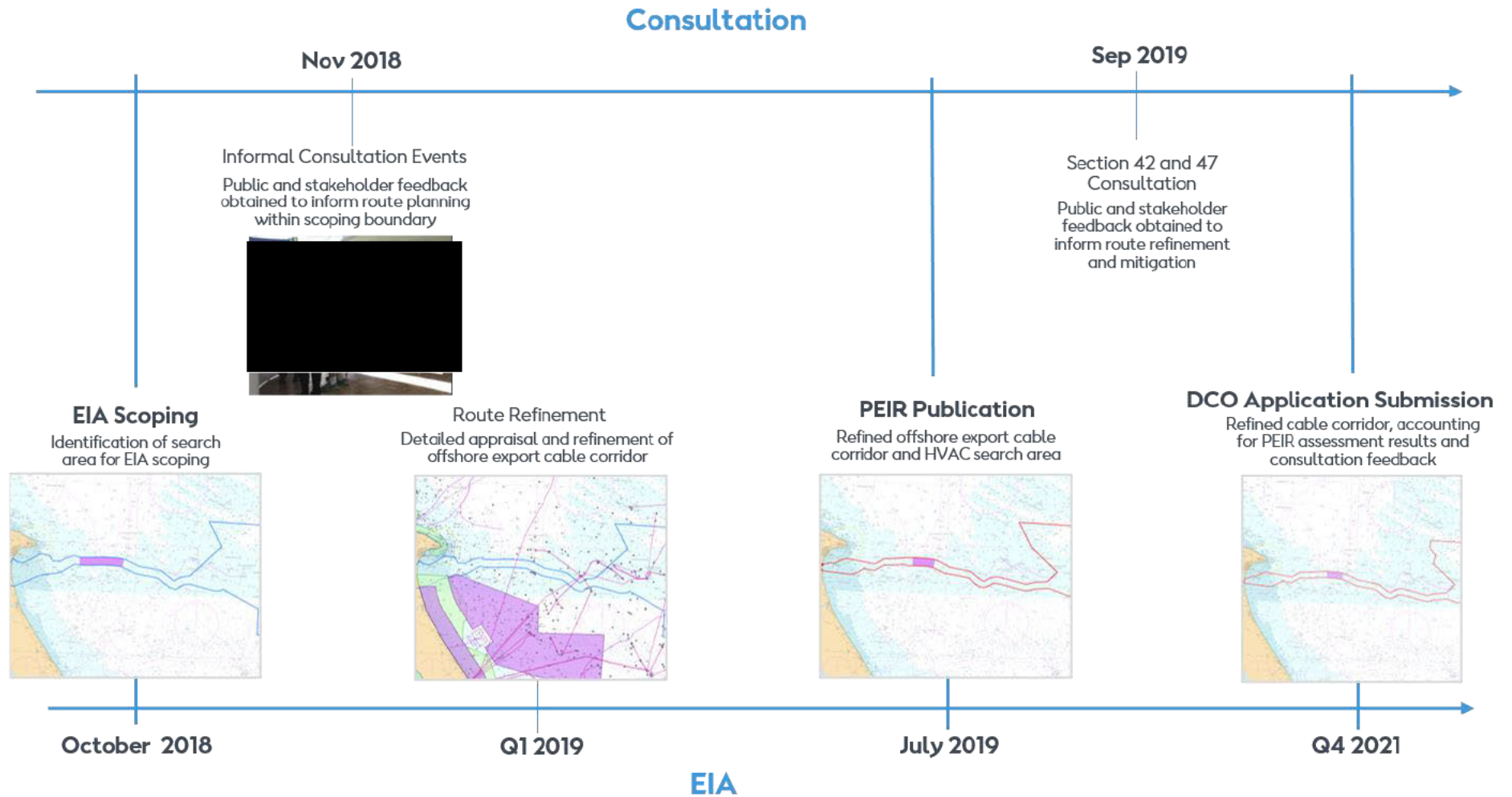


Figure 3.4: Site Selection Timeline – Offshore ECC.

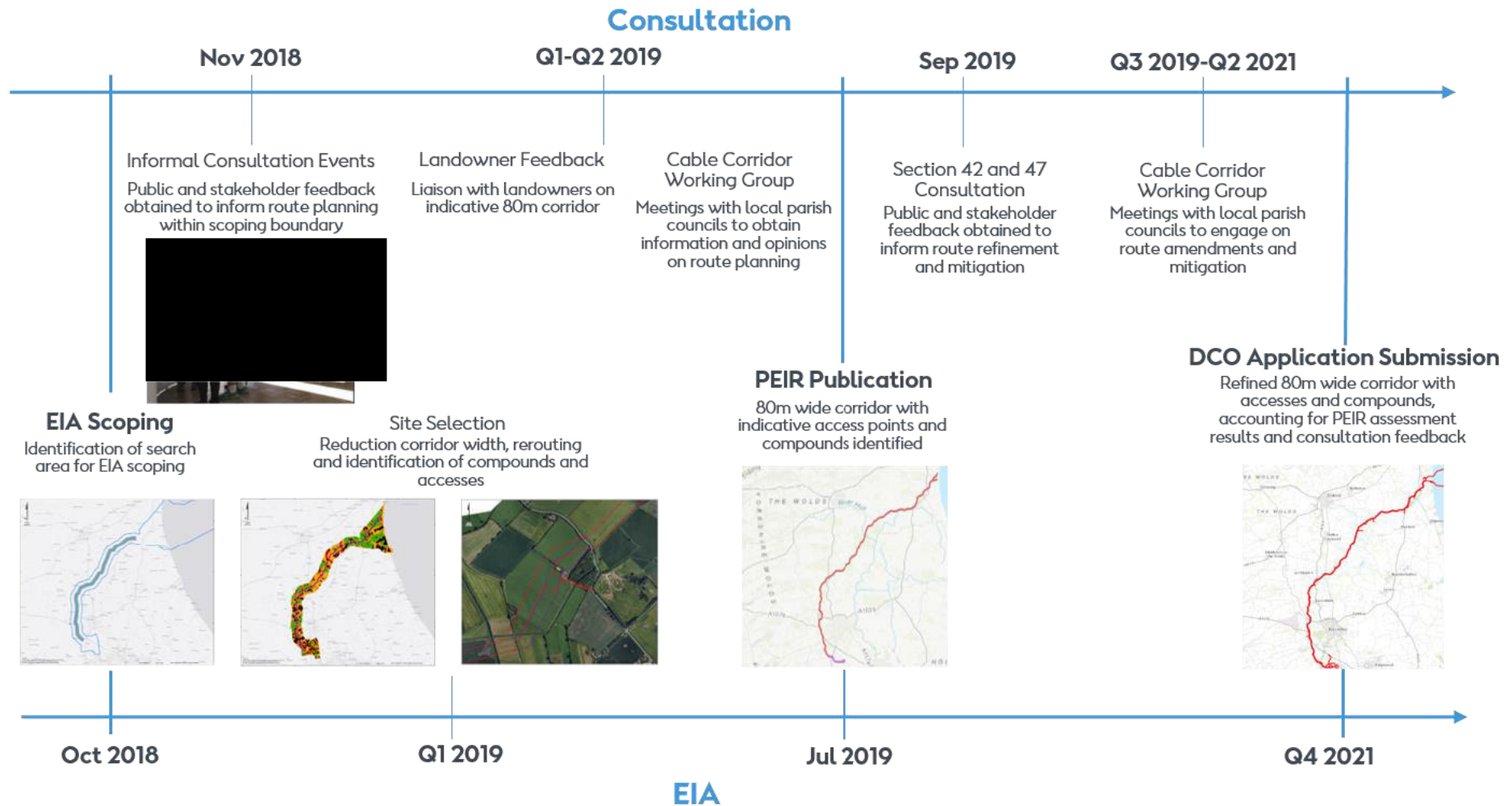


Figure 3.5: Site Selection Timeline – Onshore ECC.

3.7 Stage 1: Identification of the AfL and Grid Connection

- 3.7.1.1 The former Hornsea Zone was one of nine offshore wind generation zones around the UK coast identified by TCE during its third round of offshore wind licensing. In 2009 SMart Wind Ltd. were awarded the developmental rights to the former Hornsea Zone. Through the process of Zone Appraisal and Planning (ZAP), identified Hornsea Project One and Two.
- 3.7.1.2 Following acquisition by Orsted (formerly DONG Energy) of the developmental rights of Hornsea Project One in February 2015 and, subsequently in August 2015, the acquisition of SMartWind and the remainder of the former Hornsea Zone, together with the development rights for Hornsea Project Two, Hornsea Three and Hornsea Four in March 2016, the Hornsea Zone Development Agreement (ZDA) was terminated and the Hornsea Zone dissolved (and hence is referred to as the former Hornsea Zone). Following this, new project specific agreements, called AfLs, were agreed with TCE for Hornsea Project One, Hornsea Project Two, Hornsea Three and Hornsea Four (locations of the offshore turbines and supporting infrastructure) (see [Figure 3.9](#)). These new documents replaced existing AfLs relating to the former Hornsea Zone and were created in a new format by TCE.
- 3.7.1.3 Hornsea Four will be the fourth project to be developed in the former Hornsea Zone and will have similarities to the existing Hornsea projects both in terms of the nature of the project and general geographic location of the offshore array area.
- 3.7.1.4 The specific identification of the potential grid connection routes, including Landfall Zones for Hornsea Four, comprised a sequence of steps to identify the route between the start and end point for the connection. In this case the start point is the centre point of the Hornsea Four offshore array area with the endpoint being a connection made to a location established with National Grid Electricity Transmission (NGET) for connection to the UK electricity network, as shown in Figure 4 of [Volume A4, Annex 3.2](#).
- 3.7.1.5 NGET's decision making and thus its connection offer considers technical, commercial, regulatory, environmental, and socio-economic aspects. The grid connection offer process for Hornsea Four concluded that the preferred option representing the most optimal design (economic, efficient and co-ordinated) considering all criteria (i.e. technical, cost, environmental and deliverability) was the Creyke Beck substation, near Cottingham, East Riding of Yorkshire. Hornsea Four was formally offered a grid connection to Creyke Beck substation on 10 April 2017 with agreement signed on 10 December 2018.

3.8 Stage 2: Identification of an Electrical Infrastructure Study Area

- 3.8.1.1 The Hornsea Four Electrical Infrastructure Study Area (EISA), which spans both onshore and offshore areas, is defined by the AfL (location of the offshore turbines and supporting infrastructure) and grid connection point at Creyke Beck (location of the OnSS).
- 3.8.1.2 The northern onshore extent of the EISA runs from Creyke Beck to just north of Barmston, with the southern extent running from Creyke Beck to just north of Holmpton to avoid the international environmental designations at Spurn Head and the Humber Estuary. These locations were determined by the shortest routes to shore from the northern and southern corners of the AfL area respectively. The EISA was not fixed allowing modification during the route planning and site selection process where necessary.

3.9 Stage 3: Identification of Landfall

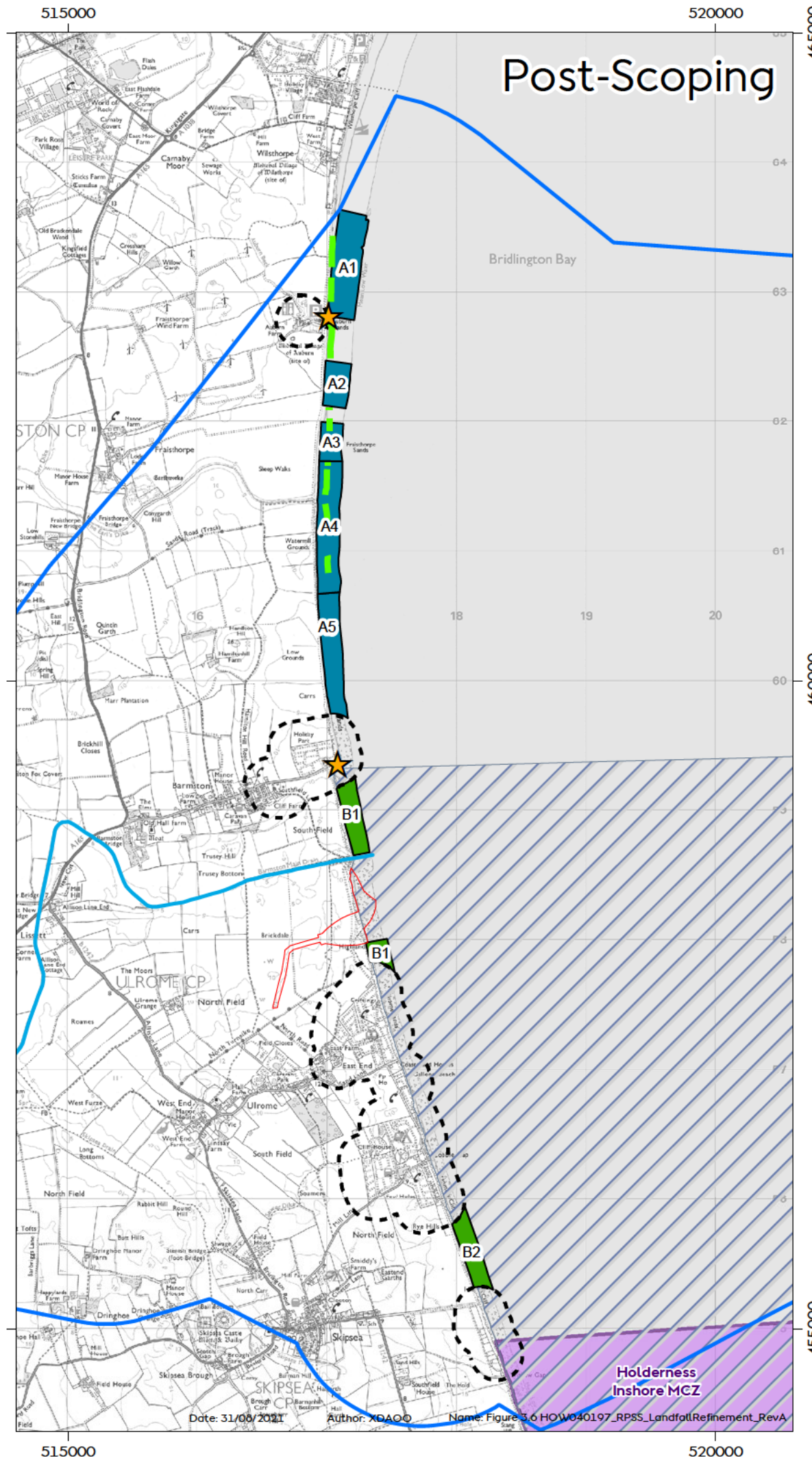
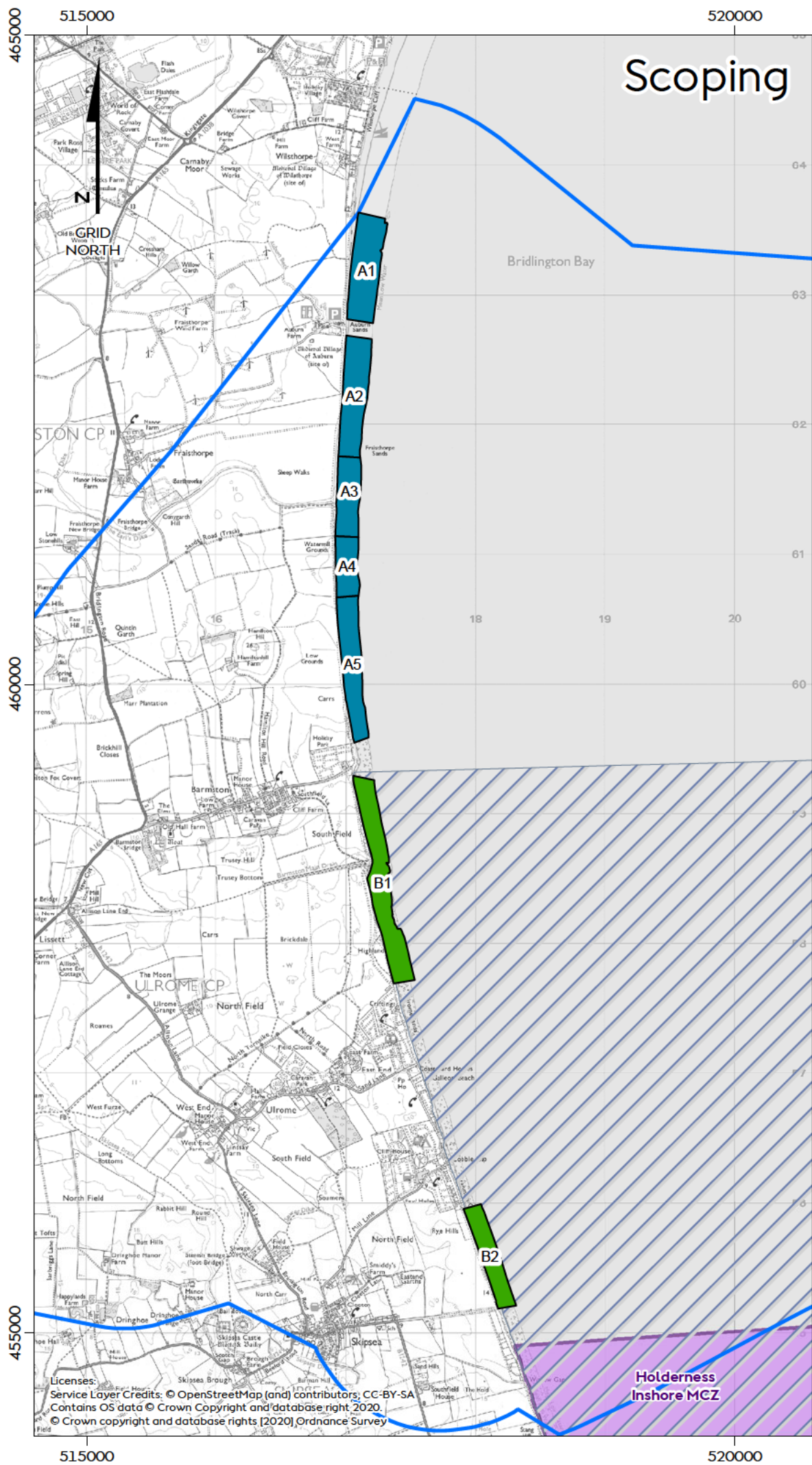
- 3.9.1.1 The cable landfall point is the location at which the offshore ECC meets the coastline. The landfall covers the near-shore shallow approaches, the intertidal area and the onshore route near the transition jointing bay (in which the jointing of the onshore and offshore export cables takes place). The landfall construction compound (40,000m³) will also be provided in this area.
- 3.9.1.2 In addition to following the guiding principles set out in Section 2 of [Volume A4, Annex 3.1](#), an appraisal to identify key technical, consenting and commercial risks was undertaken. The process utilised a colour coding approach (BRAG) to identify risk/constraints and further refine the landfall options (as defined in Section 5.1 of [Volume A4, Annex 3.1](#)). The process of defining the most suitable landfall point went through three such iterations resulting with the preferred options of sites A3 and A4 at PEIR. The rationales for discounting certain sites are summarised in [Table 3.3](#) and the key constraints associated are represented visually in [Figure 3.6](#).
- 3.9.1.3 Sites A3 and A4 were considered the most favourable at PEIR from all perspectives (technical, commercial, environmental and consents). Whilst some constraints remain, notably those relating to access through the village of Fraisthorpe (which were raised as a result of informal landowner/ occupier and Section 47 feedback) and potential historic artefacts, these were considered a lower-risk of resulting in significant impacts when subject to appropriate mitigation. However, this feedback was considered in the further refinement in establishing a final landfall site and the associated access to this site.

