Hornsea Project Four

A4.6.5: Compensation EIA Annex Part 1-6 (Tracked)

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Revision Summary				
Rev	*Date*	*Prepared by*	*Checked by*	*Approved by*
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Revision Change Log			
Rev	*Page*	*Section*	*Description*
01	N/A	N/A	Document submitted at application.
02	Updated throughout	Updated throughout	Updated based on the most recent compensation proposal details and to reflect the refinement of Areas of Search for the different measures.

Non-Technical Summary

Orsted Hornsea Project Four Limited (hereafter the 'Applicant') is proposing to develop Hornsea Project Four Offshore Wind Farm (hereafter 'Hornsea Four'). Hornsea Four will be located approximately 69 km offshore the East Riding of Yorkshire in the southern North Sea and will be the fourth project to be developed in the former Hornsea Zone. The Applicant is proposing a suite of ~~'without prejudice'~~ Compensation Measures that could be implemented in the event that the Secretary of State (SoS) concludes that there would be an Adverse Effect on Integrity (AEoI) on the Flamborough and Filey Coast (FFC) Special Protection Area (SPA) as a result of Hornsea Four alone and/ or in combination with other plans or projects. These Compensation Measures are presented 'without prejudice' for guillemot and~~,~~ razorbill features, however for kittiwake, where AEoI has been concluded for potential in-combination effects, this ('without prejudice' case) does not apply. For full details on the background to Hornsea Four and the compensation measures see ~~**Volume A4, Annex 6.1:**~~A4.6.1 **Compensation Project Description** (Deadline 7 submission) and **Section 4** below.

The 'without prejudice' (with exception of kittiwake) Compensation Measures are being considered to provide compensation for a number of species of seabird and across a number of locations where the measures could be located, termed 'Areas of Search' (AoS), with these summarised below. Note that fish habitat enhancement is referred to as a resilience measure.

Compensation Measure	Option	Location	Location ID	Kittiwake	Guillemot	Razorbill
Offshore nesting	New	S~~s~~outhern North Sea (Area of Highest Ecological Potential)	A1			
Offshore nesting	Repurposed	S~~s~~outhern North Sea (Wenlock platform)	A1			
Onshore nesting	New	C~~l~~ayton Bay to Newbiggin by the Sea~~Suffolk Coast~~	B1~~B2~~			
Bycatch	-	~~Thames Estuary~~South coast of England~~:~~ ~~Broadstairs to Plymouth~~	~~C1~~C1~~212~~			
Predator eradication	-	~~Isles of Scilly~~~~Rathlin Island, Moyle, Northern Ireland~~~~Torquay, Devon~~Bailiwick of Guernsey ~~and Alderney~~	~~D1D2D3~~ D1~~4~~			
Fish habitat enhancement[1]	Seagrass	~~Rathlin Island, Moyle, Northern Ireland~~~~Isles of Scilly~~~~Celtic Sea, Wales~~~~Plymouth Sound to Helford River~~~~Solent~~~~Essex Estuaries~~Humber Estuary	~~E1E2E3E4 E5E6~~E1~~7~~			

The process of identifying the type, location and extent of potential compensation measures has considered a number of alternatives to date. Consideration of these commenced in spring 2020, with the preparation of a long list of options. These were consulted on in June 2020, with the subsequently revised short list presented to stakeholders for consultation in autumn 2020. Further work since then has

[1] Fish habitat enhancement is a resilience measure to support the compensation measures.

refined the compensation and resilience measures included here for assessment. The consideration of alternatives is described in more detail in **Section 3**. It is expected that further work will continue to refine the compensation measures under consideration.

To ensure all potential impacts that may result from the installation/ construction, implementation/ operation/ maintenance, and decommissioning, a Compensation Impacts Register has been established (see **Section 6.3** and ~~**Volume A4, Annex 6.3:**~~**A4.6.3 Compensation Impacts Register** (Deadline ~~6~~ 7 submissions~~APP-057~~) for more detail). This is presented as an Excel spreadsheet and includes the following:

- All potential impacts associated with each Compensation Measure, with a unique identification reference which can be traced through the subsequent steps/documents;
- Sets the scope of the Compensation Measures EIA with appropriate justification;
- States the magnitude, sensitivity and significance for all potential impacts associated with all activities, in all phases of development of each Compensation Measure;
- Identifies Commitments to reduce or eliminate LSE; and,
- Defines the Maximum Design Scenario (MDS) for any given impact.

The Impact Register covers the breadth of Environmental Impact Assessment (EIA) topics (encompassing natural environment and human environment) and across all stages of each of the compensation and resilience measures.

A cornerstone of the Hornsea Four assessment process is the establishment of the Compensation Measures Commitments Register (see **Section 4.1.3** and ~~**Volume A4, Annex 6.4:**~~**A4.6.4 Compensation Commitments Register** (Deadline ~~6~~7 submission~~APP-060~~). As advocated in EIA guidance (e.g. IEMA 2004), it is only necessary to assess potential effects arising from the final design, incorporating all primary and tertiary mitigation (only pre-mitigation effects and residual effects need to be both set out where secondary mitigation is required). In this respect, the Applicant has considered the Commitments in making an initial assessment of the likely significant effects.

The Commitments Register includes Commitments that provide the justification for potential effects to be scoped out of the assessment and are sufficient to ensure that all the impacts in the Impacts Register can be mitigated sufficiently to ensure no potential likely significant effect will result in all cases. As such, the potential effects to all receptors and for all the compensation or resilience measures are therefore **not significant** in terms of the EIA Regulations (~~**Volume A1, Chapter 5:**~~**A1.5 Environmental Impact Assessment Methodology** (APP-011)).

The assessment provided in this document is based on the current understanding of the location, scope and nature of the proposed Compensation Measures. It should be noted, however, that ultimately, the Compensation Measures will not be consented through the Hornsea Four DCO application process and will be subject to (where necessary) standalone EIA and HRA processes as part of their own consenting process (for example a Marine Licence application and/or Planning Application). As part of that consenting process, further assessment work will be undertaken, based on refined design and methodology details.

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Glossary

Term	Definition
Area of Search	A term used to identify the locations for each of the proposed primary Compensation Measures.
Commitment	A term used interchangeably with mitigation and enhancement measures. The purpose of Commitments is to reduce and/or eliminate Likely Significant Effects (LSEs), in EIA terms. 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). Secondary commitments are incorporated to reduce LSE to environmentally acceptable levels following initial assessment i.e. so that residual effects are acceptable.
Compensation Commitment Register	An Excel spreadsheet which identifies all of the commitments identified for consideration when assessing/ implementing the proposed compensation measures. The compensation commitments relate to both onshore and offshore, and includes the construction, operation and decommissioning phases of development for the proposed Compensation Measures. Document reference: **Volume A4, Annex 6.4: Compensation Commitments Register** (Deadline 7 submission).
Compensation Impacts Register	An Excel spreadsheet which identifies all of the potential effects that the project team have identified that could possibly result from the construction, operation and decommissioning of the Compensation Measures, relating to each technical topic under consideration in the EIA process. See **Volume A4, Annex 6.3 Compensation Impacts Register** (Deadline 7 submission) for more details.
Compensation Measures	The measures that have been developed by the Applicant pursuant to the HRA Derogation Provisions "without prejudice" to the Applicants position of no Adverse Effect on Site Integrity at the Flamborough and Filey Coast in respect of the qualifying features. The Compensation Measures are: {offshore and onshore nesting; predator eradication; bycatch and fish habitat enhancement measures.} Each a Compensation Measure and together Compensation Measures.
Cumulative effects	The combined effect of Hornsea Four in combination with the effects from a number of different projects, on the same single receptor/resource. Cumulative impacts are those that result from changes caused by other past, present or reasonably foreseeable actions together with Hornsea Project Four.
Design Envelope	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.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Projects (NSIP).

Term	Definition
Effect	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 value, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
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 Impact Assessment (EIA) Report.
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.
Hornsea Project Four Offshore Wind Farm	The term covers all elements of the project (i.e. both the offshore and onshore). Hornsea Four infrastructure will include offshore generating stations (wind turbines), electrical export cables to landfall, and connection to the electricity transmission network. Hereafter referred to as Hornsea Four.
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.
Maximum Design Scenario (MDS)	The maximum design parameters of each Hornsea Four compensation measure (both on and offshore) considered to be a worst case for any given assessment.
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, or PEIR or ES).
Orsted Hornsea Project Four Ltd.	The Applicant for the proposed Hornsea Project Four Offshore Wind Farm Development Consent Order (DCO).
Planning Inspectorate (PINS)	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects (NSIPs).
SSSI	Site of Special Scientific Interest
TCE	The Crown Estate
UKHO	UK Hydrographic Office

Acronyms

Term	Definition
AA	Appropriate Assessment
AADT	Annual Average Daily Traffic
AEoI	Adverse Effect on Integrity
AfL	Agreement for Lease
AIAA	Areas of Intense Air Activity
AONB	Area of Outstanding Natural Beauty
AoS	Area of Search
AQMAs	Air Quality Management Areas
AWDS	Above Water Deterrents
BEIS	Department for Business, Energy & Industrial Strategy
BAP	Biodiversity Action Plan
CBRA	Cable Burial Risk Assessment
CCS	Carbon Capture and Storage
DBCB	Dogger Bank Creyke Beck
DCO	Development Consent Order
DP	Dynamic Positioning
ECC	Export Cable Corridor
ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
ES	Environmental Statement
FFC	Flamborough and Filey Coast
HEMS	health emergency medical services
HGV	Heavy Goods Vehicle
HRA	Habitats Regulations Assessment
IAQM	Institute of Air Quality Management
JNCC	Joint Nature Conservation Committee
JUV	Jack Up Vehicles
LAT	Lowest Astronomical Tide
LSE	Likely Significant Effect
LW	Low Water
MBES	Multi-Beam Echo Sounder
MCZ	Marine Conservation Zone
MDS	Maximum Design Scenario
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MPA	Marine Protected Area
NFFO	National Federation of Fisherman's Organisations
O&G	Oil and Gas
O&M	Operations and Maintenance
OOEG	Offshore Ornithology Export Topic Group
PEIR	Preliminary Environmental Information Report
PEMMP	Project Environmental Marine Management Plan
PINS	The Planning Inspectorate
PLA	Port of London Authority

Term	Definition
PSA	Particle Size Analysis
RIAA	Report to Inform Appropriate Assessment
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SoS	Secretary of State
SPA	Special Protection Area
SNCBs	Statutory Nature Conservation Bodies
SoS	Secretary of State
SPA	Special Protection Area
SSS	Side-Scan Sonar
TCE	The Crown Estate
TPOs	Tree Preservation Orders
UK	United Kingdom
UKHO	UK Hydrographic Office
UXO	Unexploded Ordnance
WSI	Marine Written Scheme of Archaeological Investigation

Units

Unit	Definition
dB	Decibel (sound pressure)
ft	Feet (distance)
Ha	Hectares (distance)
Hz	Hertz (frequency)
km	Kilometre (distance)
Km^2	Kilometre squared (distance)
m	Metre (distance)
m^2	Metre squared (distance)
nm	Nautical Mile (distance)

1 Introduction

1.1 Project Background

1.1.1.1 Orsted Hornsea Project Four Limited (hereafter the 'Applicant') is proposing to develop Hornsea Project Four Offshore Wind Farm (hereafter 'Hornsea Four'). Hornsea Four will be located approximately 69 km offshore the East Riding of Yorkshire in the Southern North Sea and will be the fourth project to be developed in the former Hornsea Zone. Hornsea Four will include both offshore and onshore infrastructure including an offshore generating station (wind farm), export cables to landfall, and connection to the electricity transmission network. Detailed information on the project design can be found in ~~Volume A1, Chapter~~ A1.~~4~~1~~:~~ Project Description (REP6-002), with detailed information on the site selection process and consideration of alternatives described in ~~Volume A1, Chapter~~ A1.3: Site Selection and Consideration of Alternatives (APP-009).

1.1.1.2 The Hornsea Four Agreement for Lease (AfL) area was 846 km^2 at the Scoping phase of project development. In the spirit of keeping with Hornsea Four's approach to Proportionate Environmental Impact Assessment (EIA), the project has given due consideration to the size and location (within the existing AfL area) of the final project that is being taken forward to Development Consent Order (DCO) application. This consideration is captured internally as the "Developable Area Process", which includes Physical, Biological and Human constraints in refining the developable area, balancing consenting and commercial considerations with technical feasibility for construction.

1.1.1.3 The combination of Hornsea Four's Proportionality in EIA and Developable Area Process has resulted in a marked reduction in the array area taken forward at the point of DCO application. Hornsea Four adopted a major site reduction from the array area presented at Scoping (846 km^2) to the Preliminary Environmental Information Report (PEIR) boundary (600 km^2), with a further reduction adopted for the Environmental Statement (ES) and DCO application (468 km^2) due to the results of the PEIR, technical considerations and stakeholder feedback. The evolution of the Hornsea Four Order Limits is detailed in ~~Volume A1, Chapter~~ A1.3: Site Selection and Consideration of Alternatives (APP-009) and ~~Volume A4, Annex~~ A4.3.2: Selection and Refinement of the Offshore Infrastructure (APP-037).

1.1.1.4 The Applicant has~~is~~ submitt~~ied~~ed~~ing~~ (September 2021) a DCO application to the Planning Inspectorate (PINS), supported by a range of plans and documents including an ES which sets out the results of the EIA of Hornsea Four and its associated infrastructure. The Applicant has~~is~~ also submitted~~ing~~ a Report to Inform Appropriate Assessment (RIAA) (B2.2: Report to Inform Appropriate Assessment (REP5-012; REP2-005; AS-013; REP1-012 and APP-171 – APP-178)~~APP-167 – APP-178~~) which sets out the information necessary for the competent authority (the Secretary of State (SoS) for the Department for Business, Energy & Industrial Strategy (BEIS)) to undertake an Appropriate Assessment (AA) to determine if there is any Adverse Effect on Integrity (AEoI) on the national site network as a result of the development of Hornsea Four (alone and or in-combination). Should the conclusion of that AA be AEoI (or there is uncertainty around this), that would raise the requirement for the Applicant to consider subsequent stages of the Habitats Regulation Assessment (HRA) process (typically referred to as the derogations), which brings a requirement, among other considerations, to secure compensatory measures.