Table 3.3: Post-Scoping Discounting Landfall Rationale.

Discounted Landfall Options	Rationale
A1, A2	<p>Within/neighbouring Fraisthorpe Beach:</p> <ul style="list-style-type: none"> • UK Seaside Award; • Popular destination with tourists and locals; • Busy café (The Cowshed Tearoom) and car park; and • “Active Coast” scheme promoting beach walking for health. <p>Sites contain many World War II Artefacts:</p> <ul style="list-style-type: none"> • Anti-tank concrete cubes/anti-invasion defences are still positioned in the sand; and • Promoted as a tourist attraction and point of cultural heritage. <p>Onshore windfarm located directly behind the landfall Constraint for onshore cable route.</p>
A5, B1	<p>Dogger Bank Creyke Beck offshore cable corridor borders both sites:</p> <ul style="list-style-type: none"> • Considered unfeasible to cross cable in such shallow water. <p>Caravan Park neighbours both sites: Sensitive stakeholders: tourists, residents, Barmston Beach (Rural Beach Seaside Award)</p>
B2	<ul style="list-style-type: none"> • Nearby caravan parks and residential properties; • Access required through the village of Skipsea; • Located within the Greater Wash SPA; • Primary school present just inland of compound site; • Very high cliffs; potentially unstable due to high predicted erosion rate; and • Does not adjoin remaining landfalls; thus increasing project scope to progress geographically distinct sites.

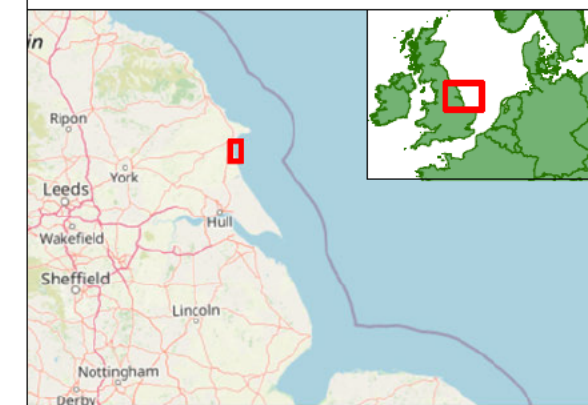
3.9.1.4 It was therefore concluded that sites A3 and A4 would be taken forward for assessment in the PEIR. These landfalls were considered as a continuous zone (as shown in [Figure 3.6](#)), with the optimum landfall construction compound, onshore ECC and the exact location at which the offshore ECC will make landfall to be identified within this zone.

3.9.1.5 Refinement of the landfall at and after PEIR allowed for further work, including the use of consultation responses to inform the final landfall selection to be undertaken. Landfall zone A4 ([Figure 3.7](#)) was selected as the preferred option within which the landfall compound would be located. Although the constraints within A4 include existing WWII artefacts, more variable ground levels and less flexibility for micro-siting the compound, the access to the compound area both from the highway road network and to the beach is considered to be more favourable than the equivalent accesses to A3. This is due to the quality of the road network and a smaller interface with Fraisthorpe and beach users.



Hornsea Four
Figure 3.6
Post-Scoping
Landfall Refinement

- Landfall Zone A
- Landfall Zone B
- Scoping Boundary
- Beach Award
- Barmston Main Drain
- 200m Residential Property Buffer
- WWII Artefacts
- Greater Wash SPA
- Indicative Creyke Beck A & B Permanent Land Take
- Marine Conservation Zone (MCZ)




Coordinate system: British National Grid
Scale@A3: 1:40,000

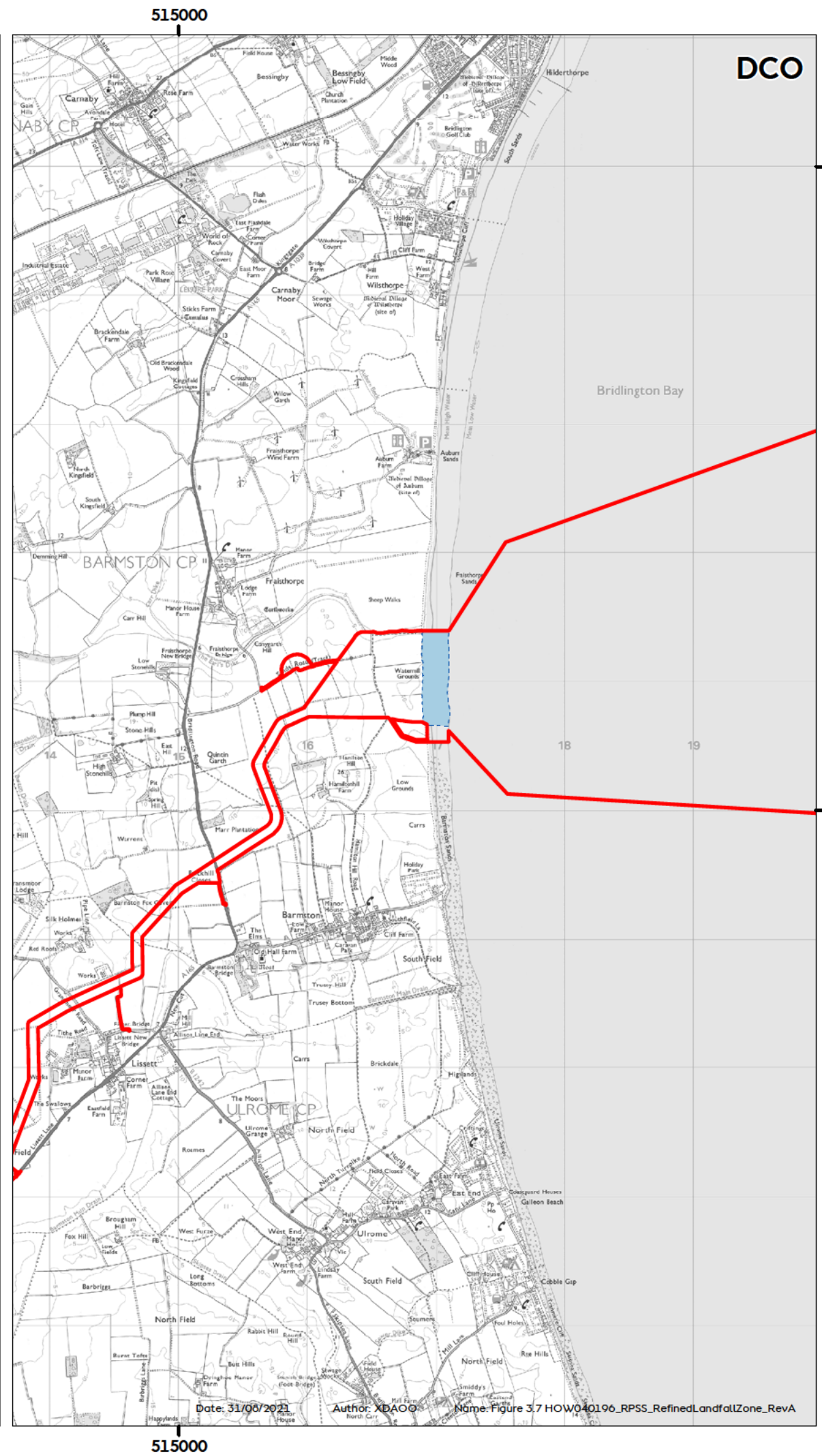
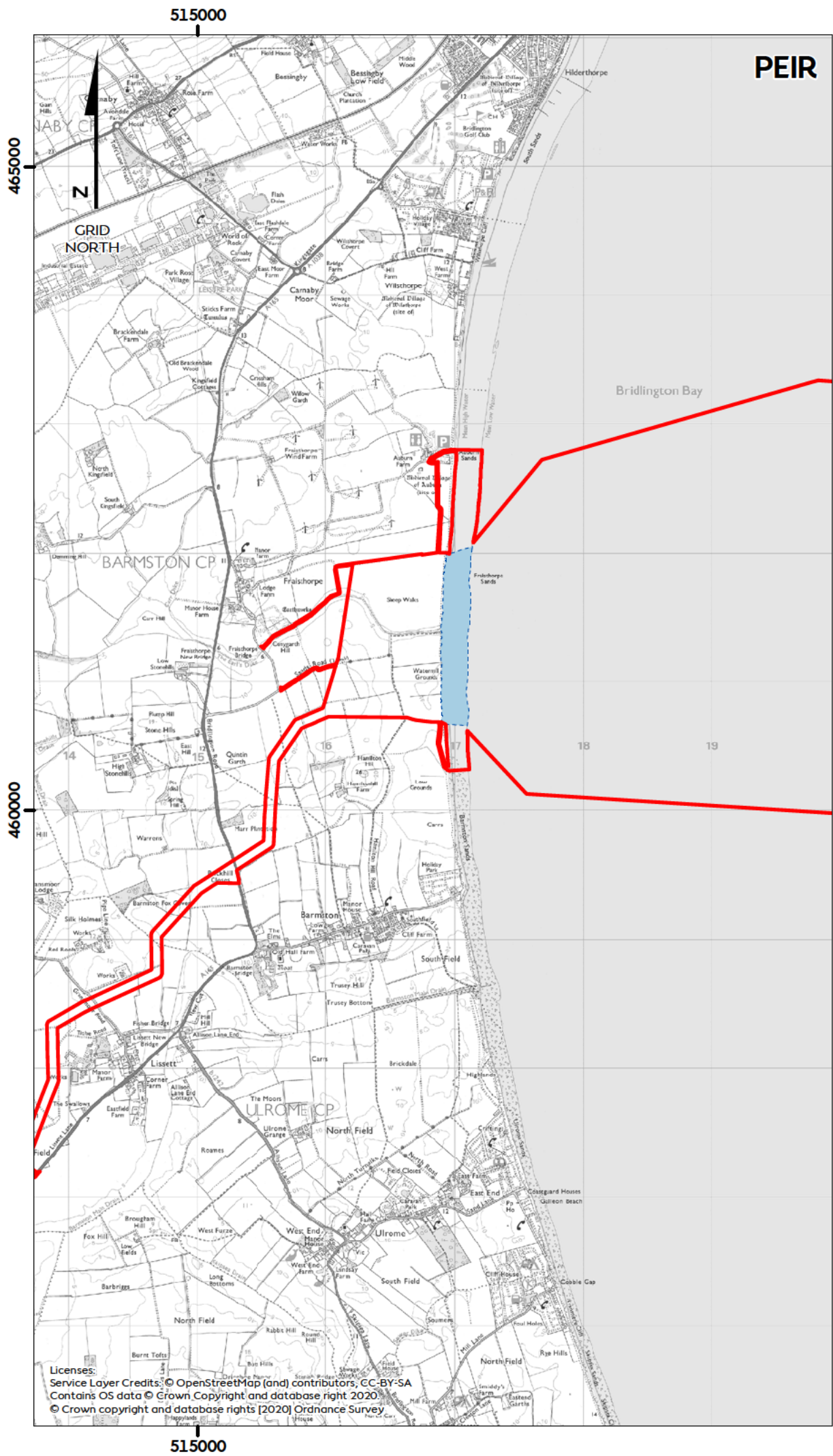
0 0.5 1 2 Kilometres

0 0.25 0.5 1 Nautical Miles

REV	REMARK	DATE
	First issue for PER	17/04/2019
A	Updated for DCO	17/03/2020

Post-Scoping Landfall Refinement
Document no: HOW040197
Created by: XDAOO
Checked by: JOHLE
Approved by: JULCA





Hornsea Four

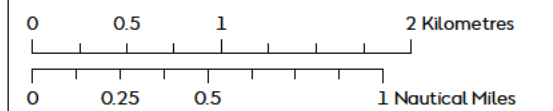
Figure 3.7

Refined Landfall Zone

- PEIR / DCO Boundaries
- Landfall Connection Works



Coordinate system: British National Grid
Scale@A3: 1:40,000



REV	REMARK	DATE
	First issue for PEIR	22/05/2019
A	Updated for DCO	17/03/2020

Refined Landfall Zone
Document no: HOW040196
Created by: XDAO
Checked by: JOHLE
Approved by: JULCA



3.10 Stage 4: Identification of the OnSS site

3.10.1 EIA Scoping Boundary

3.10.1.1 The OnSS site will contain the electrical components for transformer substation and electrical balancing infrastructure (EBI). The OnSS adjusts the power supplied from the offshore wind farm to 400 kV, as required to meet the UK Grid Code for supply to the National Grid.