1.1.1.5 In accordance with the Habitats Regulations, the RIAA ~~{~~**B2.2: Report to Inform Appropriate Assessment (REP5-012; REP2-005; AS-013; REP1-012 and APP-171 – APP-178)**~~}~~ considers whether Hornsea Four could result in an AEoI on a conservation site of European importance (European site). ~~The Applicant's evidence presented within the RIAA concluded that Hornsea Four will not have an AEoI on any European site.~~ The Applicant's RIAA concluded that Hornsea Four will potentially have an AEoI, in combination, on the kittiwake feature of the Flamborough and Filey Coast (FFC) SPA. No AEoI was concluded for all other European site features.

1.1.1.6 During the consideration of the DCO application for Hornsea Three Offshore Wind Farm (Hornsea Three), the SoS clarified the importance of i) identifying the potential for AEoI of designated sites during the pre-application period and ii) considering the need for derogation of the Habitats Regulations during examination, where there is potential for AEoI. The SoS further expected Applicants and Statutory Nature Conservation Bodies (SNCBs) to engage constructively during the pre-application period and on these matters, including possible compensatory measures, for consideration during examination. The SoS was clear that this does not require that an agreement is reached between the Applicant and the SNCBs on the potential for significant adverse impacts on designated sites, and that evidence relating to derogation can be provided on a "without prejudice" basis, as the final decision on such matters remains with the SoS.

1.1.1.7 As such, the Applicant is proposing a suite of Compensation Measures that could be implemented in the event that the SoS concludes that there would be an AEoI on the Flamborough and Filey (FFC) Coast Special Protection Area (SPA) as a result of Hornsea Four. These Compensation Measures are set out in a 'without prejudice' Derogation Case which forms part of the DCO Application (~~specifically **Volume A4 Annex**~~A4.~~6.1 Compensation Project Description~~ (Deadline ~~6~~7 submission)~~B2.5: Without Prejudice HRA Derogation Case (APP-182)~~). However, the Applicant has since revised its RIAA conclusion for kittiwake to AEoI in-combination. Therefore, t~~T~~he Compensation Measures presented remain "without prejudice", with the exception of those proposed for kittiwake ~~are proposed "without prejudice", to the Applicant's conclusion of no AEoI on the FFC SPA in the RIAA~~.

1.1.1.8 The potential Compensation Measures are set out in **Table 1** with further details on the measures set out in ~~**Volume A4 Annex**~~A4.~~6.1 Compensation Project Description~~ (Deadline ~~6~~7 submission~~B2.5: Without Prejudice HRA Derogation Case (REP1-014~~). The Compensation Measures are proposed to be located in numerous areas of the UK and beyond~~, including British dependency islands~~ (see **Figure 1**).

Table 1: Potential 'Without Prejudice' Compensation Measures for Hornsea Four.

Compensation Measure	Option	Location	Location ID	Kittiwake	Guillemot	Razorbill
Offshore nesting	New	Ssouthern North Sea (Area of Highest Ecological Potential)	A1			
Offshore nesting	Repurposed	Ssouthern North Sea (Wenlock platform)	A1			
Onshore nesting	New	Cayton Bay to Newbiggin by the Sea ~~Suffolk Coast~~	B1 ~~B2~~	- -	- -	- -
Bycatch	-	~~Thames Estuary~~ South coast of England~~:~~ ~~Broadstairs to Plymouth~~	~~C1~~ C2~~1~~~~12~~	- -	- -	- -
Predator eradication	-	~~Isles of Scilly~~ ~~Rathlin Island, Moyle,~~ ~~Northern Ireland~~ ~~Torquay, Devon~~ Bailiwick of Guernsey ~~and~~ ~~Alderney~~	~~D1~~ ~~D2~~ ~~D3~~ D1~~4~~	- - - -	- - - -	- - - -
Fish habitat enhancement[2]	Seagrass	~~Rathlin Island, Moyle,~~ ~~Northern Ireland~~ ~~Isles of Scilly~~ ~~Celtic Sea, Wales~~ ~~Plymouth Sound to Helford~~ ~~River~~ ~~Solent~~ ~~Essex Estuaries~~ Humber Estuary	~~E1~~ ~~E2~~ ~~E3~~ ~~E4~~ ~~E5~~ ~~E6~~ E1~~7~~	- - - - - - -	- - - - - - -	- - - - - - -

[2] Fish habitat enhancement is a resilience measure to support the compensation measures.

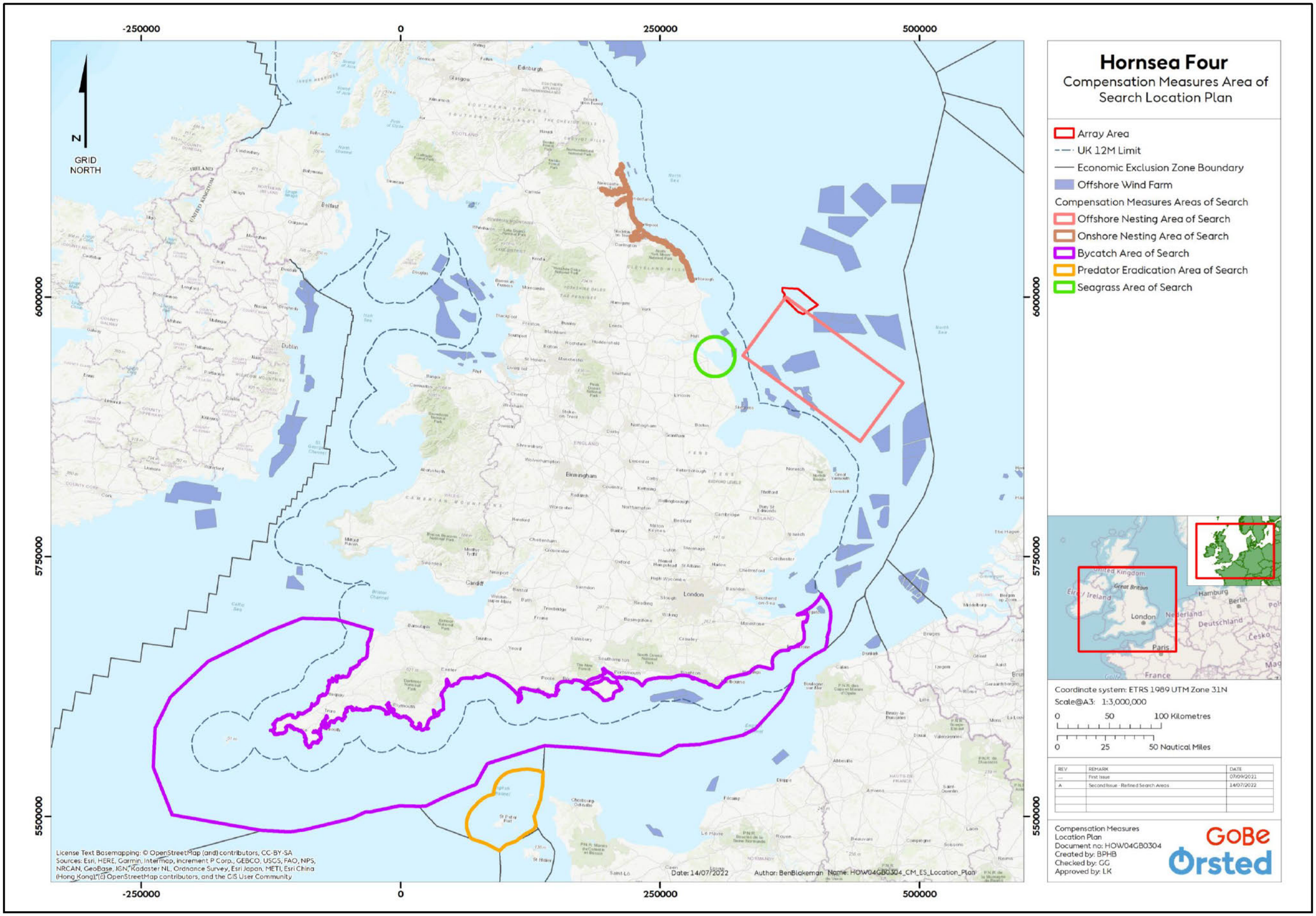


Figure 1: Compensation Measures Areas of Search Location Plan.

1.2 Purpose of this Document

1.2.1.1 In order to consider the environmental impacts associated with the implementation of the proposed Compensation Measures, this Annex to the Hornsea Four ES has been produced (hereafter 'the Compensation Measures EIA'), accompanied by a Habitats Regulations Assessment (~~**B2.2.2 Compensation Measures HRA Plan**~~ **B2.2.2** ~~**Volume B2 Annex**~~ **Habitats Regulations Assessment Compensation Measures** (Deadline ~~6~~7 submission~~REP5-015 and APP-180) Part 1~~ – 'the Compensation Measures HRA'). The focus of the EIA is on the assessment of the likely significant environmental effects.

1.2.1.2 The assessment provided in this document is based on the current understanding of the location, scope and nature of the proposed Compensation Measures. It should be noted, however, that ultimately, the Compensation Measures will not be consented through the Hornsea Four DCO application process and will be subject to (where necessary) standalone EIA and HRA processes as part of their own consenting process (for example a Marine Licence application and/or Planning Application). As part of that consenting process, further assessment work will be undertaken, based on refined design and methodology details.

1.3 Structure of this Document

1.3.1.1 This Compensation Measures EIA is set out in a number of stages as follows:

- Policy and Legislation (**Section 2**)
- Consideration of Alternatives (**Section 3**);
- A brief summary of the potential Compensation Measures for Hornsea Four (**Section 4**);
- Consultation (**Section 5**);
- A brief summary of the EIA Methodology used for the assessment (**Section 6**);
- An EIA section for each Compensation Measure (**Section 7** to **12~~0~~**), with each section containing the following sections:
  - Baseline – a summary of the baseline environment for each Area of Search (AoS);
  - Assessment – identification of impacts and associated assessment.
- Conclusions (**Section 13~~0~~**); and
- References (**Section 14**).

2 Policy and Legislation

2.1.1.1 ~~**Volume A1, Chapter 2:**~~**A1.2 Planning and Policy (APP-008)** of the Hornsea Four ES sets out the international, national, region and local planning policy context in relation to Hornsea Four and the EIA process. This detail is also relevant to the Compensation Measures EIA (to the extent they are located in areas where the policy applies e.g. national policy) and as such, not repeated within this Annex. Policies specific to each EIA topic are outlined in **Volume A2, Chapter 1** to **12 (APP-013 – APP-017; REP5-004; REP5-006** and **APP-020 – APP-024)** for offshore topics and **Volume A3**, **Chapter 1** to **10 (APP-025 – APP-026; AS-008** and **APP-028 – APP034)** for onshore topics. Regional and local planning policies for each Compensation Measure will be considered further via the relevant consenting process (as appropriate) once final details on location are known.

3 Consideration of Alternatives

3.1.1.1 This section outlines the process undertaken by the Applicant to site selection and consideration of alternative measures and alternative site/locations for their delivery. The scope of the consideration of alternatives relates specifically and directly to the compensation measures for kittiwake, *Rissa trydactyla*~~,~~ and large auks (common guillemot – hereafter guillemot, *Uria aalge,* and razorbill, *Alca torda*)~~, and gannet, *Morus bassanus,*~~ at Flamborough and Filey Coast Special Protection Area (FFC SPA).

3.1.1.2 An important part of the Hornsea Four development process is the consideration of potential options, selection and the subsequent refinement of compensation options and their delivery. Well informed decisions on the selection and consideration of alternatives are critical and Hornsea Four recognise the need to ensure consultees and stakeholders understand how such decisions have been made.

3.1.1.3 In spring 2020, the Applicant commenced a process to identify compensation measures to inform the 'without prejudice' Derogation Case. Initially a long list of potential options was drawn up (see **Annex B2.6.1: Compensation measures of the FFC SPA: Compensation Criteria (AS-018)**. The draft long-list was presented to stakeholders at a workshop on 24th June 2020 (see **B2.9: Record of Consultation (APP-201)**). The initial long list for kittiwakes and ~~auks~~ guillemot and razorbill are presented in **Table 2** and **Table 3** respectively.

Table 2: Long list of compensation options for kittiwake.

Habitat creation	i: Construction of an ONSHORE artificial ~~structures~~structure to encourage a new kittiwake colony outside of FFC SPA at a location lacking suitable nesting habitat (and preferably near to foraging ground and away from OWFs).
	ii: Construction of an OFFSHORE artificial ~~structures~~structure to encourage a new kittiwake colony outside of FFC SPA at a location lacking suitable nesting habitat (and preferably near to foraging ground and away from OWFs).
	iii: Creation of area of seabed habitat for prey spawning or nursery ground combined with management measures (potentially also to accommodate and mitigate effects of climate change on stocks) to boost prey stocks
Reserve creation	i: Designation of new marine SPA in important offshore foraging location.
Species recovery	i: Eradication of American mink from an island important to/used by kittiwake using trapping or poisoning techniques.
	ii: Eradication of feral cat from an island important to/used by kittiwake using trapping/ lethal technique.
	iii: Eradication of rat (brown rat and or black rat (and house mouse) from an island colony using trapping or poisoning techniques.
	iv: Exclusion of foxes from a colony using anti-predator fencing
	v: Exclusion of great skua from a buffer zone around a kittiwake colony
Incentives/ disincentives for certain activities	i: Management of recreational pressure at the FFC SPA (or another SPA)
	ii: Sandeel fishery exclusion zone
	iii: Sandeel fisheries exclusion zone within the Hornsea Project Four array area
	iv: Purchase of a sandeel fishery quota
	v: Work with ICES (and relevant key stakeholders) to change the sandeel quota for this region of the North Sea based on an ecosystem approach to management

Table 3: Long list of compensation for guillemot and razorbill~~auk~~.

Species recovery	i: Eradication of rats from an island colony of guillemot and razorbill using rodent traps or poisoned bait.
Habitat creation	i: Encourage establishment of a new colony in an area close to heightened prey availability using models and call playback.
	ii: Creation of area of seabed habitat for prey spawning or nursery ground combined with management measures (potentially also to accommodate and mitigate effects of climate change on stocks) to boost prey stocks
Incentives/ disincentives for certain activities	i: Sandeel and sprat fishery exclusion zone.
	ii: Sandeel and sprat fisheries exclusion zone within the Hornsea Project Four array area.
	iii: Purchase of a sandeel and sprat fishery quota.
	iv: Sandeel and sprat fisheries exclusion in wintering areas.
	v: Work with ICES (and relevant key stakeholders) to change the sandeel quota for this region of the North Sea based on an ecosystem approach to management
Reserve creation	i: Designation of new marine SPA at important offshore foraging location.
Reduction of other threats and pressures	i: Reduce bycatch.