3.10.1.2 The first stage in the OnSS site selection process was to establish an initial 3 km search boundary around the Creyke Beck substation. This radius was set to minimise the length of the connection linking the new OnSS and the National Grid connection point. Minimising this distance is necessary to reduce cable reactive power issues, mitigate transmission losses, and minimise adverse effects on economic efficiency.

3.10.1.3 The initial 3 km search area was then further refined by removing heavily constrained areas such as highly populated areas and two areas of high amenity value (i.e. golf courses). This was done to avoid unnecessary adverse effects on relatively high-density residential receptors and users of the local golf course. Figure 4 of [Volume A4, Annex 3.3](#) illustrates the reduction in the overall OnSS search area.

3.10.2 Post-Scoping to PEIR Search Area Refinement

3.10.2.1 Following this, a heat mapping exercise (as detailed in Section 2.2.2 and illustrated in Figure 4 of [Volume A4, Annex 3.3](#)) was carried out to identify areas that could be excluded from consideration and/or indicate the least environmentally constrained locations within the search area.

3.10.2.2 The ECC options to the east and west of Beverley were then developed ([Figure 3.12](#)). These were considered and when it was determined that the eastern route to the OnSS search area was not useable due to the unfeasibility of crossing the railway line, the portion of the OnSS search area to the east of the railway line was then dropped from further consideration.

3.10.2.3 After the Scoping Report was submitted, a series of informal public and community consultation events were also held by Orsted in October 2018, allowing residents and landowners to comment on the proposed boundary. Their responses allowed for greater refinement of the location of the OnSS post-scoping. Full details of such consultation can be found in [Chapter 6: Consultation](#).

3.10.2.4 Post-scoping, the next stage in the process was to split the refined boundary area into Search Zones. These were created by firstly excluding areas within the boundary that did not contain land parcels of a suitable size to accommodate the OnSS (as detailed in Section 2.2.2.6 of [Volume A4, Annex 3.3](#)). The remaining area was then divided into four zones using established field boundaries and existing highway infrastructure as shown in Figure 5 in [Volume A4, Annex 3.3](#).

- 3.10.2.5 The four zones were then assessed for suitability through an initial Red, Amber, Green (RAG) appraisal as detailed in Section 2.2.2.8 and Table 4 of [Volume A4, Annex 3.3](#). Alongside the RAG appraisal, Orsted also explored OnSS access options. Such appraisal took account of feedback from the informal local information events, notably expressions of concern associated with the potential for construction traffic to be routed through Cottingham and turning off the A164. Noting such concerns, a local transport consultancy, Local Transport Projects Ltd (LTP), was appointed to analyse five potential access and egress points to inform the process further.
- 3.10.2.6 LTP's appraisal was aimed at establishing whether suitable access and egress points existed within the surrounding highway network, and the assessment identified that access from the A1079 via the existing northbound layby (Option 4) provided the most suitable point of entry/exit from those options considered for providing construction access to both Zones 2 and 3.
- 3.10.2.7 The OnSS search area refinement methodology and access appraisal were then presented and discussed at a meeting with East Riding of Yorkshire Council's (ERYC) Planning and Highways officers on 21 November 2018. During the meeting, it was agreed in principle (and based on available information) that of the four zones, Zone 2 was the preferred area to locate the OnSS. It was also agreed that Access Option 4 offered the best overall solution for construction access to Zone 2, through the utilisation of the existing northbound layby on the A1079. During these discussions the A164/Jocks Lodge Highways Improvement Scheme was also taken into consideration and the potential for interaction with Hornsea Four.
- 3.10.2.8 Further to the 2018 meeting, an OnSS working group was held on 12 March 2019 with parish council representatives from Rowley, Skidby, Walkington, Cottingham and Woodmansey. The principles of the construction access and identification of Zones 2 and 3 were presented and discussed. Feedback from the working group (as documented in the meeting minutes held by Orsted) indicated that Access Option 4 was the preferred option and that the OnSS site should be located as close to the NGET substation at Creyke Beck as possible. A second working group was held on 21 May 2019, which confirmed the approach taken was appropriate, with attendees agreeing that Zone 2, as close to Creyke Beck NGET substation was the optimal solution.
- 3.10.2.9 Once Zone 2 had been identified as the most suitable area for the OnSS, and a feasible construction access point established, a detailed site selection exercise within the zone was able to take place. This was conducted in line with the OnSS design principles listed in Table 5 in [Volume A4, Annex 3.3](#). This enabled two potential sites (Options A & B) to be identified within Zone 2, as shown in [Figure 3.16](#). These sites provided the best fit for the proposed footprint of the OnSS given the surrounding constraints within the search area of Zone 2 ([Figure 3.16](#) and panel 1 of [Figure 3.15](#) later in this chapter).

3.10.2.10 The two potential options were then subjected to a BRAG assessment (detailed in Section 2.3.4 of [Volume A4, Annex 3.3](#)) to determine the preferred site. From this assessment, Option B has been identified as the most preferable site for the OnSS.

3.10.3 OnSS Refinement - PEIR to ES

3.10.3.1 Between PEIR and DCO and in response to stakeholder comments at Section 42 consultation, the permanent OnSS access road identified at PEIR was removed from the south of the site. As such, the access identified for construction use from the A1079 will be retained throughout the lifetime of Hornsea Four. Additionally, the construction (and now construction and operation access road) was moved to be 15m away from the Birkhill Wood to reduce any impacts on the ancient woodland (Figure 11, [Volume A4, Annex 3.3](#)). Finally, in response to consultation with ERYC and nearby residents, the location of the OnSS access off the A1079 was moved, upon receipt of detailed design information for the A164 / Jocks Lodge Highways Improvement scheme. The change moved the access point to the south-east and extended the existing layby, as per recommendations made by ERYC. This change removed direct overlap / interaction between the two projects. Additionally, the routing of the access road was designed with consideration of the landowner's use of the surrounding land.

3.10.3.2 Further work also commenced refining the design via the works areas presented in the Works Plan ([Annex D1.4.2](#)). As such Hornsea Four committed to and secured the retention of existing landscaping along the northern boundary of the OnSS site (see Works Number 7(f), [Annex D1.4.2](#)); additional landscape mitigation along the south and west of the permanent site (Works Number 7(f), [Annex D1.4.2](#)); and in consultation with the Environment Agency and Lead Local Flood Authority (East Riding of Yorkshire Council), an attenuation area (Works Number 7(e), [Annex D1.4.2](#)) as a part of the sustainable drainage design (see [F2.6: Outline Onshore Infrastructure Drainage Strategy](#)).

3.10.3.3 As a result of the updated ecological baseline data, and the resultant [Volume A3: Chapter 3: Ecology and Nature Conservation](#) impact assessment undertaken, Hornsea Four was also able to commit to up to a 10 m 'dark corridor' buffer along the northern and eastern boundaries of the OnSS (see [F2.3 Outline Ecological Management Plan](#) (OEMP) and [F2.13: Outline Design Plan](#)).

3.10.3.4 The Hornsea Four bat surveys identified that the northern boundary of the OnSS is likely to be commuting route for bats. As a result Hornsea Four, in agreement with Natural England, has sought to mitigate potential impacts on bats at this location by including a dark corridor. The dark corridor is an area created to guide bats away from lit areas. As such, where existing landscaping overlaps with this dark corridor, this vegetation will be retained. Additionally, lighting required in this area during construction will only operate when required, and will be directional to avoid unnecessary illumination and in line with the relevant guidance (Guidance Note 8 – Bats and Artificial Lighting; ILP, 2018).

3.11 Stage 5: Identification of the Offshore and Onshore ECC (and associated infrastructure)

3.11.1 Identification of the Offshore Array and Infrastructure

- 3.11.1.1 During the period between acquisition of the AfL and the receipt of the Scoping Opinion (PINS, 2018) work was carried out to refine the Hornsea Four array area which ultimately resulted in the EISA discussed in [Section 3.8](#) and shown in [Figure 3.9](#). Details of this process can be found in the Hornsea Four Scoping Report (Orsted, 2018).
- 3.11.1.2 Following receipt of the Scoping Opinion, the project consulted with a range of interested parties on the potential for array area refinement. This process was iterative, taking account of refinements to the offshore ECC search area and the latest site-specific data to ensure that options were aligned and site appropriate. Consideration was given to several technical, commercial and environmental consenting constraints ([Paragraph 3.11.1.3](#)) informed by data analysis and constraints mapping prior to presentation and consultation with key stakeholders, including Natural England, RSPB, MCA and Trinity House (detailed in [Table 3.2](#)).
- 3.11.1.3 The array area is technically constrained by variable seabed and subsurface geological conditions, presenting a challenge for turbine foundation installation. Furthermore, commercial considerations for array refinement included proximity and crossing options at oil and gas infrastructure assets and other commercial entities including shipping operators.
- 3.11.1.4 In the spirit of proportionate EIA, Hornsea Four gave due consideration to the size and location (within the AfL array area) of the final project to be taken forward to consent application. This consideration was captured internally as a "Developable Area Approach" (DAA), which includes the consideration of physical, biological and human constraints in refining the developable area, balancing consenting and commercial considerations with technical feasibility for construction. The review of constraints in relation to the offshore array is set out in detail in Section 5.4 and 6.4 of [Volume A4, Annex 3.2](#), with the final array footprint set out in Figure 12 of [Volume A4, Annex 3.2](#).
- 3.11.1.5 The outcome of the DAA was the adoption of three major site reductions from the AfL presented at Scoping (846 km²) to the PEIR boundary (600 km²), with a further reduction adopted for the ES and DCO application (468 km²) (presented in [Figure 3.8](#)) due to the findings of the impact assessment presented at PEIR, technical considerations and stakeholder feedback (see [Figure 3.9](#)).
- 3.11.1.6 Ornithology was identified as a principle environmental constraint early in the development process due to the relative proximity of the Hornsea Four site to the Flamborough and Filey Coast Special Protection Area (SPA), hence required detailed consideration through the DAA. The first DAA Biological Workshop (February 2019) resulted in a major site reduction (DAA#1) which was determined by the density and distribution of gannet, kittiwake and guillemot within the Hornsea Four array (as surveyed pre-development). The reduction

resulted in ~54% reduction in bird numbers between what was observed in the original AfL to that reduced Order Limits.

3.11.1.7 Stakeholder feedback received at Section 42 and 47 consultations lead Hornsea Four to reconsider the commercial impacts of existing shipping route deviations caused by the proposed Hornsea Four array area at PEIR.

3.11.1.8 In response Hornsea Four undertook additional extensive consultation with the shipping industry and statutory authorities to identify a suitable mitigation solution. The implementation of a gap between Hornsea Two and Hornsea Four, secured through a reduction in the DCO Order Limits (DAA#2), facilitated the continued safe passage of vessel traffic between the two projects (refer to [Volume A2, Chapter 7: Shipping and Navigation](#)).

3.11.1.9 The final reduction (DAA#3) within the north of the AfL was undertaken in an effort to reduce/eliminate the potential for Adverse Effect on Integrity (AEol) upon the guillemot and razorbill features of the Flamborough and Filey Coast (FFC) Special Protection Area (SPA) by removing areas of high auk (guillemots and razorbills) density to the northwest of the AfL and thereby significantly reducing bird numbers within the final development footprint.

3.11.2 Identification of the Offshore ECC

3.11.2.1 Offshore ECC routeing is partially a minimisation exercise to identify the shortest possible route from the offshore AfL area to the selected landfall site, whilst avoiding key constraints dictated by: engineering limitations; physical, third-party, and environmental constraints; and existing seabed users.

3.11.2.2 Minimising interactions with physical constraints such as cables and pipelines played a key part in establishing indicative initial Offshore ECC options. As undertaken for Scoping, the identification of suitable options for the landfall, OnSS, and onshore and offshore ECCs each followed a similar process, as summarised below.

3.11.2.3 A search area (EISA) was defined for which constraints data were collected and teams within Hornsea Four (i.e. Environment and Consents, Land and Property, Commercial, Technical and Electrical Installation) developed selection criteria for a Black, Red, Amber and Green (BRAG) appraisal to be undertaken ([Section 3.3.1.3](#)).

3.11.2.4 Several options were developed that avoided key constraints within the search area based on Hornsea Four's requirements (e.g. land requirement, corridor width).

3.11.2.5 Black and red constraints are critical in determining features that should be avoided wherever possible to avoid consenting risk, reduce EIA complexity and reduce the cost of mitigation. Hornsea Four has subsequently made commitments based on the avoidance of features that were rated as black and red constraints (e.g. national and international environmental designations). These commitments are set out in the Commitments Register ([Volume A4, Annex 5.2](#)) and Hornsea Four will continue to identify where commitments can

be made to avoid constraints based on the site selection work in order to reduce project risk and deliver a proportionate EIA.

3.11.2.6 Amber and green constraints are those that may be more readily minimised or managed by employing appropriate mitigation measures. Based on the BRAG appraisal the number of options were reduced. The remaining options will continue to be reduced as preferred options and alternatives are identified and refined for the ES.

3.11.2.7 Consideration of seabed bathymetry, physical environment as well as existing seabed infrastructure was applied as a general principle in the refinement of the offshore ECC, as detailed in [Volume A4, Annex 3.2](#).

3.11.2.8 [Figure 3.11](#) shows the offshore seabed constraints for Hornsea Four superimposed on the bathymetry of the area. Table 3 in [Volume A4, Annex 3.2](#) also lists the physical and third-party constraints as well as any mitigation measures applied. Table 4 in [Volume A4, Annex 3.2](#) details any environmental constraints and the appropriate mitigation measures applied.

3.11.2.9 Similar guiding principles are applied to the offshore ECC routeing as for the onshore. These are listed below:

- Shortest route preference for cable routing to minimise impacts by minimising footprint for the offshore and onshore cable routes as well as minimising cost (hence ultimately reducing the cost of energy to the consumer) and transmission losses;
- Avoidance of key sensitive features where possible and where not, seek to mitigate impacts;
- Minimise the disruption to populated areas; and
- The need to accommodate the range of technology sought within the design envelope and exclude those options out with the envelope.

3.11.2.10 The initial stage of offshore ECC routeing (considering the guiding principles) resulted in the development of three straight line routes from the array area to the initial three landfall zones described in [Volume A4, Annex 3.1](#) and as shown in Figure 6 in [Volume A4, Annex 3.2](#).

3.11.2.11 Refinement of these initial route options, accounting for the considerations listed in Section 4.2.2 of [Volume A4, Annex 3.2](#) resulted in the amended route options shown in Figure 7 in [Volume 4, Annex 3.2](#). [Figure 3.10](#) shows the development of what was simply a straight-line route into a more complex route which avoids those constraints identified during the refinement process (e.g. MCZ, exploration wells and known wrecks).

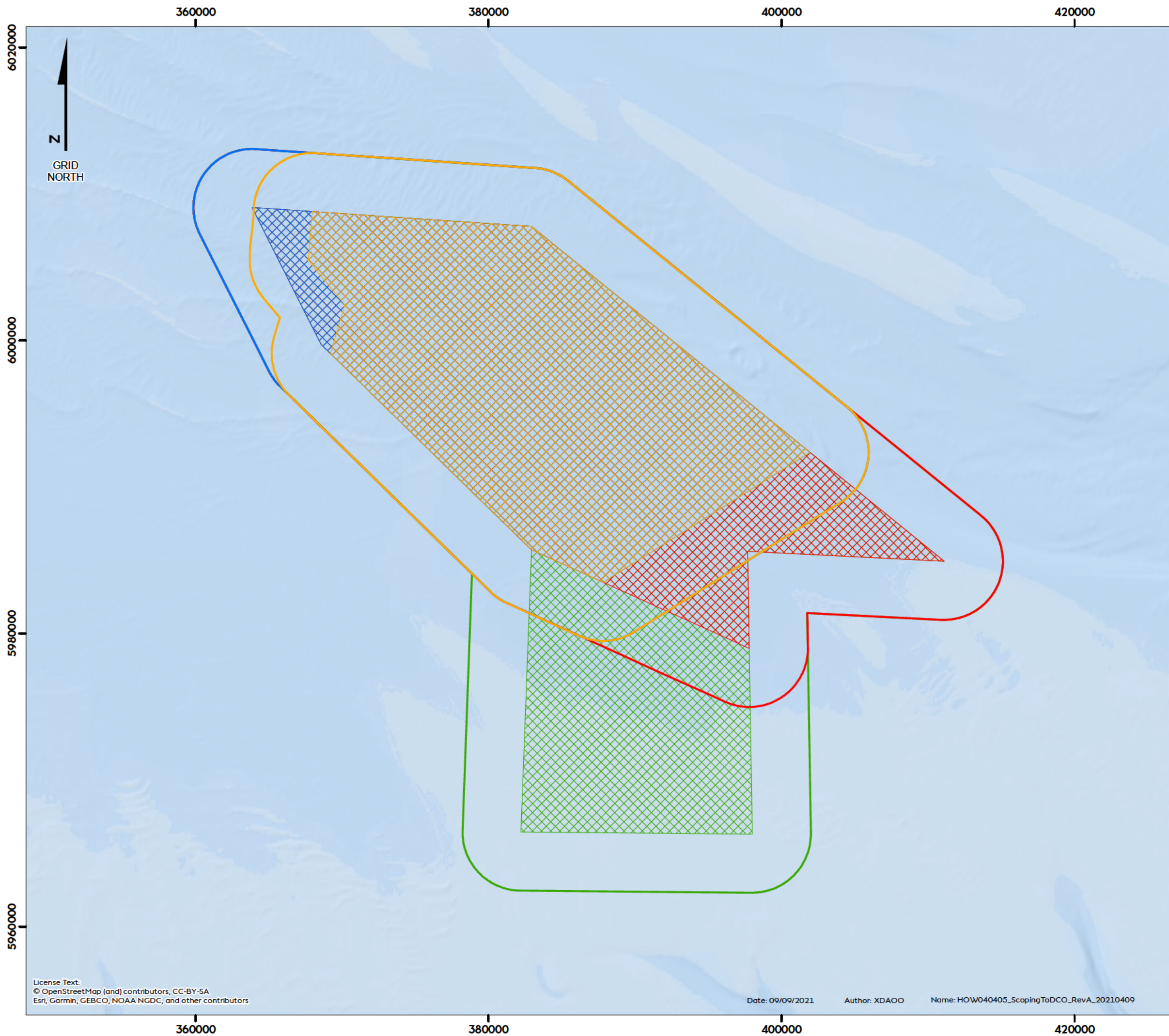
3.11.2.12 Further refinements to the landfall site options prompted corresponding adjustments in the offshore ECC, with the commitment to avoid the Holderness Coast Inshore (see Co44 in [Volume A4, Annex 5.2](#)) and Offshore (see Co45 in [Volume A4, Annex 5.2](#)) Marine Conservation Zone (MCZ) removing the southern landfall and cable route options from

further consideration ([Figure 3.9](#)). Discounting landfall and cable route options within the MCZ avoids any potential for significant adverse effects on any MCZ.

3.11.2.13 Additional modifications to promote best possible crossing angles of other linear infrastructure and to avoid wrecks (as further historic environment data became available) were also included at this point, resulting in the four route options shown in Figure 8 in [Volume A4, Annex 3.2](#).

3.11.2.14 The four-potential offshore ECCs were then assessed against a set of refinement criteria and the initial offshore ECC routes modified as described in Section 4.2.4 of [Volume A4, Annex 3.2](#) and illustrated in Figure 9 in [Volume A4, Annex 3.2](#). Version 4 was then subjected to a BRAG assessment, as set out in section 4.2.5 of [Volume A4, Annex 3.2](#) and detailed in Table 8 and Table 9 of [Volume A4, Annex 3.2](#). Following this refinement assessment, one route (Route 3) was identified as the preferred offshore ECC option as it presented the optimal balance of environmental and technical constraints in comparison to the other initially identified route options.









3.11.2.15 The preferred offshore ECC option then formed the scoping search area which is shown in [Figure 3.9](#). The final offshore ECC route taken forwards at PEIR is shown in Figure 11 in [Volume A4, Annex 3.2](#), which comprised a reduction in width from 3km to 1.5km and only minor adjustments being made to the HVAC booster station search area for DCO (see [Section 3.11.3](#)).

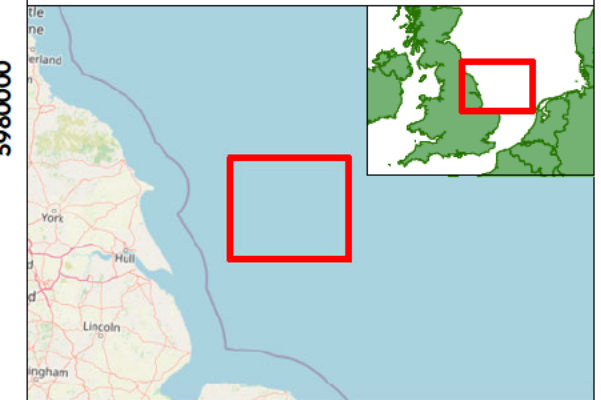


Hornsea Four

Figure 3.8

Array Area- Scoping to DCO

-  DCO Array Area
-  DCO 4km Buffer
-  Draft ES Array Area
-  Draft ES 4km Buffer
-  PEIR Array Area
-  PEIR 4km Buffer
-  Scoping Area for Lease (AFL)
-  Scoping 4km Buffer



Coordinate system: ETRS 1989 UTM Zone 31N

Scale@A3: 1:250,000

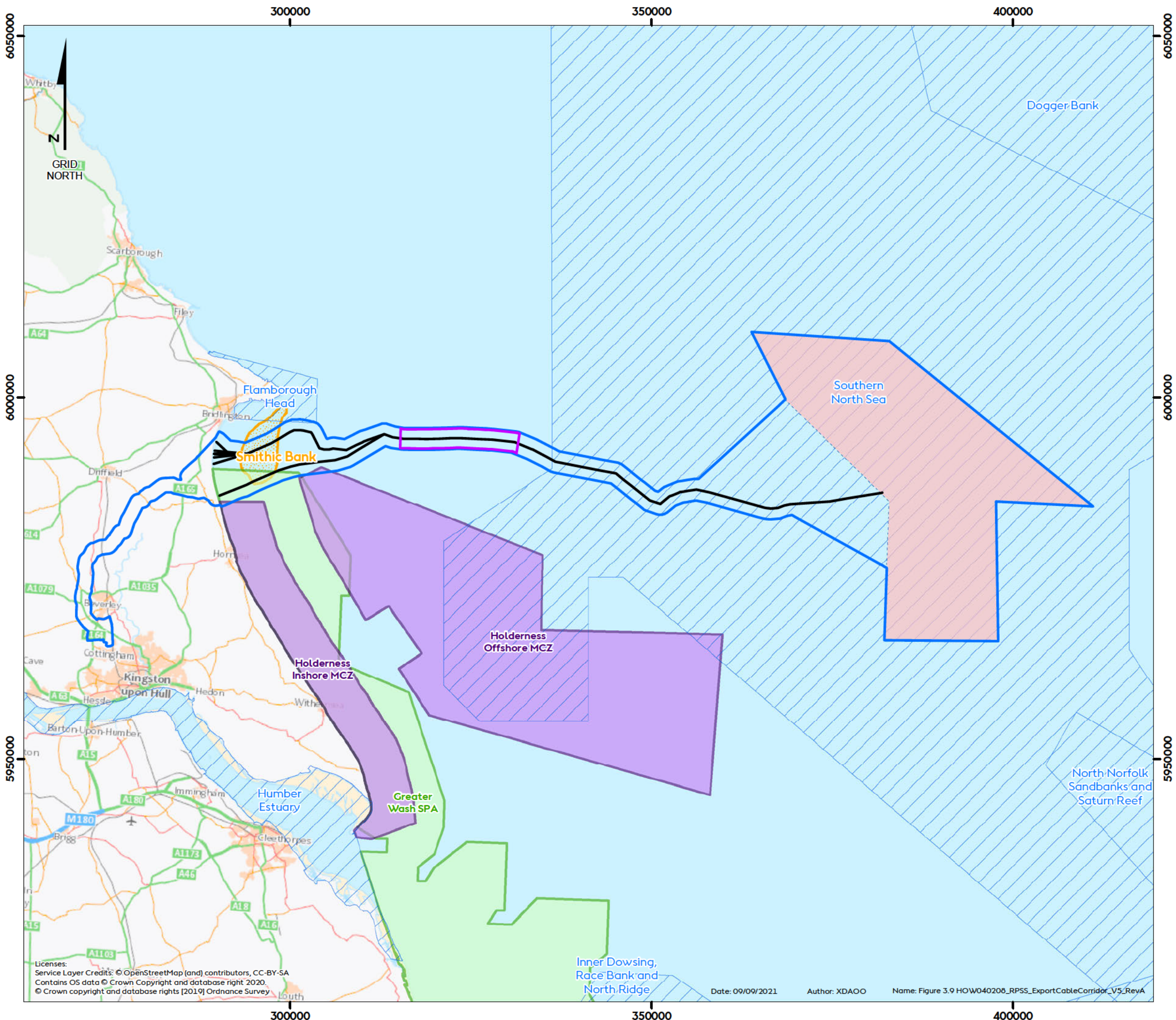
0 2.5 5 10 Kilometers

0 1.25 2.5 5 Nautical Miles

REV	REMARK	DATE
	First Issue	09/07/2020
A	Updated DCO Array Area	09/04/2021

Array Area - Scoping to DCO
 Document no: HOW040405
 Created by: XDAO
 Checked by: JOHLE
 Approved by: JULCA



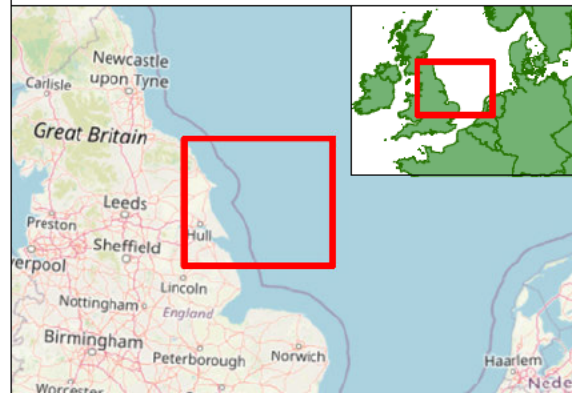


Hornsea Four

Figure 3.9

Offshore Export Cable Corridor Version 5

- Scoping Boundary
- Hornsea Four Array Area for Lease (AFL)
- Export Cable Version 5
- HVAC search area (at Scoping)
- Special Area of Conservation (SAC)
- Marine Conservation Zone (MCZ)
- Greater Wash Special Protection Area (SPA)
- Smithic Bank



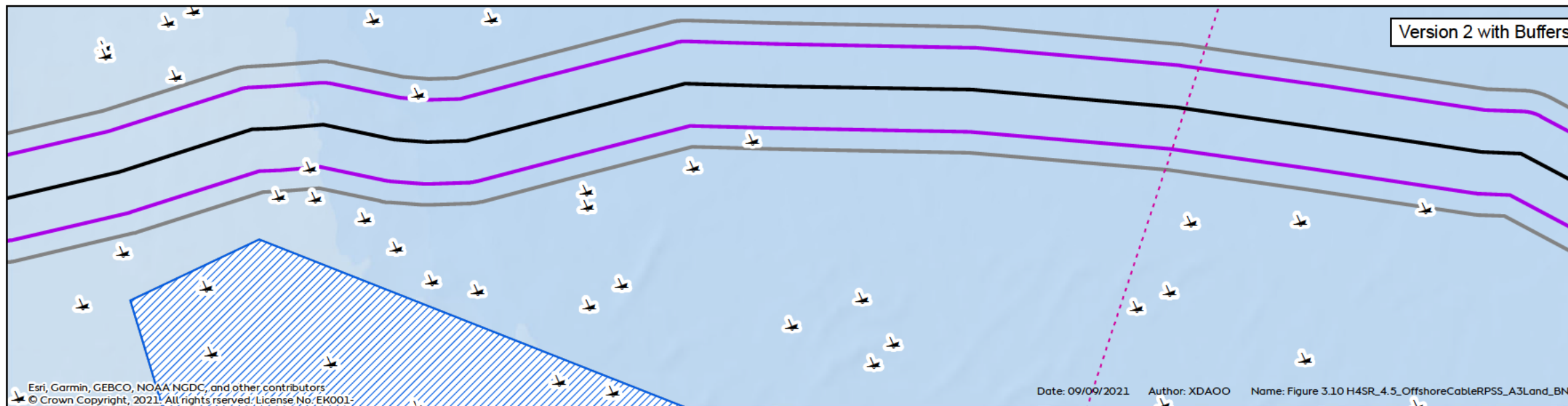
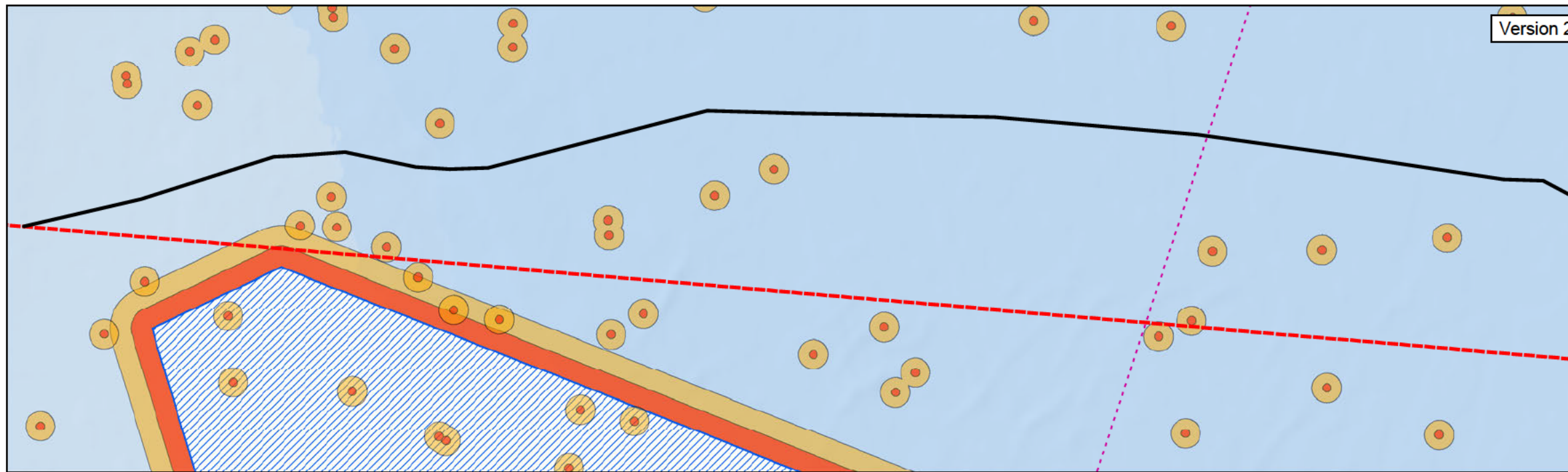
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 0 2.5 5 10 Nautical Miles