3.1.1.4 The long list was presented to stakeholders in autumn 2020, with stakeholder agreement that there were no exclusions from the long list (see **B2.9: Record of Consultation (APP-201)**). ~~A long listing exercise was also completed for gannet. However, following discussions with stakeholders it was determined that there were no other options we should be considering for compensation, therefore the conclusions of the measures to take forward for kittiwake and large auksguillemot and razorbill are feasible and appropriate for gannet as well.~~

~~3.1.1.4~~3.1.1.5 In order to evaluate the potential compensation measures in a robust and transparent manner, each of the options were evaluated against a set of criteria. The criteria are described in full in Table 3 of **B2.6.1 (APP-184)**, and summarised below[3]:

- Targeted - The compensatory measures must address the issue specifically;
- Effective – The compensatory measures must be feasible in reinstating the ecological conditions needed to ensure the overall coherence of the national site network;
- Technical feasibility – The technical feasibility of the measure taking into account requirements of the ecological features to be reinstated;
- Extent of compensation – The extent required for the compensatory measures to be effective is directly related to the quantitative and qualitative aspects inherent to the elements of integrity;
- Location of compensation - Compensatory measures should be located in areas where they will be most effective in maintaining the overall coherence of the National Site Network (note general agreement to be as close to the impacted site as feasibly possible);
- Timing of compensation – The timing of the compensation is difficult to specify and should be adapted using a case-by-case approach, and;
- Long-term implementation – The compensatory measures require a legal and financial basis for long-term implementation as well as for the protection, monitoring and maintenance of the site/species.

[3] Guidance criteria was built upon Defra Compensatory Measures guidance: Best practice guidance for developing compensatory measures in relation to Marine Protected Areas (defra.gov.uk)

~~3.1.1.5~~3.1.1.6 The application of the criteria to the long list options is referred to as "short-listing" and was undertaken to evaluate selected compensation measures in more detail and to decide which measures to advance. The results of this short-listing exercise were presented to stakeholders in autumn 2020 (see **B2.9: Record of Consultation (APP-201)**).

~~3.1.1.6~~3.1.1.7 The most promising options for compensation of kittiwakes were identified as:

- Habitat creation (onshore);
- Incentives/ disincentives for certain activities (change the sandeel quota);
- Habitat creation (offshore); and
- Species recovery (rat eradication).

~~3.1.1.7~~3.1.1.8 The most promising options for compensation of guillemot and razorbill were:

- Reduction of other threats and pressures (bycatch reduction);
- Species recovery (rat eradication);
- Incentives/ disincentives for certain activities (change the sandeel quota); and
- Incentives/ disincentives for certain activities (sandeel and sprat fishery exclusion zone).

~~3.1.1.8~~3.1.1.9 Despite the options of many different compensation measures, they vary in feasibility. The Applicant therefore took forward the following compensation measures for inclusion in the derogation case, as a result of the short-listing process combined with stakeholder feedback on the potential measures:

- Kittiwake:
  - ~~o~~
  - Onshore artificial ~~structures~~structure;
  - Offshore artificial ~~structures~~structure; and
  - Habitat creation – seagrass restoration.
- ~~•~~
- Guillemot and razorbill:
  - Bycatch reduction;
  - Predator eradication; and
  - Habitat creation - seagrass restoration.

~~Following consideration by the Applicant in light of the the SoS's recommendation for inclusion of compensation measures where there is no agreement on AEoI with the SNCB, further discussion, it was agreed compensation options arwould be presented for gannet due to the potential risk of AEoI identified by stakeholders. The Applicant is confident in their position of no AEoI on gannet and confirmation of this position by the SNCB by the end of examination. Notwithstanding, tTwo options were selected by the Applicant following further desk based study:~~

- ~~Artificial nesting structure for gannet (to be delivered as a joint structure for both kittiwake and gannet; and~~
- ~~Bycatch reduction of gannet in commercial fisheries.~~

~~3.1.1.9~~3.1.1.10 Areas of Search (AoS) have been identified for each Compensation Measure, with these shown in **Figure 1.** These AoS range from small areas around islands or discrete sections of coastline, to larger areas spanning large areas of sea and coastlines. The AoS identification process is detailed for each compensation measure in ~~**Volume A4, Annex**~~**A4. 6.1: Compensation Project Description** (Deadline ~~6~~7 submission~~APP-057~~). Information on the consultation undertaken as part of the process to date is presented within ~~**Volume B2, Annex**~~ **B2.9 Record of Consultation (APP-021)**. As noted above, the extent of the AoS remains broad to incorporate sub-options and numerous locations which will be refined as the process progresses.

4 Project Description

4.1 Project Description

4.1.1 Introduction

4.1.1.1 The project description is presented for each Compensation Measure as a Maximum Design Scenario (MDS), in line with the approach taken in the ES and the RIAA. This approach ensures that the scenario(s) that would have the greatest impact, relevant to the AoS and the Compensation Measure under consideration, is identified and assessed. As a result, we can be confident that any other (lesser) scenario(s) will have an impact that is no greater than that assessed.

4.1.1.2 The following sections provide a description of the design and methodologies related to each of the proposed Compensation Measures referenced in **Table 1** and summarised below, presented as an MDS. These descriptions set out the design and components for any infrastructure, as well as the activities associated with the installation/ construction, implementation/ operation/ maintenance, and decommissioning of each Compensation Measure (where relevant). Further details on these measures can be found in ~~**Volume A4, Annex**~~A4.~~ 6.1: Compensation Project Description~~ (Deadline ~~6~~7 submission~~APP-057~~). The Compensation Measures are as follows:

- Offshore Artificial Nesting Structure (New and Repurposed);
- New Onshore Artificial Nesting Structure;
- Bycatch Reduction Technology;
- Predator Eradication; and
- Resilience Measure – Fish Habitat Enhancement (Seagrass).

4.1.2 Areas of Search (AoS)

4.1.2.1 As noted above, AoS have been refin~~identifi~~ed for each Compensation Measure, with these shown in **Figure 1**. These AoS range from small areas around islands or discrete sections of coastline, to larger areas spanning large areas of sea and coastlines. These have been identified and the AoS identification process is detailed for each compensation measure in ~~**Volume A4, Annex 6.1:**~~**A4.6.1 Compensation Project Description** (Deadline ~~6~~7 submission)~~**(APP-057)**~~. Information on the consultation undertaken as part of the process to date is presented within ~~**Volume B2, Annex 9**~~**B2.9 Record of Consultation (APP-201)**. Consultation has continued throughout the E~~e~~xamination processes which has facilitated and supported the refinement process. As noted above, the extent of the AoS remains broad but will be refined as the process progresses. The individual AoS for each Compensation Measure are shown in figures following each MDS.

4.1.3 Compensation Measures Commitments

4.1.3.1 All Commitments relevant to the Compensation Measures EIA~~HRA~~ are detailed in ~~**Volume A4, Annex** A4~~.6.4: Compensation Commitments Register (Deadline ~~6~~7 submission)~~**(APP-060)**~~.

4.1.4 Compensation Measures Programme

4.1.4.1 The high-level anticipated programme (may be subject to change) presented below is applicable to the implementation and delivery of all Compensation Measures:

- Hornsea Four development consent determination – 2022/23;
- Compensation implementation licencing – 2022/24;
- Compensation implementation – 2023/24;
- Offshore construction of Hornsea Four Foundations– 2026;
- Offshore construction of Hornsea Four Turbines– 2027; and
- First Power (partially operational windfarm) – 2028.

4.1.4.2 Implementation of compensation measures will be subject to successful progression of the Hornsea Four project. The timing of implementation of individual compensation measures are provisional as the timeframe for Examination, consent award, reaching final investment decision (FID) and Contracts for Difference (CfD) Allocation Round Five, have not yet been set. The programme has been carefully considered to ensure timely delivery of the compensation measure.

4.1.4.3 The requirement for, and the exact nature of, the decommissioning of the Compensation Measures will be determined in consultation with the relevant authorities towards the end of the 35-year operational life of Hornsea Four. The Applicant will design the bird nesting ~~structures~~structure for a design life equal to that of the windfarm (i.e. 35 years plus 4 years to establish the compensation measures, pre-wind farm operation). Therefore, the lifetime of the structure is approximately 39 years. In the final few years of wind farm operation, the Applicant will commence inspections and surveys of the bird nesting ~~structures~~structure to determine if an extension of the lifetime is possible.

4.1.4.4 It is currently anticipated that both the predator eradication and bycatch measures implementation will result in new management practices which shall continue for the lifetime of Hornsea Four. Fish habitat enhancement (seagrass) compensation measure sites will be left in perpetuity.

4.1.5 Offshore Artificial Nesting Structure (New and Repurposed)

4.1.5.1 The provision of a new ~~and/~~or repurposed artificial nesting site~~s~~ is presented as a potential Compensation Measure for the black-legged kittiwake (*Rissa trydactyla*) (referenced throughout as kittiwake)~~ and northern gannet (*Morus bassanus*) (referenced throughout as gannet)~~.

4.1.5.2 Kittiwake have been observed readily (APEM 2021 and NIRAS 2021) utilising man-made structures. As such, the provision of an offshore artificial nest site to increase the annual recruitment of kittiwake into the regional population of the southern North Sea. Evidence supporting the measure ~~for gannet (and kittiwake in greater detail)~~ is presented within the Applicant's ecological evidence reports (**B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187), B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189)**). This is considered a potential primary Compensation Measure relating to in-combination collision effects during the operation and maintenance phase of Hornsea Four on the kittiwake ~~and gannet~~ population designated at the FFC SPA. The aim of the Compensation Measure is to provide one structure that can collectively sustain a breeding population of ~~both~~ kittiwake ~~pairs and gannet~~, which would produce sufficient breeding adults to compensate for the estimated impact of Hornsea Four.

4.1.5.3 The Applicant is considering two options by which to achieve this:

- Repurposing an existing oil and gas platform (Wenlock platform)~~(s)~~ that is due for decommissioning (preferred option); or
- Construction of a new offshore nesting structure (within the Area of Highest Ecological Potential).

4.1.5.4 The Area of Search for offshore artificial nesting ~~structures~~structure (both new and repurposed ~~structures~~structure) is shown in **Figure 1** and set out within the **B2.7.2 Compensation measures for Flamborough and Filey Coast (FFC) Special Protection Area (SPA): Kittiwake Offshore Artificial Nesting Roadmap** (~~REP5-018~~submitted at Deadline 7)**.** The site selection process for the~~se~~ offshore ~~structures~~structure is outlined in the ~~Without Prejudice~~ Derogation Case (specifically **B2.7.5~~1~~ Compensation measures for FFC SPA: ~~Offshore~~ Artificial Nesting: Site Selection and Design~~Ecological Evidence~~ (APP-191)**). The purpose of the site selection process has been to identify an area, or existing structure (e.g., an oil and gas platform), to host an artificial nesting structure~~ites~~ that will be occupied by new recruits that will contribute to an increase of breeding adults to the ~~Southern North Sea kittiwake~~relevant biogeographic population. The principles influencing optimal site selection include:

- Locations with connectivity to the relevant biogeographic ~~Eastern Atlantic kittiwake~~ population – based within the North Sea;
- Locations with proximity to reliable food resources – close to sea fronts (e.g. southern North Sea); and
- Locations with proximity to growing kittiwake colonies – near to known offshore sites with colonies of kittiwake (e.g., southern North Sea oil and gas platforms).

4.1.5.5 Ongoing consultation will involve conservation and ornithological groups with local knowledge and expertise. Updates on progress on the site selection are presented within the **B2.7.2 Compensation measures for Flamborough and Filey Coast (FFC) Special Protection Area (SPA): Kittiwake Offshore Artificial Nesting Roadmap** (submitted at Deadline 7). Post-consent, a steering group named the Offshore Ornithology Engagement Group (OOEG) would be convened by the Applicant to consult on the implementation, reporting and any necessary adaptive management of the structure as determined by the Applicant. The OOEG will aim to incorporate relevant stakeholders and ultimately inform the Kittiwake Compensation Implementation and Monitoring Plan (KCIMP). ~~The detail of the continued site selection process will be presented within **B2.7.6: Outline Kittiwake Compensation Implementation and Monitoring Plan (REP5-024)** that will be developed in consultation with relevant stakeholders (through the Hornsea Four OOEG).~~

New offshore artificial nesting structure

4.1.5.6 For the purpose of the assessment, a maximum design scenario of a single ~~up to two~~ new offshore artificial nesting ~~structures~~structure is ~~are~~ considered, to be installed on one of the following foundation types, noting that the requirement for new offshore ~~structures~~structure, ~~their number and~~ location, and the exact foundation type are yet to be determined:

- Monopile;
- Mono-suction bucket;
- Gravity based foundation;
- Piled jacket; or
- Suction bucket jacket.

4.1.5.7 The overall design of a topside nesting structure is flexible, as long as suitable narrow nesting ledges are present for the ~~re~~ areas intended for kittiwake. A summary of the key features an offshore platform for nesting might include is provided below for kittiwake ~~(with an outline process for gannet with associated preliminary designs provided within **G5.19 Compensation measures for Flamborough and Filey Coast (FFC) Special Protection Area (SPA): Gannet Artificial Nesting: Roadmap (REP5-073)**)~~:

- High and steep sided structure, narrow horizontal ledge for nests, small overhang above nest;
- Inaccessible to predators, which offshore would primarily be large gulls;
- Some shelter from high winds and other adverse weather conditions; and
- May include a shelter and potentially CCTV to enable monitoring of the seabirds.

4.1.5.8 The new offshore artificial nesting structure will likely be installed in two stages, firstly the foundation will be installed, and secondly the topside will be lifted from a jack -up vessel (JUV) onto the foundation. Some form of seabed preparation (boulder and sandwave clearance), unexploded ordnance (UXO) clearance and scour protection may be required for the foundations.

4.1.5.9 The maximum design scenario parameters for a new offshore nesting structure is presented below in **Table 4**.

Table 4: Maximum design parameters for a new offshore nesting platform.