REV	REMARK	DATE
	First issue for PER	24/04/2019
A	Updated for DCO	17/03/2020

Offshore Export Cable Corridor Version 5
 Document no: HOW040208
 Created by: XDAOO
 Checked by: JOHLE
 Approved by: DAVKI



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Hornsea Four

Figure 3.10

Offshore Export Cable - Route Planning and Site Selection

- Version 1**
- Indicative Export Cable Route (Version 1)
 - Pipeline
 - Marine Conservation Zone
 - Red BRAG Criteria
 - Amber BRAG Criteria
- Version 2**
- Indicative Export Cable Route (Version 1)
 - Indicative Export Cable Route (Version 2)
 - Pipeline
 - Marine Conservation Zone
 - Red BRAG Criteria
 - Amber BRAG Criteria
- Version 2 with Buffers**
- Indicative Export Cable Route (Version 2)
 - Indicative Permanent Cable Area (2000m)
 - Indicative Temporary Works Area (3000m)
 - Wreck
 - Pipeline
 - Marine Conservation Zone

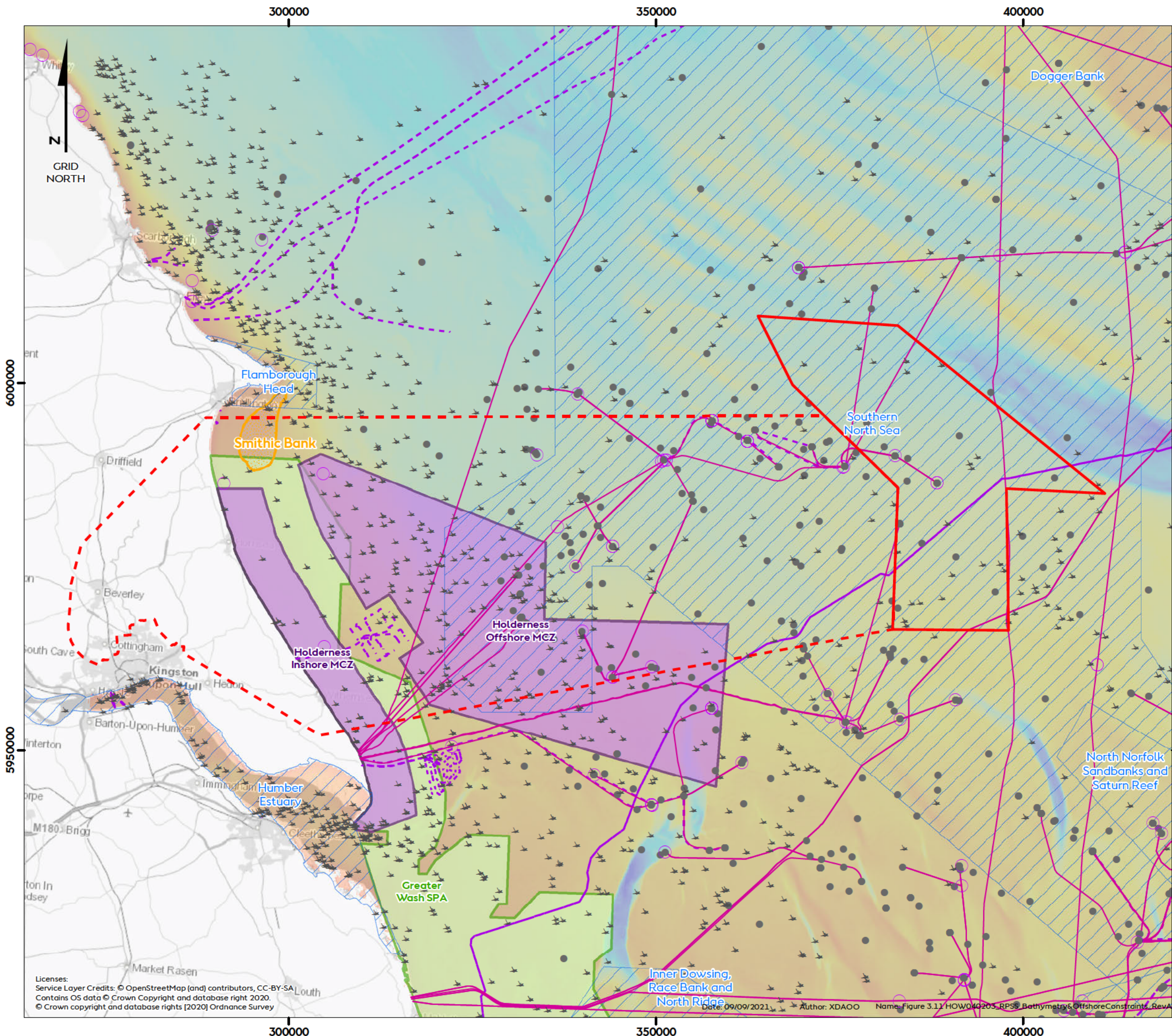


Coordinate system: ETRS 1989 UTM Zone 31N
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0 0.5 1 2 Nautical Miles

REV	REMARK	DATE
	First issue for Scoping	04/10/2018
A	Updated for DCO	17/03/2020



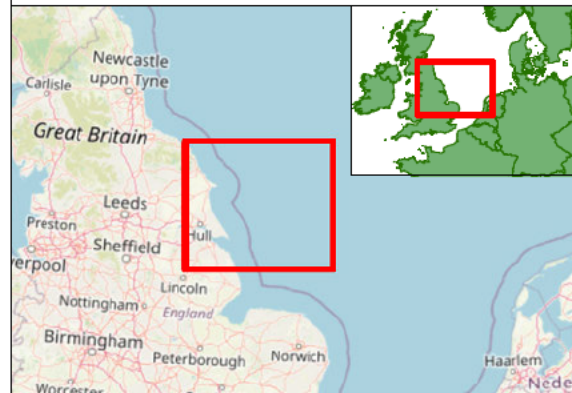
Hornsea Four
 Figure 3.11
 Seabed Bathymetry
 and Offshore Constraints

- Hornsea Four Array Area (AFL)
- Electrical Infrastructure Study Area
- Wreck
- Surface Infrastructure
- Well
- Pipeline
- Cable
- Special Area of Conservation (SAC)
- Marine Conservation Zone (MCZ)
- Greater Wash Special Protection Area (SPA)
- Smithic Bank

Bathymetry (mLAT)

High : 5.6

Low : -96.93



Coordinate system: ETRS 1989 UTM Zone 31N
 Scale@A3: 1:500,000

0 5 10 20 Kilometres

0 2.5 5 10 Nautical Miles

REV	REMARK	DATE
	First issue for PEIR	14/06/2019
A	Updated for DCO	07/11/2019

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3.11.3 High Voltage Alternating Current (HVAC) booster station

3.11.3.1 Concurrent to the development of the offshore ECC, selection of a preferred HVAC booster station search area was also carried out, as detailed in Section 5.3 and Section 6.3 of [Volume A4, Annex 3.2](#). Hornsea Four requires up to six HVAC booster stations within this search area, with a minimum separation of 100 m.

3.11.3.2 The optimum position for a HVAC booster station along the ECC is midway (+/- 10%) between the offshore substation and OnSS, based on an assessment of energy loss (too close and the benefit of the boost could be lost and too distant, the signal is already too weak) and within the range of 50% to 60% of the total export distance, combining both on and offshore export cable lengths.

3.11.3.3 A reduced 24 km² area was identified at PEIR to the east of the HVAC booster station search area identified at Scoping. This avoided the most challenging seabed conditions, and highest density known shipping routes. This area was deemed to provide enough scope to maintain flexibility in project design while addressing the key technical and consenting issues.

3.11.3.4 Further adjustments were made to the HVAC booster station search area for DCO application (comprising a reduction to 2.5km width and 8km length (20km²)) in response to Section 42 and 47 consultation responses. Further detail can be found in Table 10 and Figure 12 of [Volume A4, Annex 3.2](#).

3.11.4 Identification of the Onshore ECC

3.11.4.1 The onshore ECC will contain the electrical cables: connecting to the offshore ECC at the landfall (seaward end); and terminating at the OnSS (landward end). The initial onshore ECC route options were therefore driven by the initial prospective landfall zones and wider OnSS search area.

3.11.4.2 However, due to ongoing refinement of both the landfall zones ([Figure 3.6](#)) and the OnSS search area ([Figure 3.15](#)), and an initial overview of potential routing options, two potential initial onshore ECC routes (Option A and Option B) were identified ([Figure 3.12](#)) each comprising two sub-options (A1, A2, B1 and B2) and routed around the east and west of Beverley using Ordnance Survey Open Data base mapping and the constraints data available at the time ([Figure 3.12](#)).

3.11.4.3 The centre line of both onshore ECC routes was drawn using the following guiding principles, which utilised avoidance as the primary mitigation measure to avoid or reduce the potential for significant adverse effects of the ECC as far as practicable (illustrated in [Figure 3.14](#)). For example, Co2 details onshore sensitive sites that are to be avoided and therefore form part of the Black (potential showstopper to development) part of the BRAG assessment and must be avoided (a full list of commitments can be found in [Volume 4, Annex 5.2](#)):

- Avoidance of known and/or designated archaeology sites;
- Avoidance of designated parks and gardens;

- Where possible, avoidance of statutory and non-statutory conservation designations;
- Routed through open agricultural land where possible in order to avoid towns, villages, residential areas and buildings;
- Use the shortest possible connection between the start and end points where no other constraints were apparent; and
- Where crossing major existing infrastructure (i.e. roads and National Grid infrastructure) was necessary and unavoidable, the centreline of the onshore ECC would cross perpendicular to the existing infrastructure, as the optimal approach angle for HDD crossings (or other form of trenchless techniques).

3.11.4.4 Using these routing principles, the centreline of both onshore ECC options was diverted around the various constraints (as shown in Figure 12 of [Volume A4, Annex 3.3](#)).

3.11.4.5 Once the two onshore ECC options had been established, a single preferred option needed to be identified and developed further. A BRAG assessment was carried out on the two route options, including constraints identified from third parties (as detailed in Section 3.3 of [Volume A4, Annex 3.3](#)) and this was then fed into a strategic appraisal covering the entire 2 km buffer around each onshore ECC option (Table 10 in [Volume A4, Annex 3.3](#)).

3.11.4.6 As the initial portion of the onshore ECC (Option A1 or B1 at the seaward end) will depend on the final landfall location (yet to be determined), the main focus for site selection has been on the latter portion of the route from the merge point of A1, B1, A2 and B2 to the OnSS ([Figure 3.12](#)). The comparative appraisal for onshore ECC sections A2 and B2 identified that the western route (A2) was the preferred route option due to the greater number of constraints encountered by the route east of Beverley (B2), which impacts a greater number of residential receptors than A2 as well as being unable to gain access to the OnSS site from the east.

3.11.4.7 A major pinch point for the ECC was identified around Woodmansey Road (A1174) on the approach to the OnSS. The Indicative Dogger Bank Creyke Beck cable corridor was already placed in the only possible gap between residential properties (bringing the onshore ECC within 50 m of residential receptors), not allowing any space for an additional ECC, thus removing onshore ECC B2 as a viable option.

3.11.4.8 Once a single onshore ECC option had been selected (A2), a flyover survey was undertaken to obtain high resolution imagery. The imagery was used to identify possible constraints in greater detail, resulting in the further refinement of the onshore ECC route.

3.11.4.9 Once this process was completed, three buffers (see below) were applied to the selected onshore ECC (route A1). The buffered areas allow for the micro-siting of the ECC (which is designed to be 80 m wide) to be developed and are as follows (and shown in Figure 15 in [Volume A4, Annex 3.3](#)):

- 200 m buffer – for the Indicative Permanent Cable Area;
- 700 m buffer – for the Indicative Temporary Construction Works Area; and
- 2000 m buffer – for the Scoping Boundary. The area within which the Indicative Permanent and Temporary Cable Areas may be deviated.

3.11.4.10 After this stage of refinement, the process of identifying and incorporating potential access locations and logistics compounds was undertaken. This refinement was based on reviewing any newly received third-party data (in addition to that acquired for scoping) and by updating the BRAG assessment criteria with this additional data. The refinement of the 80 m onshore ECC was carried out with the aim of keeping the majority of the 80 m onshore ECC within the 200 m Indicative Permanent Cable Area and 700 m Indicative Temporary Works Area. The area outside of the 700 m Indicative Temporary Works Area would only be used if routeing within it was not possible due to exceptional circumstances.