Parameter	Maximum design parameter
Number of offshore nesting platforms	1~~2~~
Topside structure length (m)	25
Topside structure width (m)	25
Topside structure height (m above LAT)	20
Topside thickness (from topside to upper level of foundation) (m)	10
NOTE: Foundation dimensions are dependent on topside dimensions. Which in turn are dependent upon the design of the final topside, which is dependent upon the number of kittiwakes to be compensated.	

4.1.5.10 Full details regarding the potential development can be found in ~~**Volume A4, Annex** A4. 6.1:~~ **Compensation Project Description** (Deadline ~~6~~ 7 submission).

Repurposed offshore artificial nesting structure

4.1.5.11 The Applicant could utilise a single existing offshore platform (potentially an existing oil and gas structure or similar), and use the foundation to either design, construct and install a new topside once the existing topside structure has been removed and decommissioned or repurpose the existing topside structure by adding additional nesting ledges.

4.1.5.12 The topside of the repurposed structure will be up to 19 m above LAT, up to 16 m long, and 13 m wide. The topside design will follow the same principles as outlined in **Table 4**.

4.1.5.13 Foundation installation is not required if repurposing an existing offshore platform. However minor modifications to the existing offshore platform foundation may be required. Foundation repurposing installation activities could include repairs, modifications, or reinforcement of existing foundation infrastructure. All modifications would be undertaken using either or a combination of Dynamic Positioning (DP) and JUV vessels.

4.1.6 New Onshore Artificial Nesting Structure

4.1.6.1 The Applicant is proposing an onshore artificial nesting structure for kittiwake if during Examination, the Secretary of State considers that an alternative (to a preferred repurposed or new offshore nesting) measure is required to the proposed primary measures outlined in **Section 4.1.5**. The approach to site selection and design are primarily driven by ecological/habitat requirements of the ornithology interests to increase the likelihood of colonisation and ensure the success of the ~~structures~~structure. The onshore artificial nesting structure~~s~~structure ~~structure~~ will be located within the C~~l~~ayton Bay to Newbiggin by the Sea Area of ~~one of two~~ S~~s~~earch (B1) ~~zones~~. The Area~~s~~ of Search for an onshore artificial nesting ~~structures~~structure (either ~~both~~ new or ~~and~~ repurposed ~~structures~~structure) is shown in **Figure 1**. Updates on the site selection for on onshore nesting structure have been provided in **B2.7.4 Compensation measures for FFC SPA: Kittiwake Onshore Artificial Nesting Roadmap** (submitted at Deadline 7) and in **G6.3 Kittiwake Onshore Artificial nesting Structure Site Selection and Evidence on Nesting Limitations update (REP6-031)**.

4.1.6.2 The structure will be designed to accommodate the level of compensation required for ~~both~~ kittiwake ~~and gannet with greater proportion of the capacity available for kittiwake, relative to gannet (i.e. 80% kittiwake nests to 20% gannet nests; the exact ratio to be determined)~~ and will accord with the design principles and indicative maximum parameters set out below.

4.1.6.3 The design principles for an onshore artificial nesting ~~structures~~structure are subject to significant further development; however, design principles of direct relevance to the size or appearance of the ~~structures~~structure are as follows:

- Steep sided with a near vertical back wall and narrow horizontal ledges.
- Located close to water, facing out to sea (i.e. nest adjacent to/above harbour waters/sea).
- Inaccessible to predators (additional anti-predation features may be required at some sites
  – e.g. fences/ barriers to deter mammalian predators (e.g. foxes and rats) and dependent
  on design bird spikes may be required as avian predator deterrents).
- Nesting ledges located above the level of highest astronomical tide and beyond the reach of wave or tidal action.
- Adequate ledge dimensions: Horizontal ledges 20 cm width; length per pair from 30 cm (working length 40 cm); and height between ledges at a minimum of 40 cm and maximum of 60cm. (Note these may be subject to change based on feedback from the stakeholders during detailed design).
- Minimum height at which the lowest shelves should begin depends whether the structure is located directly over water or set back slightly, as well as the level of human disturbance anticipated.
- Overhang/roof to buffer against weather conditions as to act as and additional predator deterrents.
- Vertical wall leaning slightly forward (working angle of 5°; to minimise lower ledges becoming fouled by droppings and reduce predation risk).
- Using materials which are in-keeping with the structure's surroundings whilst ensuring they meet the requirements of kittiwake's natural habitat as much as possible.
- Higher ledges could be wider than lower ledges (to prevent lower ledges becoming fouled by droppings) (BTO Field Guide No. 23, du Feu (2015)). However, wider upper ledges may increase predation risk/ allow non target species to nest.

Construction

4.1.6.4 The construction of the onshore artificial nesting ~~structures~~structure depends on whether the structure comprises a building, or prefabricated structure (dependant on monitoring and access requirements for tagging). Building construction works, are anticipated to comprise:

- Site preparation works, including vegetation clearance (if required), erection of site fencing and small-scale enabling works;
- Establishment of a site compound and temporary site infrastructure, including a site cabin and welfare facilities;
- Delivery of construction materials and equipment;
- Installation of necessary foundations (to be confirmed, dependant on detailed design and site location); and

- Construction of the nesting ~~structures~~structure on-site, methodology of which is dependent on the materials to be used (to be agreed as part of detailed design). Materials used for the building may comprise concrete, wood, or metal).

4.1.6.5 Prefabricated structure construction works are anticipated to comprise:

- Site preparation works, including vegetation clearance (if required), erection of site fencing and small-scale enabling works;
- Establishment of a site compound and temporary site infrastructure, including a site cabin and welfare facilities;
- Delivery of pre-fabricated components of the nesting ~~structures~~structure and equipment;
- Installation of necessary foundations (to be confirmed, dependant on detailed design and site location); and
- Assembly and i~~I~~nstallation of the nesting ~~structures~~structure on-site, methodology of which is dependent on the materials to be used (to be agreed as part of detailed design). Materials used for the pre-fabricated structure may comprise wood or metal.

4.1.6.6 Construction is anticipated to comprise a maximum of 10 Annual Average Daily Traffic (AADT) Heavy Goods Vehicle (HGV) movements (subject to detailed design). The site may require a temporary construction access track (dependant on site location), using crushed aggregate on geo-textile, soil stabilisation or temporary trackway. The access track will be 10 m wide, comprising 6m wide road (with 7 m wide passing places) and additional width for topsoil storage. The maximum depth of the access track would be 1 m.

4.1.6.7 A temporary logistics compound may be required and the dimensions of which would be approximately 70x70 m.

Operation

4.1.6.8 Once the construction of the onshore artificial nesting structure is complete, the site will be secured using fencing and the ~~structures~~structure will be operational. Whilst operational activities are under development, **Table 5** outlines some design principles that may be of relevance, dependant on stakeholder input and detailed design consideration.

Table 5: Onshore nesting structure design principles.

Importance	Principle Description
Optimising monitoring	Capacity for remote monitoring devices e.g. cameras to be fitted to the structure. Ideally these would need to provide coverage of all available ledges at a sufficiently high resolution to monitor individual nests and their contents e.g., chicks and eggs, to be inspected.
Optimising monitoring / essential at some sites	Complex monitoring, to include: • Internal access; • Enclosed ~~structures~~structure where the personnel monitoring within would be hidden from view, including to birds flying above and therefore minimising any disturbance; • Either with hatches to allow access from behind/within the structure to individual nests by suitably qualified ornithologists undertaking monitoring works; • And / or one-way glass to allow observations to be made from interior/back of structure; • Capacity for additional monitoring equipment to be accommodated within/on the structure (nice to have, not essential); and

Importance	Principle Description
	• Sanitation facilities (requirement to be determined).
Desirable (a, d) Optimising success (b, c, e)	Capacity for the structure to be modified to facilitate adaptive management design features after they have been operational for some time and if required. These may include: • Extension of structure to facilitate further nesting spaces. This would require either sufficient space to expand (laterally or vertically) or designed-in expansion points – for example a modular structure which can be extended; • Relocation of nesting structure. This would require straightforward assembly of components and potential to disassemble, balanced against longevity and stability of the structure; • Additional protection from elements e.g. wind/weather shield location points; • Enhanced predator deterrent e.g. straightforward roof and fencing maintenance, including opportunities to add avian predator deterrents; and • Provision of nesting material, such as seaweed. This would require additional protected space around or under the structure.

4.1.6.9 The number of monitoring visits is anticipated to be low, accessing the site on foot where possible. It is acknowledged that the location of the nesting structure is to be determined. Therefore, noise and odour levels are to be determined during detailed design phase once the proximity to local communities has been calculated. This is anticipated to be post-consent of Hornsea Four.

4.1.6.10 Monitoring and maintenance activities could theoretically comprise the following:

- Removal of kittiwake guano from structure and appropriate disposal;
- Remedial works to structure (i.e. storm damage to nesting ledges);
- Ensuring structure is structurally sound;
- Changing batteries used for speakers playing kittiwake calls; and
- Removal of litter, graffiti or any objects deemed hazardous to kittiwakes.

4.1.6.11 Further project description details in relation to new onshore artificial nesting ~~structures~~structure can be found in **Volume A4, Annex 6.1: Compensation Project Description** (Deadline ~~6~~7 submission)**~~(APP-057)~~**.

4.1.7 Bycatch Reduction Technology

4.1.7.1 The implementation of bycatch reduction technology is presented as a potential Compensation Measure for guillemot ~~*(Uria aalge)*~~ and razorbill ~~*(Alca torda)*~~in relation to gillnet bycatch ~~and gannet in relation to longlining fisheries~~.

4.1.7.2 Bycatch, which is the incidental capture of non-target species in fisheries, can present a significant pressure on seabird populations (Miles et al. 2020). Within recent decades, seabird populations have plummeted, largely due to commercial fisheries (direct competition and bycatch) (Croxall et al. 2012). Monitoring of the issue is extremely low with onboard observer monitoring coverage relatively low compared to the number of fishing vessels (Pott and Wiedenfeld 2017). To mitigate against the number of seabirds, specifically razorbills and guillemots that may be at risk of displacement, the Applicant proposes to support the overall numbers of these birds through the reduction of bird bycatch in selected UK fisheries with connectivity to the populations from FFC SPA.

~~4.1.7.2~~

4.1.7.3 ~~For guillemot and razorbill,~~ T~~t~~he reduction of bird bycatch will be achieved through the use of additional deterrent equipment attached onto fishing gear. Different bycatch reduction techniques are more suited to specific fishing gear types and specific target bycatch species of birds. The proposed bycatch reduction methods being considered as a package of compensation measures are above water deterrents (AWDs), net lights, and net panels.

4.1.7.4 Potential fisheries with reported bird bycatch and population connectivity with the FFC SPA include the ~~UK~~ South coast of England~~, Cornwall,~~ and the Thames Estuary. ~~All of these locations~~The south coast ~~are being considered for~~~~were~~as included within the Applicant's ~~potential~~ bycatch reduction trails (presented within the Applicant's **G5.13 Bycatch Reduction Technology Selection Phase Summary report (REP5-068)**. The South coast of England will also be considered in future data collection and future implementation. Specifically, bycatch hotspots have been identified in both the South East and South West of the UK, along with reports of bird bycatch at other locations along the south coast and in the Thames Estuary. The AoS for bycatch ~~bycatch~~ reduction technology is shown in **Figure 1**; these depict areas where fishing takes place and where bycatch reduction trials may be targeted.

Fishery selection

4.1.7.5 Current research suggests that gillnetting, depending on location and seasonality, suffers high levels of bird bycatch (Northridge et al. 2020). As such, many of the bycatch reduction types currently available are focussed on bycatch from gillnets. This Compensation Measure will therefore include bycatch reduction of bird bycatch from gillnet fisheries. There is less evidence to support the contribution of other fishing methods on bycatch, including mid-water trawl bycatch. Evidence gathering by the Applicant is ongoing for mid-water trawl bycatch, however, there is not currently enough evidence to demonstrate the efficacy of above water deterrents as bycatch reduction for mid-water trawls at the moment. ~~However, currently all above bycatch reduction methods are being considered for mid-water trawling.~~

4.1.7.6 From April to July (breeding season), both guillemot and razorbill are located tightly around their colonies (around the coasts of the UK except for the Humber to the Isle of Wight). Outside of the breeding season, both species move further offshore, then start moving south. By December both species are located offshore around all UK coasts. As seabird distributions change throughout the year, it is likely that bycatch rates will also vary as higher seabird densities increase the bycatch risk (Bradbury et al., 2017). It is therefore important to evaluate temporal variations when identifying areas of high bycatch vulnerability for the purpose of planning bycatch reduction measure locations.

4.1.7.7 Potential fisheries with reported bird bycatch and population connectivity with the wider site network and include the UK South coast, Cornwall, and the Thames Estuary. All of these locations are ~~being~~ included within the Applicant's potential bycatch reduction trails (~~preliminary first year result provided within the Applicant's~~see **G5.13 Bycatch Reduction Technology Selection Phase Summary (G5.13)** ~~report).considered for potential bycatch reduction trails and future implementation.~~). Bycatch hotspots have been identified in both the South East and South West of the UK, along with reports of bird bycatch at other locations along the south coast and in the Thames Estuary.

Above Water Deterrents

4.1.7.8 AWDs are typically ~~structures~~structure fixed to buoys or markers attached to set fishing gear, which work to scare birds away from fishing nets. Current nets are often made from monofilament nylon, which is nearly invisible to seabirds underwater and so the aim of deterrents is to deter birds from approaching the nets and becoming entangled. Specifically, the proposed AWD is a L~~l~~ooming E~~e~~yes B~~b~~uoy (LEB), which is comprised of a floating buoy, topped by a long stick and a marker on the top that includes an eye-like pattern (**Figure 2**). The aim of the buoy is to work like a scarecrow in scaring birds away from nets. The eye design on the top panel may mimic deterrent eye patterns found in nature, whilst the bobbing and spinning of the buoy will result in a "looming" effect over the birds, thus deterring them from approaching the buoys. They are not designed to make any noise or light and are attached to the fishing equipment already in place. ~~Looming eye buoy~~LEB formed the basis of the Applicant's bycatch reduction trial (preliminary first year result provided within the Applicant's **G5.13 Bycatch Reduction Technology Selection Phase Summary report (REP5-068)**). ~~No additional vessel presence and/or movement or equipment is required.~~

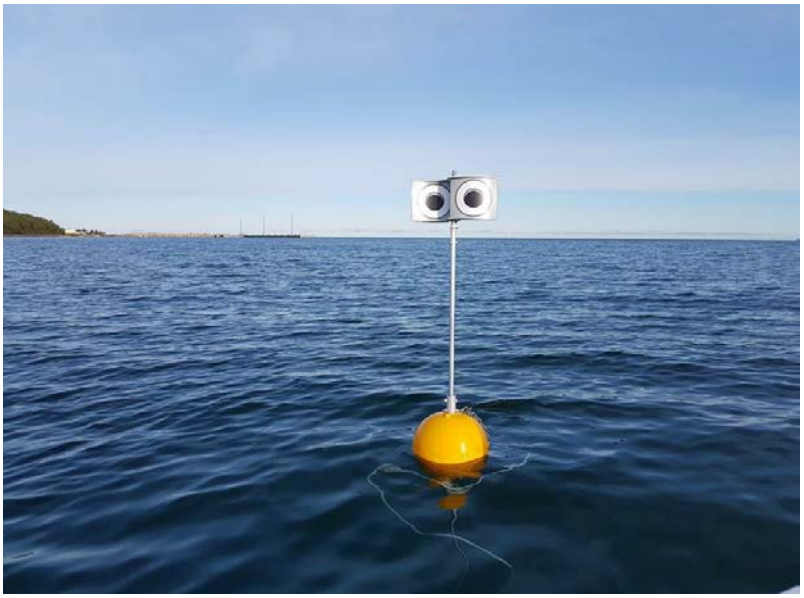


Figure 2: Looming Eyes Buoy (Source: The Independent[4]).

[4] [redacted]

Net lighting (Light Emitting Diodes [LEDs])

4.1.7.9 LED net lights are small simple lights which can be attached to existing fishing gear to act as a deterrent to non-target species. The aim of the lights is to increase the visibility of the nets in the water to birds and marine mammals so that they do not become entangled with the nets. There are multiple designs available of these lights, with the majority being pre-attached to the nets ahead of deployment and remaining in place until the nets are hauled in. No additional vessel presence and/or movement or equipment is required. This method has not been selected by the Applicant at this stage but may form part of the measure's adaptive management.

Figure 3: A commercially available net light (Source: Fishtek[5])

Net panels

4.1.7.10 Attaching highly visible panels to nets may increase the visibility of the nets to diving birds and therefore reduce bycatch. Panels may comprise equally spaced black and white squares, attached to the surface of nets, to ensure they are highly visible to diving birds. The panels often require holes in them to reduce the effect of currents on the set gear. The panels are pre-attached to nets and are deployed as the nets are set. No additional vessel presence and/or movement or equipment is required. This method has not been selected by the Applicant at this stage, but may form part of the measure's adaptive management.

Implementation, operation and monitoring

[5] [redacted]

~~4.1.7.11~~

4.1.7.11 The bycatch reduction technology selection and implementation study phases for Looming Eye Buoys commenced in October 2021. In order to determine the most effective bycatch reduction method, the Applicant commenced a bycatch reduction technology selection phase in 2021, focusing on the use of Looming Eyes Buoys (LEB) within an active gillnet fishery within the biogeographic range of guillemot and razorbill. LEB were selected as they are one of the most developed forms of above water deterrent, which have been developed and trialled by BirdLife International/ RSPB in conjunction with Fishtek Marine (i.e. Rouxel et al., 2021). The preliminary findings from the bycatch reduction technology selection phase using the LEB are promising, with an initial 25% reduction in bycatch of auks identified. (**G5.13 Bycatch Reduction Technology Selection Phase Summary (REP5-068)**). The results of the bycatch reduction technology selection phase are similar to the results from Rouxel et al., 2021 who provided the first experimental test of the LEB (noting the differences in study species). The Applicant has committed to use the LEB on vessels during the non-breeding season 2022/2023 and collect further data from September 2022 to March 2023.

~~Bycatch reduction trigails for Looming Eye Bbuoys are planned for October 2021 January 2022, with potential for further trials under considerationwere undertaken during the non breeding season of 2021/ 2022 with preliminary first year results provided within the Applicant's **Bycatch Reduction Technology Selection Phase Summary report**). The Applicant has confirmed a second year of data collection in the form of an implementation study. Following the trials to gather further evidence on the efficacy of each bycatch reduction method, a specific measure or combination of measures will be selected to take forward.~~

4.1.7.12 Implementation of the planned compensation will begin following determination of the DCO application by the Secretary of State. Details on the proposed implementation of the measure are provided within the Applicant's **B2.8.2 Compensation measures for Flamborough and Filey Coast (FFC) Special Protection Area (SPA): Guillemot and Razorbill Bycatch Reduction: Roadmap** (submitted at Deadline 7). ~~To ensure that the equipment continues to be used and that further evidence can be gathered to confirm the success of the measures, a monitoring programme may be required during the operational use of the measures. There are many examples of fishing gear monitoring around the world, which include but are not limited to gear cameras, self reporting, blue tooth tags, and equipment trackers. The exact method of monitoring to be used will be decided based upon further evidence gathering and discussion with industry experts.~~ The Wind Farm is expected to operate for 35 years following construction. If required, the accepted bycatch reduction measure(s) would be used and monitored throughout the operational lifespan of the Wind Farm. Following the monitoring programme, overall measure uptake and success of the bycatch reduction measure, the equipment may continue to be used as a deterrent.

4.1.8 Predator Eradication

4.1.8.1 To compensate the potential displacement impact on guillemot and razorbill from the operation of the Hornsea Four Wind Farm, The Applicant proposes to implement a predator eradication programme at selected guillemot and/ or razorbill breeding colonies. The selected colony will be chosen based on delivery and connectivity to the populations from FFC SPA. This would be part of a package of compensation measures for these species.

4.1.8.2 Predator eradication will be undertaken using well established methods evidenced throughout the wealth of previous predator eradication examples from the UK and further afield. For ground predators, such as rats, this usually involves poison bait stations. The primary species the measures of predator eradication would be focussed upon are rat and house mouse but could extend to include mink or crow as a supportive measure pending ecological advice and stakeholder discussions, whilst ensuring non-targeted species are not accidently eradicated.

4.1.8.3 Following the removal of the invasive species, biosecurity measures will subsequently be installed to prevent re-invasion. Biosecurity measures form a vital consideration in ensuring that efforts to remove invasive species have not been undertaken in vain. There are a significant number of biosecurity measures available depending on the location and species being considered, all of which have been tried and tested at previous predator eradication schemes (i.e.~~,~~ Biosecurity for LIFE project).

Location

~~4.1.8.4~~ It is proposed that predator eradication will be undertaken on an island or islands where both invasive mammalian predators and guillemot and/or razorbill are present. The Applicant is currently liaising with site managers at multiple islands to understand the prevalence of invasive mammalian species and ascertain the level of pressure posed to breeding guillemot and razorbill. The Bailiwick of Guernsey, within the Channel Islands, ~~potential broad~~is ~~areas~~ currently being considered for predator eradication. ~~include multiple islands within the Channel Islands.:~~

4.1.8.4

~~Rathlin Island;~~
~~Channel Islands;~~
~~Isles of Scilly; and~~
~~Islands off the south coast of Devon.~~

~~The specific locations within these broad areas are continuing to be explored and The Applicant will remain open to considering other locations if identified and/or deemed suitable. Those islands where invasive mammalian predators have increased access to breeding locations will be favoured due to the high degree of overlap.~~

4.1.8.5 Before any predator eradication schemes are implemented at a specific location, an eradication implementation study~~feasibility assessment~~ will be undertaken to ensure measures can be employed to remove the invasive species and that biosecurity measures can be subsequently installed to prevent reinvasion, whilst not affecting the native species and/or species that may not affect guillemot and/or razorbills. The island implementation studies were initiated in 2021 by the Applicant in the Bailiwick of Guernsey to gather further evidence to maximise the chances of success of the eradication programme and feed into the decision-making process of which island(s)/islet(s) to take forward. It is planned that the implementation studies will be completed in 2022 before the DCO is granted. An update of the progress up to June 2022 is presented within **G5.4: Predator Eradication Implementation Study Update (REP5-082)**. An MoU has been agreed by the States of Guernsey (dated 10th June 2022) providing a framework to ensure support and long term security of the compensation measure. Based on the evidence collected during the eradication implementation studies and presented within **G5.4: Predator Eradication Implementation Study Update (REP5-082)**, the Applicant is highly confident it has determined locations where ~~an~~ eradication is highly feasible, deliverable and will result in benefits to guillemot and razorbill.

~~4.1.8.5~~

Operation, implementation, and monitoring

4.1.8.6 The objective of the eradication programme will be to remove mammalian predators from the island(s) that are currently suppressing the breeding success (and therefore, population size) of guillemot and razorbill (amongst other species) at these locations. The removal of this pressure will therefore lead to an increase in productivity and ultimately an increase in the population size of these species, whilst not affecting any other species that are not known to be detrimental to guillemot and/or razorbills.

4.1.8.7 Following the implementation studies~~feasibility assessment~~ and in partnership with site managers, invasive species eradication specialists will be contracted to undertake the island(s) eradication. Consideration of the timing of a predator eradication programme will be made to ensure that they are undertaken at the optimal time and that will not for example affect a species/habitat that are not known to be detrimental to guillemot and/or razorbills.

4.1.8.8 The primary aim of an eradication scheme is always to completely remove the introduced animal from the chosen area. ~~In theory, just a single pregnant female of the invasive animal could repopulate the area.~~ Two years intensive monitoring for the presence of the eradicated animal is required to receive the invasive-free status (Nathan et al., 2015; Russell et al., 2017). For example, this was the process taken for the eradication of rats on Canna and Sanday under contract by Wildlife Management International, starting in late 2005. By February 2006 the last rat sign was detected, and after a two-year period of intensive monitoring, the island was declared rat-free in 2008 (see Bell, et al., 2011). The predator eradication programme would only be undertaken by appropriate qualified people and all methods will be agreed with the appropriate stakeholders.

4.1.8.9 Following the invasive species free status, seabird recovery monitoring will continue for the lifetime of Hornsea Four. Monitoring will include population census and productivity monitoring. This will be compared to pre-eradication data (which will be collected to characterise the baseline and supplement historic seabird data for the location where available). The presence of invasive species will also be monitored to detect signs of repopulation.

Summary of Predator Eradication Compensation Measure

4.1.8.10 Predator eradication is a primary Compensation Measure. In-combination with other primary razorbill and guillemot measures, predator eradication will be able to deliver the required level of compensation for Hornsea Four. A detailed evidence report, and roadmap ~~will be~~has~~ve~~ been submitted with the DCO application to demonstrate the potential compensation deliverable by the predator eradication programme both alone and combined with the other primary compensation measures. The evidence report ~~will~~ includes a summary of the supporting evidence for predator eradication compensation and the roadmap ~~will~~ outlines the further steps that will be undertaken from submission to demonstrate that the Compensation Measure can be secured. These Compensation Measures are effective, feasible and securable measures that can be implemented prior to the impact occurring and sustainable for the lifetime of the project. In designing this compensation measure the Applicant has consulted and worked with Natural England, JNCC, the RSPB, The Wildlife Trust, other statutory bodies and other relevant stakeholders to seek to ensure this compensation measure is both robust, deliverable and effective.

4.1.9 Resilience Measure – Fish Habitat Enhancement (Seagrass)

4.1.9.1 Fish habitat enhancement (as a concept) seeks to improve vital habitats for fish species such as those that provide spawning or nursery grounds, with an aim of increasing the productivity of fish populations. This in turn will increase prey abundance for many seabird species (e.g. kittiwakes, guillemots) who are known to forage in coastal shallow water areas when nesting (Bugge et al. 2011; Redfern and Bevan 2014) and consume young fish known to be abundant in seagrass (Bugge et al. 2011; Lilley and Unsworth 2014). Therefore, the restoration of seagrass habitats is being considered as a potential Resilience Measure to boost key forage fish densities for kittiwake, ~~Northern gannet,~~ guillemot and razorbill breeding adults to compensate for the estimated impact of Hornsea Four.

4.1.9.2 The Applicant recognises the importance of seagrass as a measure that can provide resilience to the compensation measures such as predator eradication, habitat management, bycatch reduction and provision of artificial nesting. The Applicant proposes to provide a package of measures that will support the seabird populations such as kittiwake, ~~gannet,~~ guillemot and razorbill locally and in the North Sea. The measures will be designed to seek opportunities to be spatially co-located to maximise the benefits of the measures and located to ensure the overall coherence of the network is maintained. The Applicant is exploring opportunities to expand existing seagrass restoration projects that are already underway and opportunities to create new projects with the academic community that could potentially improve the resilience of the measure.

4.1.9.3 The site selection process for these seagrass locations is outlined in the Without Prejudice Derogation Case (specifically **B2.8.5 Compensation measures for FFC SPA: Fish Habitat Enhancement: Ecological Evidence (APP-198)**. The purpose of the site selection process has been to identify areas supporting all the target seabird species and are suitable for seagrass restoration projects. The resulting AoS is~~are~~ shown in **Figure 1**, the Humber Estuary, with thi~~ese~~ area~~s~~ consistently supporting all of the target seabird species, providing options for seagrass restoration as well as supporting the compensation measures. ~~Specifically, potential existing seagrass meadows located within proximity of the primary razorbill and guillemot compensation measures (i.e. bycatch and predator eradication), with reported connectivity with the wider site network and the North Sea populations including the Solent, Channel Islands, Cornwall, Isles of Scilly, Essex, Rathlin Island and Humber Estuary. All of these locations are being considered for potential feasibility trails and future implementation.~~ This location (Humber Estuary) has been taken forward for trials and has been determined through the implementation study as the highest scoring future implementation. Furthermore, **G6.6 Fish Enhancement Seagrass Restoration Implementation Study and Fish Monitoring Summary (REP6-033)** presents an update on the ongoing monitoring work and research studies in relation to this measure and an overview of the anticipated next steps.

4.1.9.4 Consultation will commence with conservation and ornithological groups with local knowledge and expertise. The detail of the continued site selection process and consultation is presented within **B2.9: Record of Consultation (APP-201)**.