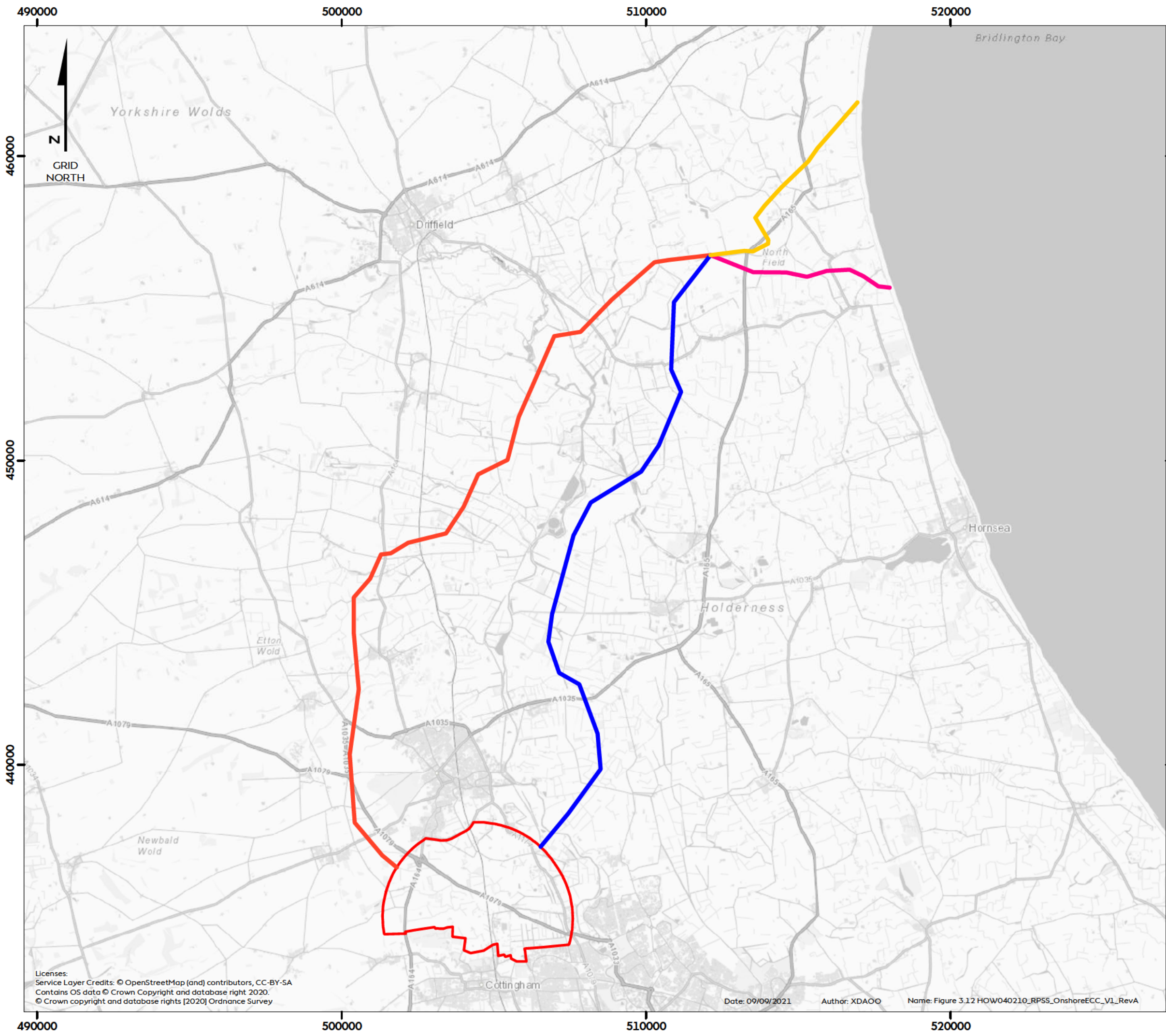
3.11.4.11 Using the 200 m Indicative Permanent Cable Area and the 700 m Indicative Temporary Works Areas as the starting point, the 'Refined Indicative 80 m ECC (Version 1)' (referred to as the 'refined 80m onshore ECC v1' here) was developed. The two main stages of this are described in detail in Section 4.2 of [Volume A4, Annex 3.3](#).

3.11.4.12 Letters and plans showing the Refined Indicative 80 m onshore ECC (Version 1), indicative logistics compounds and accesses were sent to landowners and tenants in November 2018. Meetings were subsequently conducted with landowners and tenants as a part of the informal consultation in order to receive feedback and comments. These were then fed into the refinement process and actioned as a change request resulting in early changes to the routing of the onshore ECC, location of access tracks and logistics compounds, based on landowner and occupier preference and local knowledge of the land and surrounding area. Further information on these are detailed in Section 5 of [Volume A4, Annex 3.3](#). An example of how the indicative 80 m ECC was routed is shown in [Figure 3.14](#).

3.11.4.13 At Section 42 consultation (PEIR) and subsequently during Targeted Consultation (Material changes resulting from Section 42 Consultation), Hornsea Four received a range of responses from statutory consultees, and those with an interest in land. These responses combined with the outcomes from additional baseline data updates, and the environmental assessment conducted at PEIR, resulted in 39 changes being made to the onshore ECC. Further examples of these changes can be found in Section 6, [Volume A4, Annex 3.3](#). The 39 changes were comprised of:

- 15 changes to the onshore ECC;
- Seven changes to logistics compounds; and
- 17 changes related to traffic and transport (i.e. changes to access tracks or access points).

- 3.11.4.14 In addition, 27 operational accesses were included, consisting of 9 accesses which were previously identified as temporary accesses, and 18 new accesses which made use of existing access and farm tracks to facilitate access to indicative link box locations.
- 3.11.4.15 Following the Targeted Consultation, further feedback was received from landowners and occupiers. All feedback was considered by the Applicant, and resulted in the re-routing of the onshore ECC and associated logistics compound and access track at Killingwoldgraves (south of York Road) around an area proposed to be developed as a petrol station, at the request of the landowner.
- 3.11.4.16 An extension to the DCO application submission in 2021 also provided an opportunity to make minor changes to the onshore Order Limits (paragraph 6.1.1.5 of [Volume A4, Annex 3.3](#)), in addition to amending a temporary access point off the A164 to facilitate interaction with the A164/Jocks Lodge Highways Improvement scheme. This change was the subject of targeted consultation under Section 41(1) of the Planning Act 2008.
- 3.11.4.17 Additionally, it is noted that between PEIR and DCO application submission, an additional onshore ECC and primary logistics compound option was added to the Order Limits due to feedback from the landowner and occupiers. After the delay to the DCO application submission date in 2021, the Applicant undertook an appraisal between the two options and dropped the additional option added between PEIR and DCO submission (the 'northern route'). This decision was primarily based on the BMV land classification of the northern route and traffic and transport related matters (including the potential for construction vehicles to cross a footpath on the north of Station Road to access the primary logistics compound, and the increased distance of the potential road widening at that location (with the associated construction access of the northern option located further to the west).

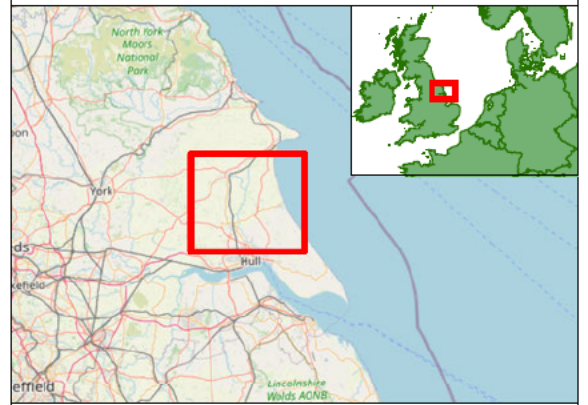


Hornsea Four

Figure 3.12

Onshore Export Cable Corridor Version 1

- Onshore Export Cable Version 1
- Option A1
 - Option A2
 - Option B1
 - Option B2
 - Substation Search Area Version 2



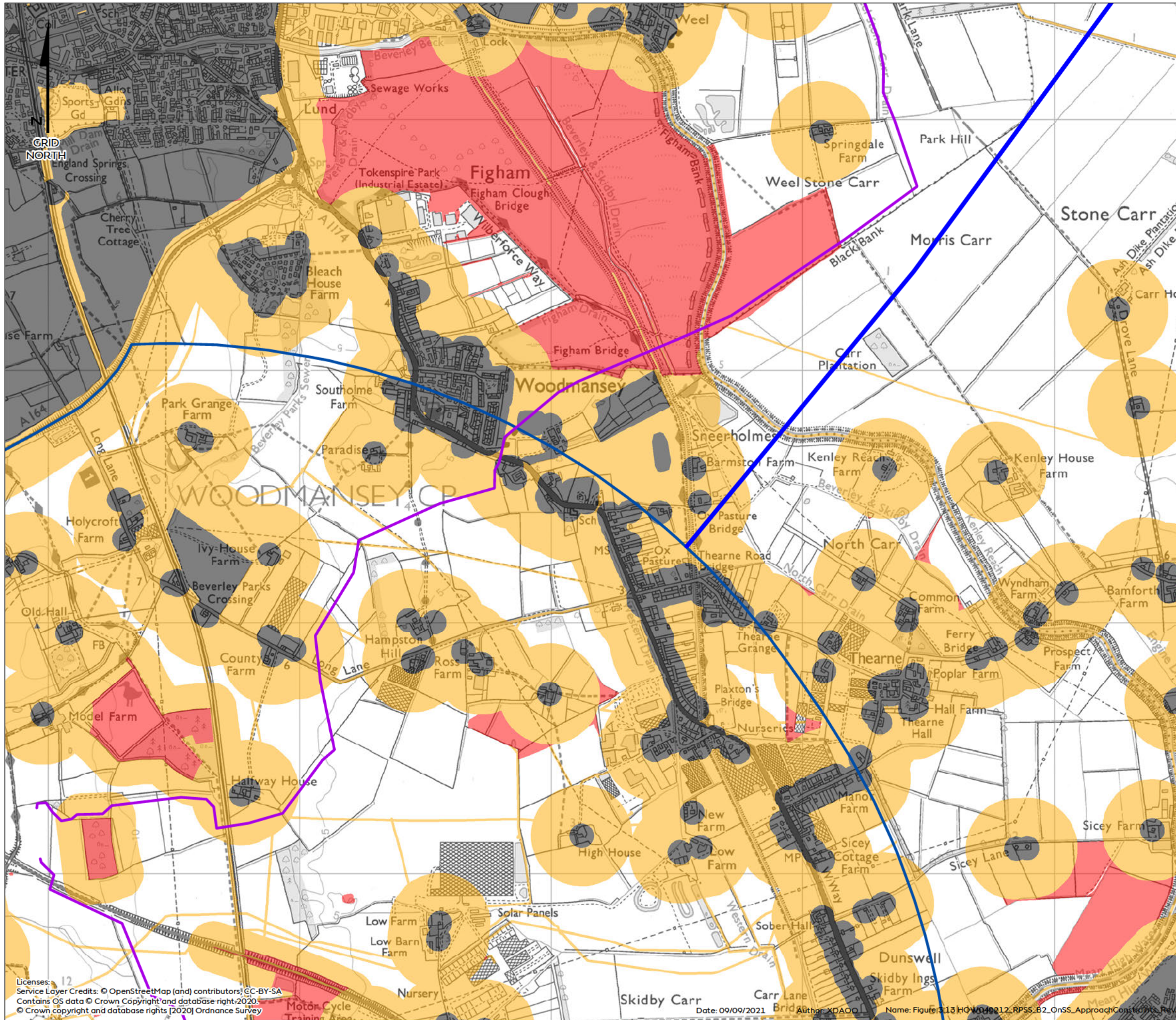
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0 0.5 1 2 Nautical Miles

REV	REMARK	DATE
	First issue for PER	25/04/2019
A	Updated for DCO	07/11/2019

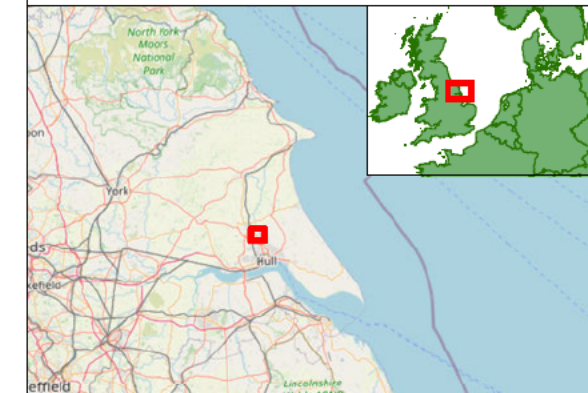
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Figure 3.13
Option B2 Onshore
Substation Approach Constraints

- Onshore Export Cable Version 1
- Option B2
 - Substation Search Area Version 2
 - Indicative Dogger Bank Cable Route
- BRAG Assessment**
- Black BRAG Constraint
 - Red BRAG Constraint
 - Amber BRAG Constraint



Coordinate system: British National Grid
Scale@A3: 1:15,000

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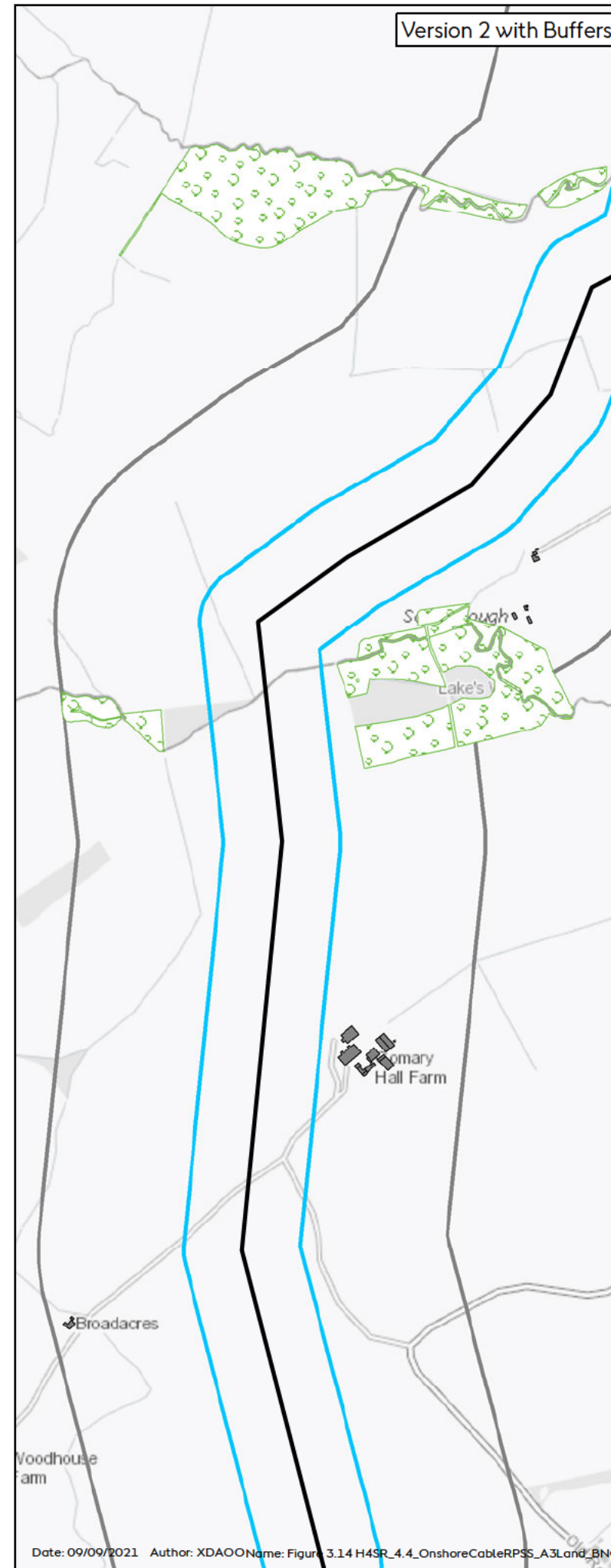
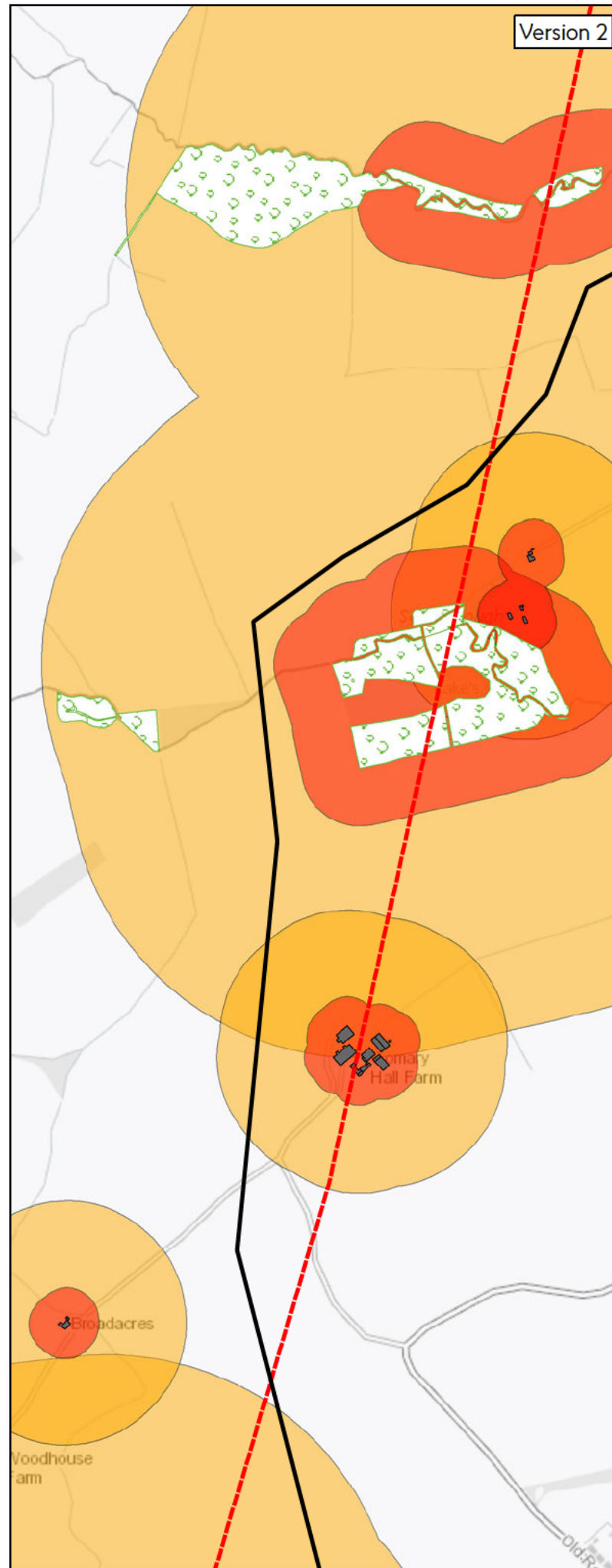
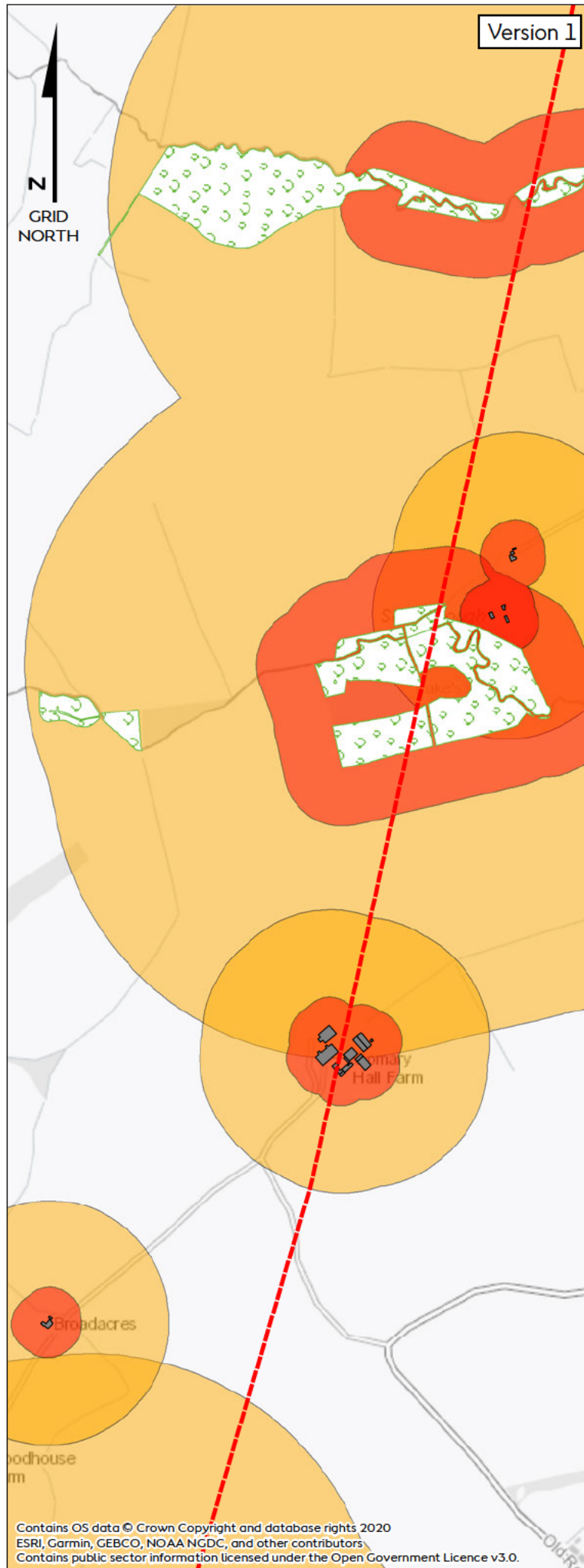
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REV	REMARK	DATE
	First Issue	08/07/2019
A	Updated for DCO	17/03/2020

Option B2 Onshore Substation Approach Constraints
Document no: HOW040212
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Hornsea Four

Figure 3.14

Onshore Export Cable - Route Planning and Site Selection

Version 1

- - - Indicative Export Cable Route (Version 1)
- Building
- Priority Habitat - Deciduous woodland
- Red BRAG Criteria
- Amber BRAG Criteria

Version 2

- - - Indicative Export Cable Route (Version 1)
- Indicative Export Cable Route (Version 2)
- Building
- Priority Habitat - Deciduous Woodland
- Red BRAG Criteria
- Amber BRAG Criteria

Version 2 with Buffers

- Indicative Export Cable Route (Version 2)
- Indicative Permanent Cable Area (200m)
- Indicative Temporary Works Area (700m)
- Building
- Priority Habitat - Deciduous woodland

Coordinate system: British National Grid
Scale@A3: 1:10,000

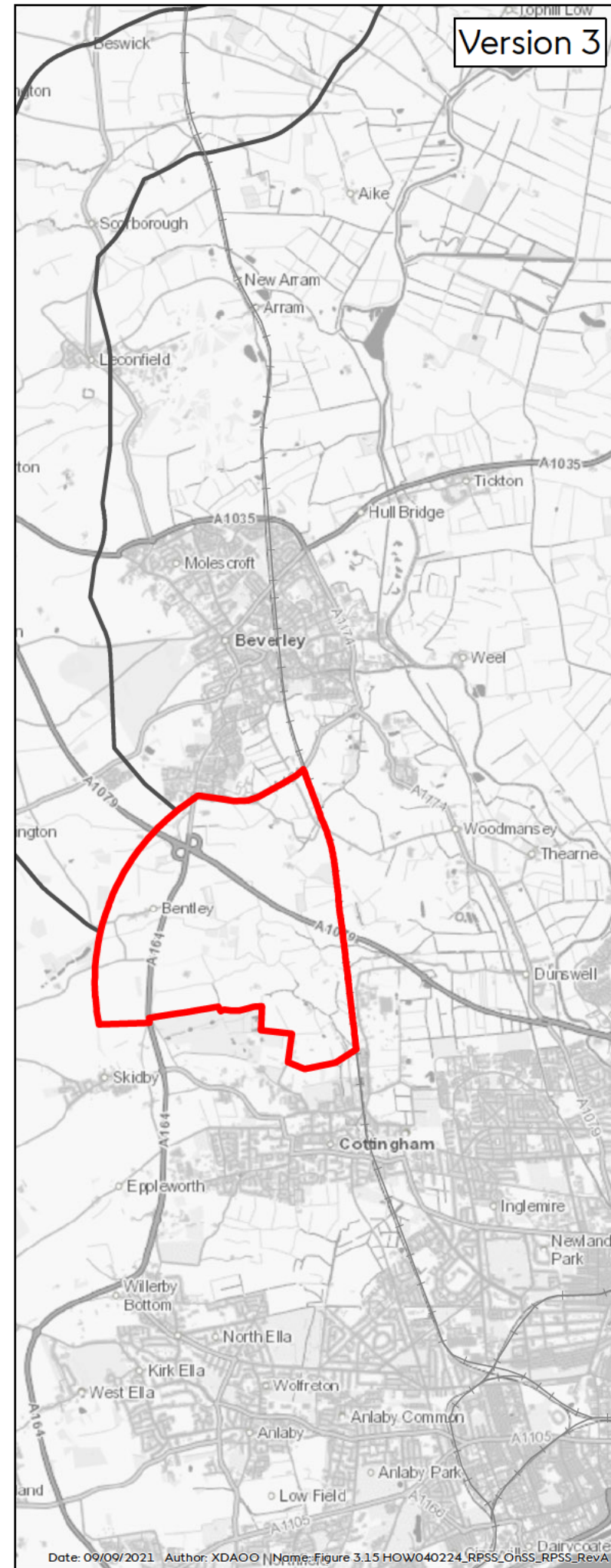
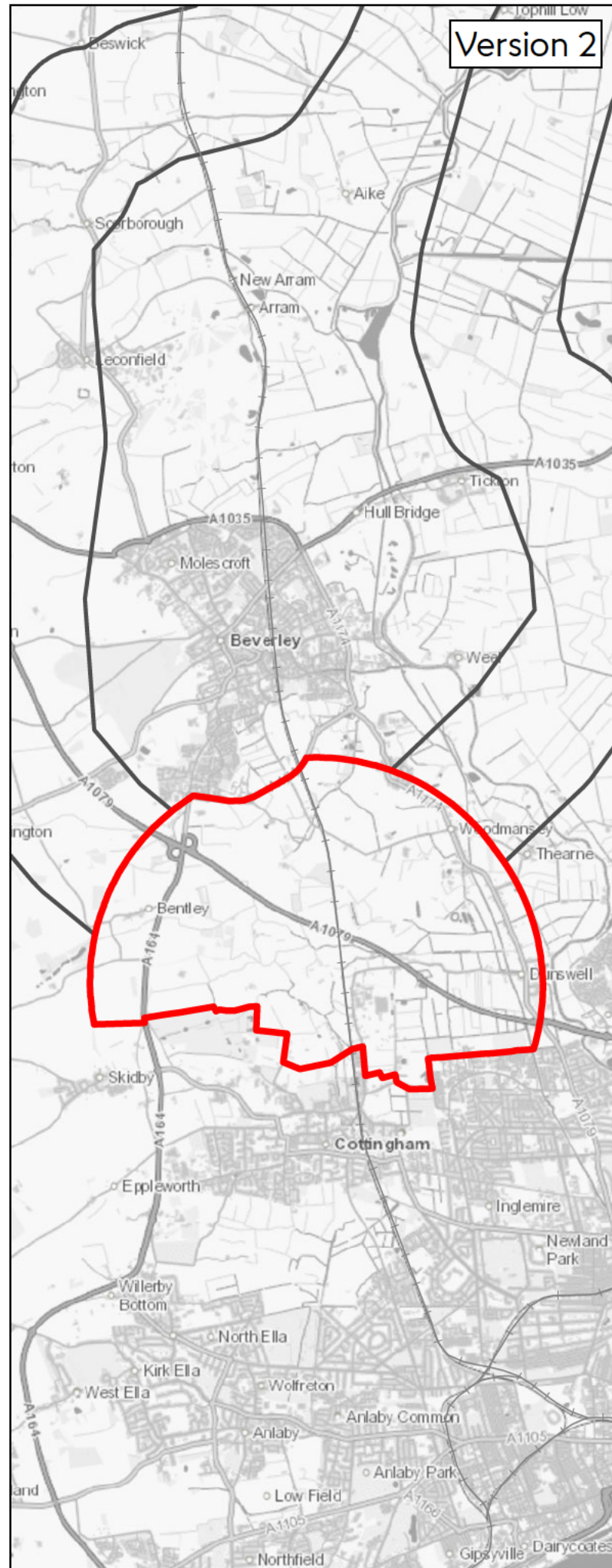
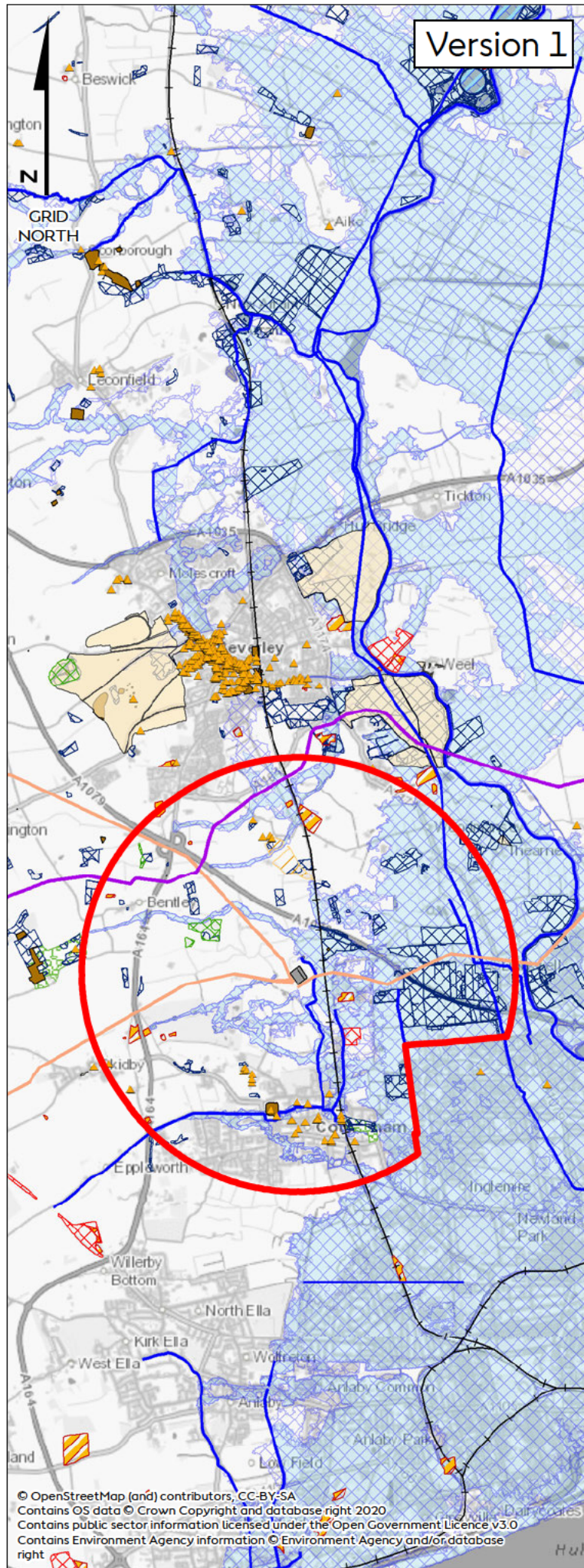
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0 0.05 0.1 0.2 Nautical Miles