Seagrass restoration trials~~Feasibility~~

~~4.1.9.5~~ Prior to obtaining consent of Hornsea Four, the Applicant has explored suitable locations and selected the area deemed most suitable for seagrass restoration to provide resilience for the Hornsea Four compensation measures. The refined area for seagrass restoration is Spurn Point in the Humber Estuary and the Applicant has commenced seagrass restoration efforts with a trial scheme. In total the Applicant has contracted the Yorkshire Wildlife Trust (YWT) to restore 4 ha of seagrass beds and has an agreement in place to deliver the full large-scale restoration of a further 30 ha following SoS decision. The Applicant ~~is also undertaking~~has also undertaken a UK site implementation study for proposed adaptive management measures. ~~Prior to any field studies commencing, detailed implementationfeasibility studies will be undertaken to assess the physical parameters for seagrass to be restored. These studies will be complemented by further stakeholder engagement. The Applicant recognises the need for feasibility studies to inform site selection and methodology to increase the likelihood of a successful restoration programme and efficacy of the resilience measure (with monitoring discussed below). Factors that will be considered prior to restoration efforts being initiated include looking for sites sheltered from wave action, with good water quality, suitable topographical and hydromorphological conditions (including sedimentation rates, sufficient nutrients and available light), and avoidance of sites with activities that could cause significant physical disturbance.~~

4.1.9.5

~~4.1.9.6~~ The area within which the trial planting is taking place is Spurn Point, this location was selected by the YWT and the Applicant being adjacent to remnant seagrass beds and as YWT own the foreshore and have a byelaw in place to protect the area. Further studies of the seagrass restoration scheme are being conducted by the YWT and the UoH, these aim to monitor the success of the restoration effort, effects on fish assemblages and abundance and demonstrate fish connectivity to wider North Sea. ~~A key component of the fish habitat enhancement compensation measure will be research, to gather evidence to contribute towards filling current knowledge gaps. We have identified a number of initial potential research projects (in addition to feasibility studies) that the research could cover including: foraging seagrass habitat study for seabirds including species counts, behavioural observations and habitat mapping, fish surveys within seagrass meadows using seine and/or fyke netting, further seabird diet studies, and migratory fish tagging to understand fish movements.~~

4.1.9.6

Restoration techniques

4.1.9.7 The Applicant is considering two major techniques by which to restore seagrass habitats: replanting and reseeding.

4.1.9.8 Seagrass restoration has been formally conducted for over 50 years and the means of doing this can principally be split into two major techniques: reseeding and replanting. Both techniques have their relative merits and have exhibited varying levels of success. Reseeding generally relates to the collection and targeted redistribution (and sometimes processing) of wild seed. Seeds can be directly deployed either from the boat or for intertidal areas, deposited using tree planting tool (pottiputki), and often hessian bags are used to help anchor the seeds in place during germination. It is expected that if vessels are required, then up to two vessels would be required for the seagrass restoration ~~at each location~~.

4.1.9.9 Adult shoot replanting normally involves harvesting plants from an existing meadow and transplanting them to the restoration site. For the replanting process, the reproductive fronds of wild seed is collected by hand by SCUBA divers or by collection on foot from the foreshore. In most cases, shoot planting involves some means of anchoring the shoots to the bottom until the roots can take hold (root into the bottom). Replanting uses either labour intensive diving techniques or various mechanistic approaches to planting various sizes and ages of seagrass plants into new localities. Planting of seedlings in the UK is typically undertaken by a team of divers who are transported to the site by boat for subtidal areas or by personnel using a manual hand tool (dibber and seed press) on foot for intertidal areas. ~~It is expected that up to two vessels would be required for the seagrass restoration at each location.~~

Monitoring and Adaptive Management

4.1.9.10 Hornsea Four is expected to operate for 35 years following construction. Monitoring of restoration will be essential to demonstrate the efficacy of the compensation measure and if required, the seagrass meadow would be monitored throughout the operational lifespan of the Hornsea Four. The exact method of monitoring will be decided based upon further evidence gathering and discussion with restoration experts and stakeholders. A monitoring programme will be developed and at key stages the results of the restoration will be shared to improve the knowledge and evidence for seagrass restoration.

4.1.9.11 Adaptive management is an iterative process which combines management measures and subsequent monitoring with the aim of improving effectiveness whilst also updating knowledge and improving decision making over time. Adaptive management will be an important component of the compensation measure and will be used as a method to address unforeseen issues or deviations from expected time scales (i.e. additional infill planting required).

4.1.9.12 It is assumed that any onshore access to the area chosen for seagrass restoration will be through existing highways and/or footpaths. It is considered that no new access roads will be required and that no construction is required as part of the measure. Any requirement for vehicle movements during site suitability surveys, the restoration process or subsequent monitoring are considered to be negligible. Therefore, onshore impacts have been scoped out of the assessment.

5 Consultation

5.1.1.1 The Applicant has undertaken extensive consultation with relevant stakeholders as part of the preparation of the Without Prejudice Derogation Case (namely, Natural England, Joint Nature Conservation Committee (JNCC), the Royal Society for the Protection of Birds (RSPB), the Marine Management Organisation (MMO), PINS, Defra, Local Planning Authorities, The Wildlife Trusts, the National Federation of Fisherman's Organisations (NFFO) and relevant local organisations with key knowledge) regarding compensation for Hornsea Four. Relevant stakeholders will be engaged through the Hornsea Four Offshore Ornithology Engagement Group (OOEG). Further detail on this consultation is presented in the Record of Consultation (**B2.9: Record of Consultation (APP-201)**). Consultation will be ongoing with various stakeholders for all proposed compensation measures at various stages through the process.

5.1.1.2 The Applicant has undertaken further consultation specifically in relation to the Compensation Measures with statutory consultees who may have an interest in the proposed Compensation Measures, and certain stakeholders located in the vicinity of the land potentially affected by the measures. This targeted consultation ran from 5th August to present~~6th September 2021~~. All responses and comments are presented in ~~**Volume A1, Annex**~~**B1.~~1.37 Non-Statutory Targeted Compensation Measures Consultation Responses (APP-166)** alongside the regard the Applicant has had to these consultation responses.

6 EIA Methodology

6.1 Introduction

6.1.1.1 ~~**Volume A1, Chapter**~~**A1.~~52: Environmental Impact Assessment Methodology (APP-011)** of the Hornsea Four ES sets out the EIA methodology followed for Hornsea Four. Specifically, the chapter describes the approach used to identify, evaluate and mitigate potential likely significant effects (LSE), in EIA terms, using a defined proportionate approach to the assessment process. The requirement for EIA and the proposed temporal, spatial and technical scope of the assessments are described along with details of the Applicant's specific 'commit – design – consult' ethos to developing Hornsea Four. This detail is equally relevant to the Compensation Measures EIA and as such, most of this detail is not repeated within this Annex. To enhance the readability of this Compensation Measures EIA, some elements of EIA methodology are repeated below to allow this document to be read and understood without extensive cross-referencing to other documents required.

6.1.1.2 It is important to note that given the broad nature of the proposed Compensation Measures and the extensive refinement of the site selection process that will be undertaken as part of their own consenting process (for example a Marine Licence application and/or Planning Application), the assessment presented within this Annex broadly follows the approach set out in ~~Volume A1, Chapter~~A1.~~2~~5: Environmental Impact Assessment Methodology (APP-011) of the Hornsea Four ES in terms of the stages followed (i.e. characterisation of the existing environment, identification of receptors, assessment, and commitments). More specifically, the stages followed in this Annex are summarised in the following sections. Where elements of the approach outlined in this Annex vary from that which is outlined in A1.5~~2~~: Environmental Impact Assessment Methodology (APP-011), this is noted in the sections below with justification for the approach provided.

6.2 Overview of Process

6.2.1.1 EIA is a systematic, iterative and prescribed process framed by statutory requirements as well as the relevant planning and policy context (see ~~Volume A1, Chapter~~A1.~~2~~: Planning and Policy Context (APP-008)). Furthermore, consideration of best, good and advised EIA practice and adoption of a Proportionate EIA approach (see A1.~~Volume A1, Chapter~~5~~2~~: Environmental Impact Assessment Methodology (APP-011)) has guided the specific approach followed by the Applicant in relation to this Compensation Measures EIA.

6.2.1.2 The key elements of the Compensation Measures EIA process and the identification of significant effects are described in the following sections. While these provide a general framework for identifying impacts and assessing the significance of their effect(s), in practice the approaches and criteria applied across different EIA topics vary.

6.2.1.3 An overview of the approach to the Compensation Measures EIA is provided in Figure 4.

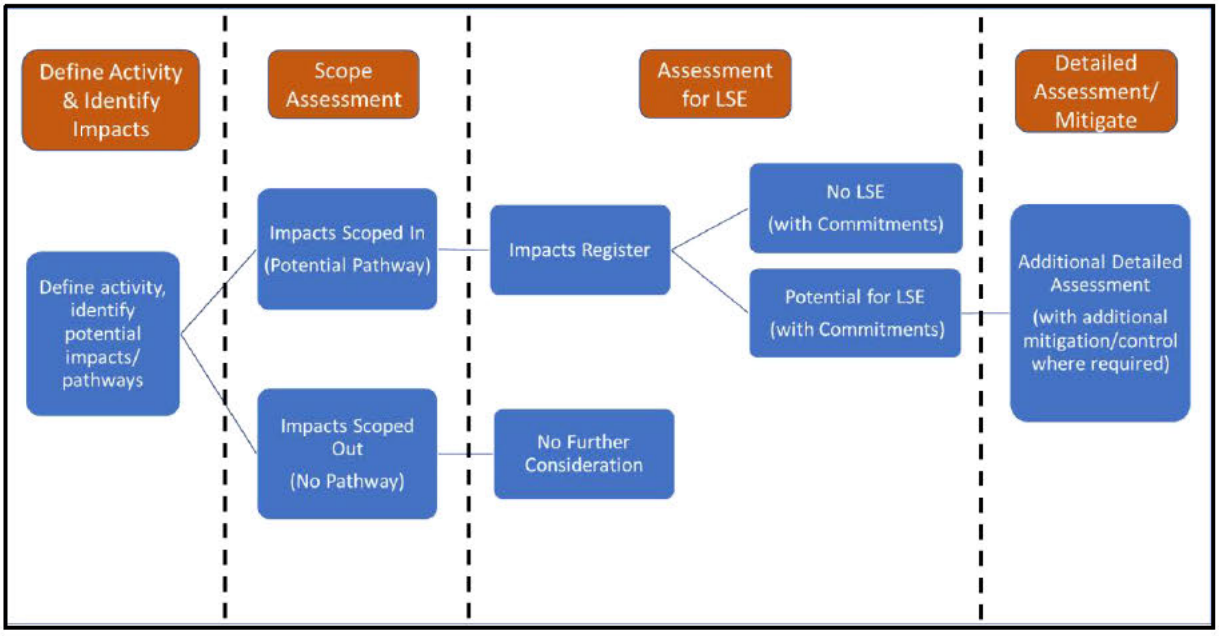


Figure 4: Compensation Measures EIA Process.

6.2.2 Maximum Design Scenario (MDS)

6.2.2.1 The MDS parameters for the relevant Compensation Measures are considered to be a worst case for any given assessment. This approach ensures that the scenario that would have the greatest impact (e.g. largest footprint, longest exposure, or tallest dimensions, depending on the topic) is assessed; and there is confidence that any other (lesser) scenarios will have an impact that is no greater than that assessed.

6.2.2.2 Impact-specific MDS relevant to this Compensation Measures EIA, as they apply to each receptor group, are defined within ~~Volume A4, Annex~~ A4.6.3: Compensation Impacts Register (Deadline ~~6~~7 submission)~~(APP-059)~~ for each Compensation Measure. For clarity regarding the differences between receptor groups, the information is presented according to individual project parameters, including a note regarding why the scenario is relevant to that receptor. Where relevant, the information includes any designed-in features which, whilst also providing mitigation, are integral to the design or physical characteristics of the project.

6.3 Compensation Impacts Register

6.3.1.1 A cornerstone of the Hornsea Four approach to delivering both proportionate EIA and delivery of commitments, is the development of an Impacts Register and this process has been followed for the Compensation Measures EIA. The Compensation Measures Impacts Register (~~Volume A4, Annex~~ A4.6.3: Compensation Impacts Register (Deadline ~~6~~7 submission)~~(APP-059)~~) provides the following discrete and separate functions:

- Details all potential impacts associated with each Compensation Measure and provides a unique identification reference which can be traced through the subsequent steps/documents;
- Sets the scope of the Compensation Measures EIA with appropriate justification;
- States the magnitude, sensitivity and significance for all potential impacts associated with all activities, in all phases of development of each Compensation Measure;
- Identifies Commitments to reduce or eliminate LSE; and,
- Defines the Maximum Design Scenario (MDS) for any given impact.

6.3.1.2 The Compensation Measures Impacts Register (~~Volume A4, Annex~~A4.~~6~~.3: Compensation Impacts Register (Deadline ~~6~~7 submission)~~(APP-059)~~) is an Excel spreadsheet which identifies the potential impacts (and the resultant effects) that could possibly result from the installation/construction, implementation/O&M, and/or decommissioning phases of each Compensation Measure, relating to each technical topic under consideration in the EIA process. The register allows the user to sort and filter the impacts that are most relevant to them. The measures described within the impacts register that result in a potential for LSE have been considered for assessment within this EIA and are presented within the relevant sections.

6.4 Compensation Measures Commitments

6.4.1.1 All Commitments relevant to the Compensation Measures EIA are detailed in ~~Volume~~ A4~~,~~ ~~Annex~~ 6.4: Compensation Commitments Register (Deadline ~~6~~7 submission) ~~(APP-060)~~. As advocated in EIA guidance (e.g. IEMA 2004), it is only necessary to assess potential effects arising from the final design, incorporating all primary and tertiary mitigation (only pre-mitigation effects and residual effects need both be set out where secondary mitigation is required). In this respect, the Applicant has considered the Commitments in making an initial assessment of the likely significant effects.

6.5 Characterisation of the Existing Environment (Baseline)

6.5.1.1 As noted in Section 4.1.2, AoS have been identified for each Compensation Measure. These AoS range from small areas around islands or discrete sections of coastline, to larger areas spanning large areas of sea and coastlines. As these AoS can cover extensive areas, a high-level characterisation of the existing environment for each AoS has been undertaken to determine the baseline conditions in each AoS and relevant surrounding areas. The scope of baseline characterisation has been made relevant to the scope of the EIA in that if a specific EIA topic has been scoped out of the assessment in relation to a particular Compensation Measure, then the baseline for that particular topic is not presented. The baseline characterisation includes usage of readily available information from desktop study. It is important to note that the Compensation Measures will not be consented through the Hornsea Four DCO application process and where applicable will be subject to standalone EIA and HRA processes as part of their own consenting process (for example a Marine Licence application and/or Planning Application). As part of that consenting process, further baseline and assessment work will be undertaken, based on refined design and methodology details.