REV	REMARK	DATE
	First issue for Scoping	04/10/2018
A	Updated for DCO	17/03/2020

Onshore Export Cable - Route Planning and Site Selection
Document no: H4SR_4.4
Created by: XDAO
Checked by: JOHLE
Approved by: JULCA

Date: 09/09/2021 Author: XDAO Name: Figure 3.14 H4SR_4.4_OnshoreCableRPSS_A3Land_BNG



Hornsea Four

Figure 3.15
Onshore Substation - Route Planning and Site Selection

- Version 1**
- Substation Search Area Version 1
 - Creyke Beck
 - Main River
 - National Grid Gas Pipeline
 - National Grid Overhead Line
 - Listed Building
 - Ancient Woodland
 - Authorised Landfill Site
 - Flood Zone 2
 - Flood Zone 3
 - Historic Landfill
 - Local Nature Reserve
 - Priority Habitat
 - Registered Common Land
 - Registered Park and Garden
 - Scheduled Monument
 - Site of Special Scientific Interest
- Version 2**
- Substation Search Area Version 2
 - Indicative Cable Corridor
- Version 3**
- Substation Search Area Version 3
 - Indicative Cable Corridor

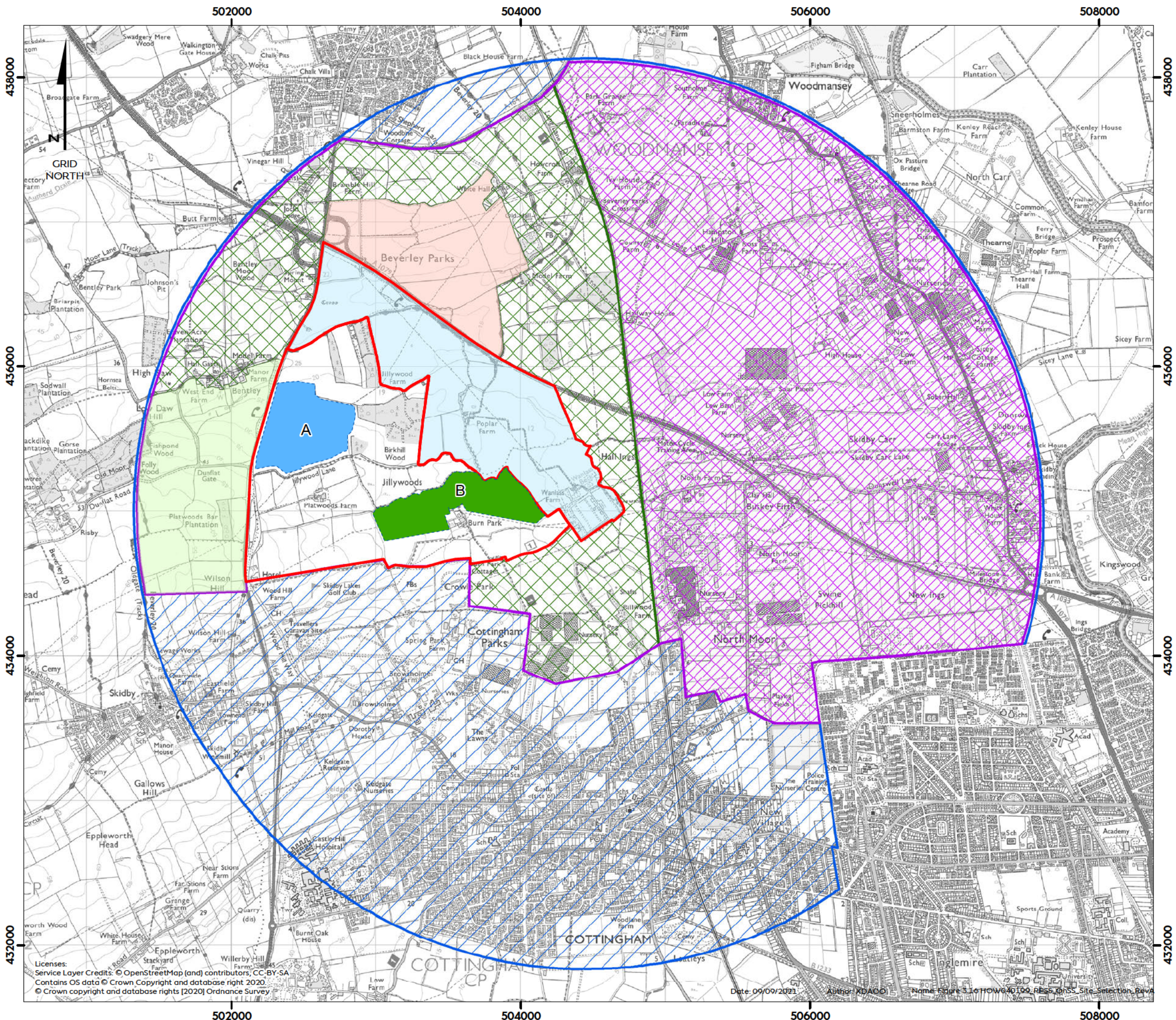


Coordinate system: British National Grid
 Scale@A3: 1:80,000

0 0.75 1.5 3 Kilometres

0 0.5 1 2 Nautical Miles

REV	REMARK	DATE
	First issue for PER	26/04/2019
A	Updated designations data, for DCO	17/03/2020

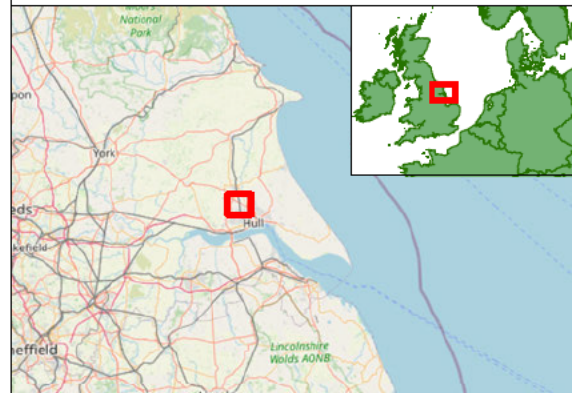


Hornsea Four

Figure 3.16

Onshore Substation Site Selection

- Substation Search Area Version 1
- Version 1 Dropped Areas
- Substation Search Area Version 2
- Version 2 Dropped Areas
- Substation Search Area Version 3
- Version 3 Dropped Areas
- Substation Search Area Version 4
- Zone 1
- Zone 3
- Zone 4
- Substation Search Area Version 5
- Onshore Substation Option A
- Onshore Substation Option B




Coordinate system: British National Grid
 Scale@A3: 1:25,000

0 0.25 0.5 1 Kilometres

0 0.125 0.25 0.5 Nautical Miles

REV	REMARK	DATE
	First issue for PEIR	26/04/2019
A	Updated for DCO	17/03/2020

Onshore Substation Site Selection
 Document no: HOW40199
 Created by: XDAO
 Checked by: JOHLE
 Approved by: JULCA



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Date: 09/09/2021 Author: XDAO Name: Figure 3.16 HOW40199 PEIR OnSS Site Selection RevA

3.11.5 ECC Approach to the OnSS

- 3.11.5.1 Once a final OnSS site had been chosen (Section 2.3.5, [Volume A4, Annex 3.3](#)) the onshore ECC route to the site was needed to connect the cable section, which stopped at the start of the refined OnSS search area version 5 (Figure 8 in [Volume A4, Annex 3.3](#)) at Beverley Road (A164), across Beverley Road and to the OnSS site.
- 3.11.5.2 Due to the high number of constraints in this area, a more refined BRAG criteria was established as shown in Table 14 in [Volume A4, Annex 3.3](#). Developing the refined BRAG criteria was an iterative process with additional constraints and criteria refined. For example, through the routeing process it became apparent that any interaction with the OnSS works would constrain construction, due to the different construction timelines involved for both onshore elements.
- 3.11.5.3 The onshore ECC route options were then ranked using the BRAG criteria. Where an onshore ECC route fulfilled any criteria, it was given a ranking for each constraint. The total number of points for each onshore ECC route option were then tallied as part of the comparative appraisal, with the chosen option incorporated in the onshore ECC for the PEIR.
- 3.11.5.4 The Applicant has been in regular discussions with the landowner of the OnSS site (and surrounding land) since the identification on the preferred site for the OnSS. The landowner informed the Applicant of its intention to develop land near to the OnSS / OnSS temporary works area and the onshore ECC as a solar park. The Applicant considers that the solar park and the onshore ECC can co-exist and this proposal has not therefore impacted the principles of the site selection or refinement of the onshore ECC approach to the OnSS. Discussions with the landowner regarding cooperation / colocation between the two development projects during construction and operation are ongoing.

3.12 National Grid Creyke Beck Substation Connection

- 3.12.1.1 To distribute the power produced by Hornsea Four to UK homes, Hornsea Four will need to connect into the National Grid at the National Grid Creyke Beck Substation ([Volume A4, Annex 3.1](#)). At the point of the PEIR, National Grid Electricity Transmission plc had not determined the exact location of bays that Hornsea Four would connect into within the Creyke Beck substation. As a result, the fields directly adjacent to the Creyke Beck Substation ([Figure 3.17](#)) were included within the Hornsea Four PEIR boundary.
- 3.12.1.2 Since PEIR, discussions with National Grid Electricity Transmission plc, as the operator and owner of the transmission system, have allowed the grid connection area to be refined to include the fields to the south and south-west of the Creyke Beck Substation, and the National Grid substation itself (for connection works) ([Figure 3.17](#)). Additionally, a minor refinement was undertaken to the south-eastern boundary to avoid interaction with a PRow.

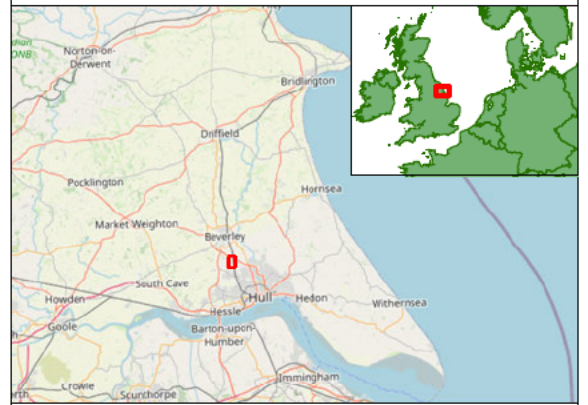


Hornsea Four

Figure 3.17

400kV Connection to National Grid Creyke Beck Substation

- PEIR / DCO Boundaries
- 400kV Export Cable Corridor
- Area within which connection works maybe required, but where compulsory powers will not be sought.
- Onshore Export Cable Corridor
- Onshore Substation (Permanent Space)
- Grid Connection Works



Coordinate system: British National Grid
 Scale@A3: 1:7,500

0 100 200 400 Meters

0 250 500 1,000 Feet

REV	REMARK	DATE
	First issue for DCO	17/03/2020
A	Updated various onshore project elements, following consultation	15/07/2021

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3.13 Conclusion and Summary

3.13.1.1 A staged approach has been undertaken in relation to the site selection and routing of the Hornsea Four infrastructure as illustrated in [Figure 3.4](#) to [Figure 3.2](#). Several guiding principles have directed the work along with inputs from consultations (including local communities), data collection through survey and wider engineering considerations. Also incorporated into the work are a number of commitments that the Applicant will apply to the project to eliminate or reduce adverse environmental effects, notably those implemented to avoid sensitive receptors both on and offshore. For example, Co. 44 dictates that *"The Holderness Inshore Marine Conservation Zone (MCZ) will not be crossed by the offshore ECC including the associated temporary works area"*. A full list of commitments can be found in [Volume A4, Annex 5.2: Commitments Register](#). The site selection process is fully documented in the accompanying Annexes ([Volume A4, Annex 3.1](#), [3.2](#) and [3.3](#)) which also provide relevant mapping.

3.13.1.2 Significant use of guiding principles and comparative assessments (notably BRAG assessments) has been made to continually refine, hone and ultimately select the best (i.e. least environmentally harmful and constrained) locations and routes for the required Hornsea Four infrastructure, providing a proportionate, comprehensive and iterative approach to alternative options assessment including a comparison of the environmental effects. Such assessments are integrated into wider project decisions that also take into account buildability (i.e. engineering constraints/opportunities), and financial considerations with appropriate and considerable emphasis placed on sustainable routing and location of infrastructure.

3.13.1.3 An overview of the site selection programme up to DCO submission is provided in [Table 3.4](#). It should be noted that although the Hornsea Four Order Limits are proposed to be fixed, further project development will be ongoing within the Order Limits and Deemed Marine Licence area through necessary micro-siting. This will take into consideration the acquisition of additional data, obtained through further site-specific surveys, desk-based reviews and further consultation prior to construction.

Table 3.4: Hornsea Four Site Selection Programme.

Stage	Description
EIA Scoping October 2018	<ul style="list-style-type: none"> • 2,000 m onshore ECC scoping boundary and indicative 200 m permanent ECC and 700 m temporary works area. • OnSS search area. • Landfall search area. • 3,000 m offshore ECC scoping boundary.
Scoping – PEIR consultation	<ul style="list-style-type: none"> • Feedback and comments from informal public consultation events, landowner liaison and stakeholders on the scoping report and scoping boundary.
PEIR July 2019	<ul style="list-style-type: none"> • 80m onshore ECC inclusive of permanent and temporary works areas with indicative construction access points. • Compounds: logistics, Horizontal Directional Drilling (HDD) and/or storage compounds outside of the permanent cable corridor for auxiliary works.

Stage	Description
	<ul style="list-style-type: none"> • Access: Area required for access (temporary or permanent) to the construction and/or operation and maintenance activities. • OnSS site. • Two landfall options. • 1,500 offshore permanent ECC with 500 m temporary works areas buffer either side of ECC).
Section 42 and 47 consultation	<ul style="list-style-type: none"> • Feedback from stakeholders and members of the public upon receipt of more detailed environmental assessment work will further inform the RPSS process.
DCO Application Q3 2020	<ul style="list-style-type: none"> • Onshore ECC (80m) which will contain all permanent (electrical cables and Transition Joint Bays (TJBs)) and temporary works for construction works and soil storage. The details of which will be developed during detailed design. • Compounds: logistics, Horizontal Directional Drilling (HDD) and/or storage compounds outside of the permanent cable corridor for auxiliary works. • Access: Area required for access (temporary or permanent) to the construction and/or operation and maintenance activities. • OnSS: preferred site within the onshore substation search area. • Landfall: preferred site within the landfall search area. • Offshore ECC (1,500 m): the area within which the export cable route and temporary works area (500m buffer either side of offshore ECC) are planned to be located.

3.14 References

National Infrastructure Commission (2020). Design Principles of Climate, People, Places and Value. Available at: <https://www.nic.org.uk/wp-content/uploads/NIC-Design-Principles-Final.pdf>

Ørsted (2018). Hornsea Four Environmental Impact Assessment: Scoping Report (EN010098-000021-EN010098)

PINS (2018) Scoping Opinion: Proposed Hornsea Four Wind Farm (Case Reference: EN010098)