6.6 Impacts, Effects Mitigation and Significance

6.6.1.1 'Impacts' are defined as the physical (or chemical) changes that will be caused by Hornsea Four activities. 'Effects' are defined as the consequences of these impacts to biological populations, ecosystems and humans (including their physical and cultural assets).

6.6.1.2 For many technical topics, the likely significance of an effect is established by combining the magnitude of an impact with the sensitivity of the receptor to that impact (noting that sensitivity is not considered as an inherent characteristic but how something specifically responds to an external factor). The value of a resource or receptor is also considered. For more information on the methodology for assessing the likely significance of effects, including the significance matrix utilised in this assessment, see ~~Volume A1, Chapter~~ A1.5~~2~~: Environmental Impact Assessment Methodology (APP-011).

6.7 Cumulative, Inter-Relationships and Transboundary Effects

6.7.1.1 For consideration of cumulative aspects, it is assumed that where potential for LSE applies to the project alone, that potential for LSE applies cumulatively with other plans or projects. However, until the precise locations of any of the Compensation Measures are finalised, it is not possible to identify relevant plans and projects to include within a cumulative assessment cannot be made.

6.7.1.2 In addition, given the nature of the proposed Compensation Measures and the extensive refinement of the site selection process that will be undertaken, the consideration of inter-relationships and transboundary effects cannot be made at this stage.

6.7.1.3 It should be noted, however, that ultimately, the Compensation Measures will not be consented through the Hornsea Four DCO application process and so far as applicable, will be subject to standalone EIA and HRA processes as part of their own consenting process (for example a Marine Licence application and/or Planning Application). As part of that consenting process, further assessment work will be undertaken, including consideration of cumulative effects, inter-relationships and transboundary effects, based on refined design and methodology details.

7 EIA – New Offshore Artificial Nesting ~~Structures~~Structure

7.1 Introduction

7.1.1.1 This section considers the potential impacts arising from the new offshore artificial nesting ~~structures~~structure Compensation Measure. An ~~regional~~ environmental characterisation of the physical, biological and human environmental baseline is presented alongside the results of an assessment of potential significant effects arising from the proposed Compensation Measure. Only one AoS has been identified for the new offshore artificial nesting ~~structures~~structure Compensation Measure (A1: Southern North Sea) and as such, the baseline and assessment within this section relates to this AoS alone.

7.2 Baseline

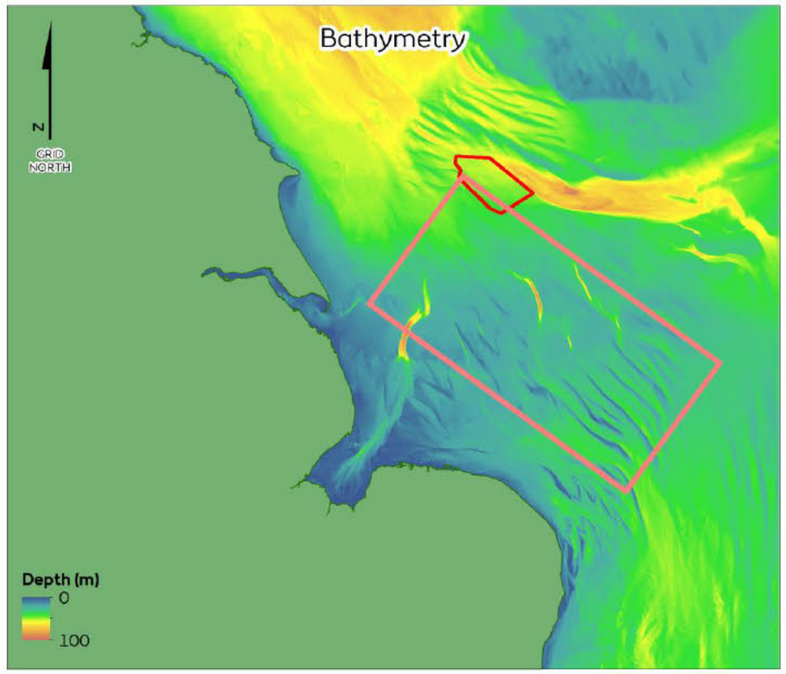
7.2.1.1 **Table 6** provides a summary of the baseline environment for AoS A1 (Southern North Sea).

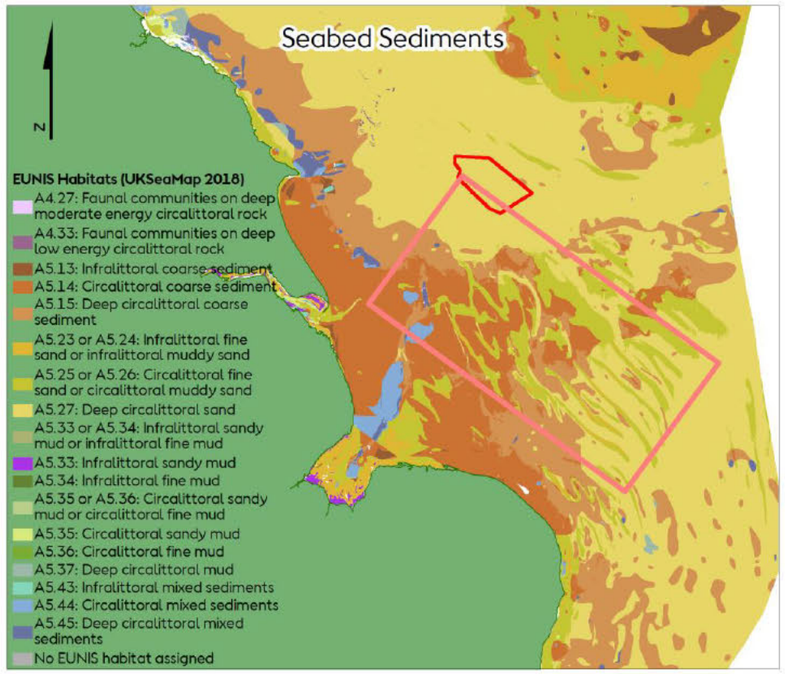
Table 6: Summary of baseline environment in relation to the Area of Search (Southern North Sea) for new and repurposed offshore nesting ~~structures~~structure.

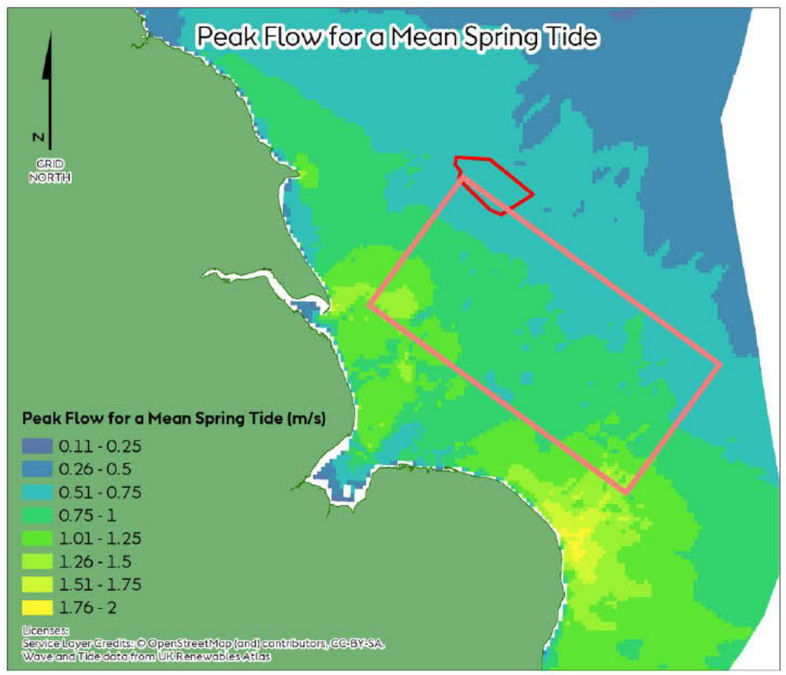
Topic	Summary of Baseline Environment
Marine Geology, Oceanography and Physical Processes	The baseline environment for marine geology, oceanography and physical processes is illustrated in **Figure 5** and can be summarised in terms of: • Bathymetry: The A1 Area of Search covers a large area of the southern North Sea, a large, shallow continental platform that has experienced successive emergences and flooding during the Quaternary regression and transgression. The area is generally shallow ~~but is in the north west where depths of up to 100m are seen, between the north east coast of England and Dogger Bank, a large, shallow sandbank feature in the southern North Sea. T~~and the south of the area is dominated by sandwave features off the Lincolnshire and East Anglian coast. • Geology and seabed sediments: The sedimentary environment consists of a mixture of sands, muds and gravels but is dominated by coarse sediments. In shallow waters, in particular in areas where there are sandwaves, the sediments tend to be coarser, whilst greater levels of fine sediments are found in deeper areas. • Hydrographic and metocean conditions: The southern North Sea is associated with distinct hydrographic conditions including shallow, well-mixed waters. The waters of the southern North Sea are slow moving with a southerly drift; they occasionally stratify and have considerable freshwater input from the River Humber. Spring tidal flows peak off the East Anglia coast and in The Wash closer to shore, decreasing with distance from shore. A similar pattern is observed for wave heights. ~~Off Flamborough head, the Flamborough Front extends eastwards and roughly divides the Area of Search in half.~~
Benthic and Intertidal Ecology	The baseline environment for benthic and intertidal ecology is illustrated in **Figure 6** and can be summarised in terms of: • Seabed habitats: The AoS~~rea of Search~~ contains a variety of benthic habitats across the southern North Sea, consisting of sands and mixed sediments with varying proportions of muds and gravels. • Species: the region is inhabited by various benthic infauna and epifauna, including polychaetes, bivalves, echinoderms, crustaceans and amphipods. • Designations: A number of designated SACs and MCZs for seabed habitats and benthic species are present across the AoS~~rea of Search~~, including the North Norfolk Sandbanks and Saturn Reef~~Dogger Bank~~ SAC, the Holderness ~~Inshore and~~ Offshore MCZ~~s~~, and the Haisborough, Hammond and Winterton SAC~~the Markham's Triangle MCA and several SACs in the southern North Sea for sandbanks off the north coast of East Anglia~~.
Fish and Shellfish Ecology	The baseline environment for fish and shellfish ecology is illustrated in **Figure 7** and can be summarised in terms of: • Species: A variety of fish and shellfish species are present in the southern North Sea region within the AoS~~rea of Search~~, including commercially important species like plaice (*Pleuronectes platessa*), sole (*Solea solea*), dab (*Limanda limanda*) and whiting (*Merlangius merlangus*), as well as smaller non-commercially important species like weaver (*Tranchinidae*), gurnard (*Chelidonichthys cuculus*) and solenette (*Buglossidium luteum*). Shellfish species include the edible crab (*Cancer pagurus*), velvet swimming crab (*Necora puber*), brown and pink shrimp (*Pandalus borealis* and *Crangon crangon*), lobster (*Homarus gammarus*) and *Nephrops*. • Spawning and nursery habitats: The Area of Search overlaps with spawning and nursery areas for several species including herring (*Clupea harrengus*), sandeel (*Ammodytidae*), and edible crab~~plaice, and sole~~. An important area for herring spawning is located just off Flamborough Head. Most of the commercially important species in the AoS~~rea of Search~~ spawn in the spring, between January and June, with the exception of the demersal spawning herring and sandeel.
Marine Mammals	The baseline environment for marine mammals is illustrated in **Figure 8** and can be summarised in terms of:

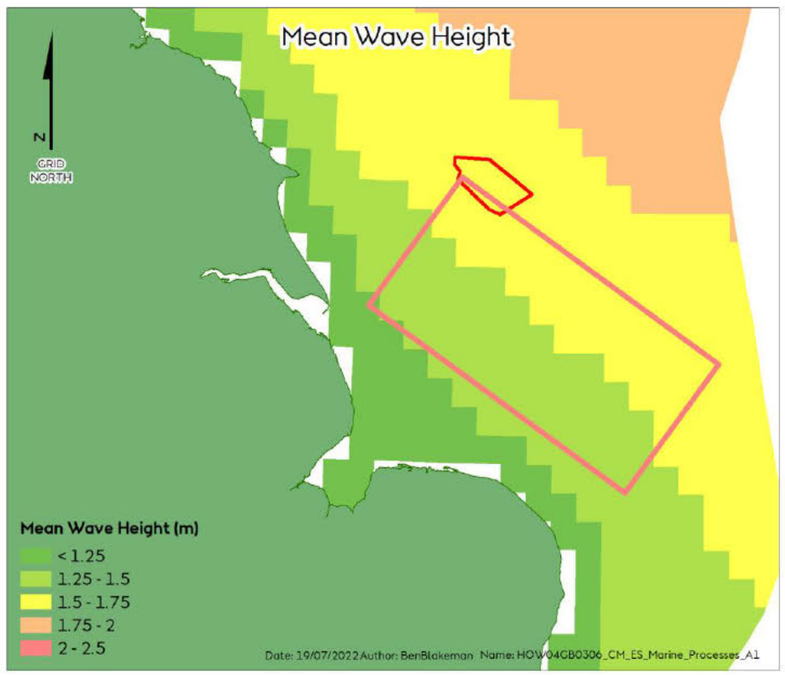
Topic	Summary of Baseline Environment
	• Species: Several marine mammal species have been observed in the southern North Sea, including harbour porpoise (*Phocoena phocoena*), white beaked dolphin (*Lagenorhynchus albirostris*), minke whale (*Balaenoptera acutorostrata*), grey seal (*Halichoerus grypus*) and harbour seal (*Phoca vitulina*). A population of bottlenose dolphin from the Moray Firth also extends down into the southern North Sea. • Designated sites: The Southern North Sea SAC is an area of importance for harbour porpoise, an Annex II species. This site includes key winter and summer habitat for this species and covers an area of 36,951 m^2, making it the largest SAC in the UK and European waters at the point of designation in 2019.
Offshore and Intertidal Ornithology	The baseline environment for offshore ornithology is illustrated in **Figure 9** and can be summarised in terms of: • Species: At least 19 species of seabird breed on the coasts of the Greater North Sea, in particular large numbers of northern gannet (*Morus bassanus*), herring gull *(Larus argentatus*), lesser black-backed gull (*Larus fuscus*), black-legged kittiwake (*Rissa tridactyla*), common guillemot (*Uria aalge*), razorbill (*Alca torda*) and puffin (*Fratercula arctica*). Kittiwake have a mean-max foraging range of 156.1 km and are concentrated around Flamborough Head in the north-west of the AoS~~rea of Search~~. Guillemot and razorbill are also concentrated in the north-east of the AoS~~rea of Search~~ and have mean-max foraging ranges of 73.1 km and 88.7 km, respectively. ~~Gannet have a larger mean max foraging range (315.2 km) and are more widely distributed across the Area of Search, but are still found in highest density in the north east.~~ • Designated sites: The key ornithological designated site in the vicinity of the AoS~~within the Area of Search~~ is the Flamborough and Filey Coast SPA, designated for a variety of breeding seabird colonies. The AoS~~rea of Search~~ is also in the vicinity of ~~also intersects with~~ the Greater Wash SPA. • Surveys of oil and gas platforms in the offshore Area of Search (A1) were undertaken in 2021 and 2022 which found many platforms with kittiwake colonies and in addition breeding razorbill and guillemot have also been found during the 2022 survey. One platform recorded 499 kittiwake Apparently Occupied Nests during the 2022 survey. Further information on the colonies surveyed are illustrated in **Figure 3** of **B2.7.2 Compensation measures for Flamborough and Filey Coast (FFC) Special Protection Area (SPA): Kittiwake Offshore Artificial Nesting Roadmap (REP5-018)**.
Commercial Fisheries	The baseline environment for commercial fisheries is illustrated in **Figure 10** and can be summarised in terms of: • Fishing activity: Approximately 6,600 fishing vessels operate in the Greater North Sea, with the largest numbers coming from the UK, Norway, Denmark, the Netherlands and France. Total landings have been decreasing since the early 1970s. • Fishing methods: The primary fishing methods used in the southern North Sea specifically are otter and beam trawls for demersal fisheries, and pelagic trawls and seines for pelagic fisheries, along with potting for crustacea including brown crab, lobster and whelk, and dredging for scallop. Within the AoS~~rea of Search~~, beam trawling is concentrated in the south east, with very limited dredging ~~is focused off the Northumberland coast around Flamborough Head and~~, otter trawling. P~~is mainly undertaken in the north, particularly around Dogger Bank, and p~~otting is the most common fishing methods in the AoS and is focused off the Lincolnshire coast and outside the Humber Estuary.
Shipping and Navigation	The baseline environment for shipping and navigation is illustrated in **Figure 11** and can be summarised in terms of: • Vessel density: The southern North Sea is a busy area in terms of vessel traffic with regular transit between major European ports. Much of the traffic is coastal, in particular between the Humber across the coast of East Anglia to and from the English Channel. Clusters of traffic are also seen around offshore wind farms and oil and gas platforms within the AoS~~rea of Search~~. • ~~Navigational features: Traffic separation scheme lanes feature at the mouth of the Humber to manage traffic entering and exiting the port. To the south east of the Area of Search, there are main deep water routes between the North Sea and the English Channel.~~
Aviation and Radar	The baseline environment for aviation and radar is illustrated in **Figure 12** and can be summarised in terms of:

Topic	Summary of Baseline Environment
	• Airspace: This AoS is in an area of Class G uncontrolled airspace, which is established from the surface up to Flight Level (FL) 195 (approximately 19,500 ft). • Radar stations: A number of civilian and military radar stations are located along the east coast of the UK looking out into the southern North Sea, including the MoD remote radar head locations are Staxton Wold and Trimingham. • Helicopter main routes: **Figure 12** identifies numerous helicopter main routes that are used to transfer equipment and personnel out to operational oil and gas platforms.
Marine Archaeology	The baseline environment for marine archaeology is illustrated in **Figure 11** and can be summarised in terms of: • Seabed archaeology: The archaeological resource contained within the Holocene sediments of the seabed remains poorly understood, primarily due to the practical limitations of carrying out archaeological investigations. • Archaeological resource: The North Sea marine archaeological resource is presented by three main classes of material and features: (1) submerged prehistoric landscaped caused by changes to sea level and eventual stabilisation of sea level at or near to the present position; (2) archaeological remains of watercraft deposited when vessels sank while at sea or became abandoned in an inter-tidal context which subsequently became inundated; and (3) remains of aircraft crash sites, either coherent assemblages or scattered material, usually the result of Second World War military conflict, but also numerous passenger casualties, particularly during the peak of seaplane activity during the inter-war period. • Wrecks: Numerous wrecks are illustrated in **Figure 11**, however in addition there are thought to be many more wrecks and features of interest that are currently undiscovered.
Seascape, Landscape and Visual Resources	The baseline environment for seascape, landscape and visual resources is illustrated in **Figure 13** and can be summarised in terms of: • Seascape: This AoS can be described as open sea with occasional offshore ~~structures~~structure, such as oil and gas platforms and offshore wind farms. There is regular passage of use by sea-going vessels for a variety of purposes, including recreational and commercial fishing activities, commercial ferry routes, tankers, cargo vessels and recreational cruising. Additionally, combat training exercises in aeroplanes, search and rescue activities and standard helicopter operations to offshore infrastructure regularly occur across this location. • Designations: Numerous landscape designations including National Parks, Areas of Outstanding Natural Beauty and Heritage Coasts overlap with the coastline adjacent to~~of~~ the AoS~~rea of Search~~, with views out to see being a prominent part of these landscapes.
Infrastructure and Other Users	The baseline environment for infrastructure and other users is illustrated in **Figure 14** and can be summarised in terms of: • Offshore development: The AoS~~rea of Search~~ sits within the southern North Sea, an area which contains a high density of offshore developments and marine industries due in part to its relatively shallow bathymetry. These includes offshore wind farms, oil and gas extraction, marine aggregate extraction, subsea cables and pipelines as well as emerging industries such as carbon capture and storage. Additionally, the baseline environment includes the activities associated with the construction, operation, maintenance and decommissioning of these activities.









Hornsea Four
Compensation Measures
Areas of Search
Offshore Nesting
Southern North Sea
Marine Processes

Array Area
Offshore Nesting Area of Search

Coordinate system: ETRS 1989 UTM Zone 31N

0 50 100 Kilometres
0 25 50 Nautical Miles

REV	REMARK	DATE
–	First Issue	19/07/2022
A	Second Issue - Refined Search Areas	14/07/2022

Compensation Measures
Marine Processes
Document no: HOW04GB0306
Created by: BPHB
Checked by: TB
Approved by: LK

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Figure 5: Compensation Measures Area of Search Offshore Nesting A1: Southern North Sea Physical Processes.

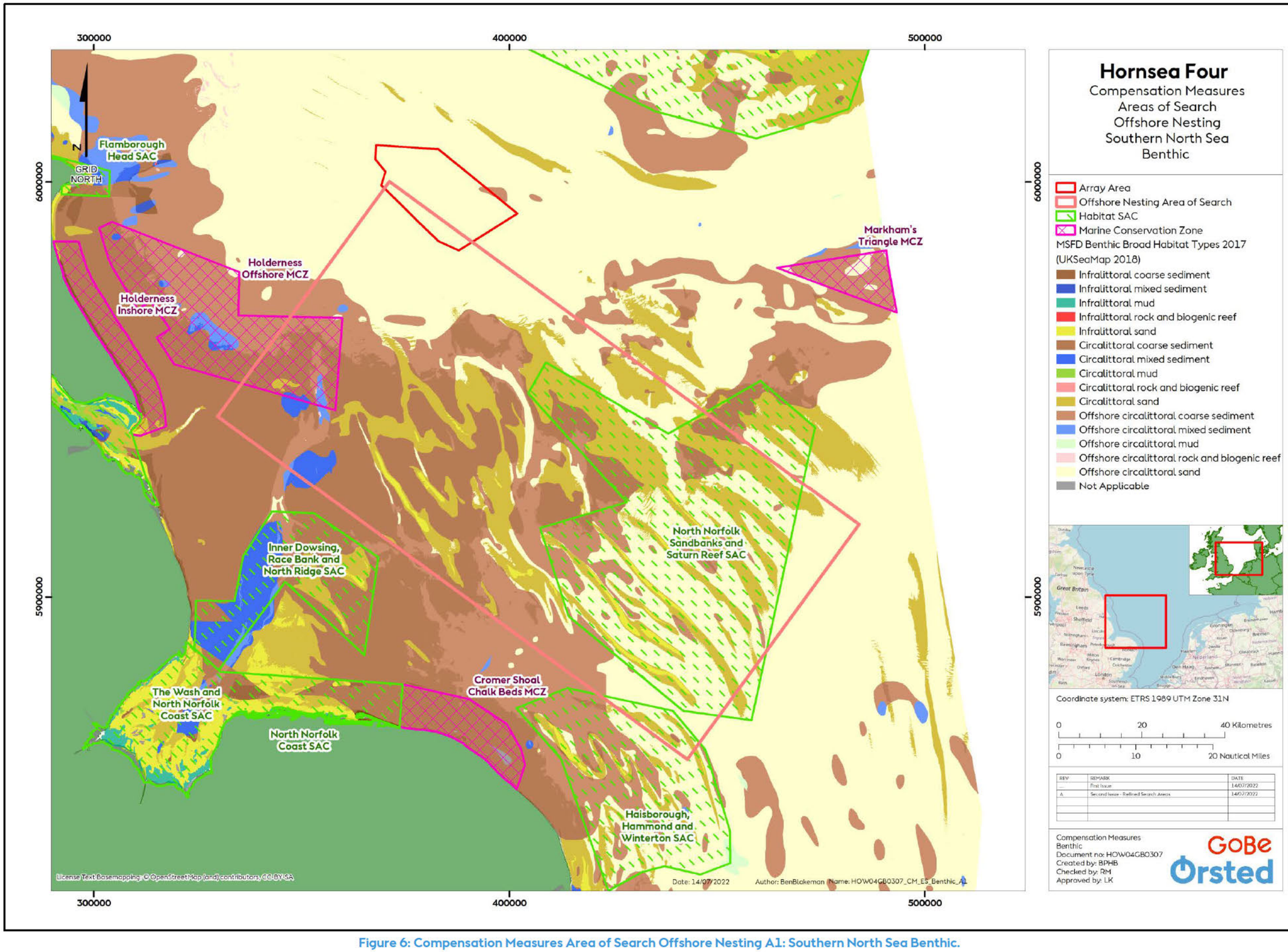


Figure 6: Compensation Measures Area of Search Offshore Nesting A1: Southern North Sea Benthic.

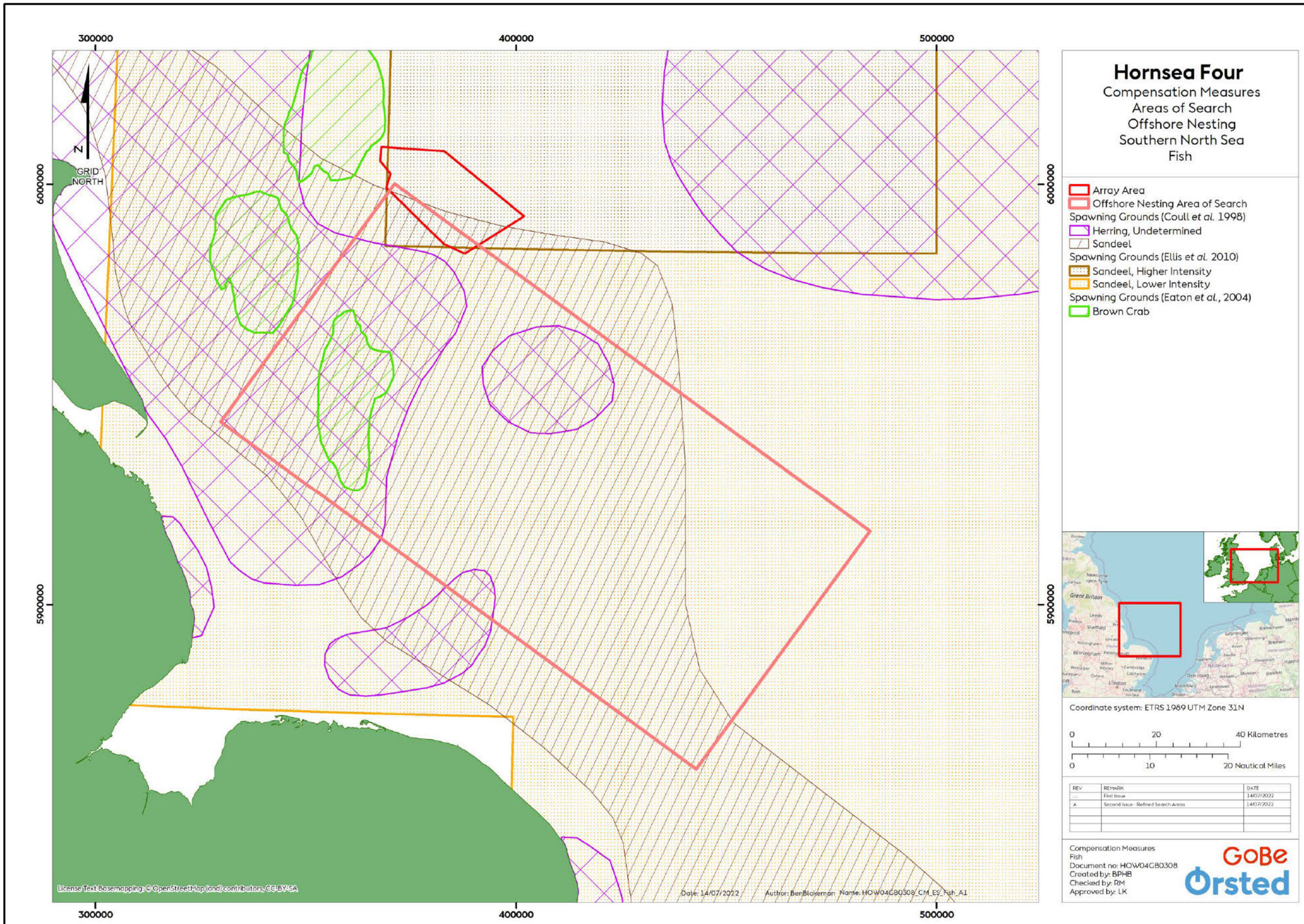
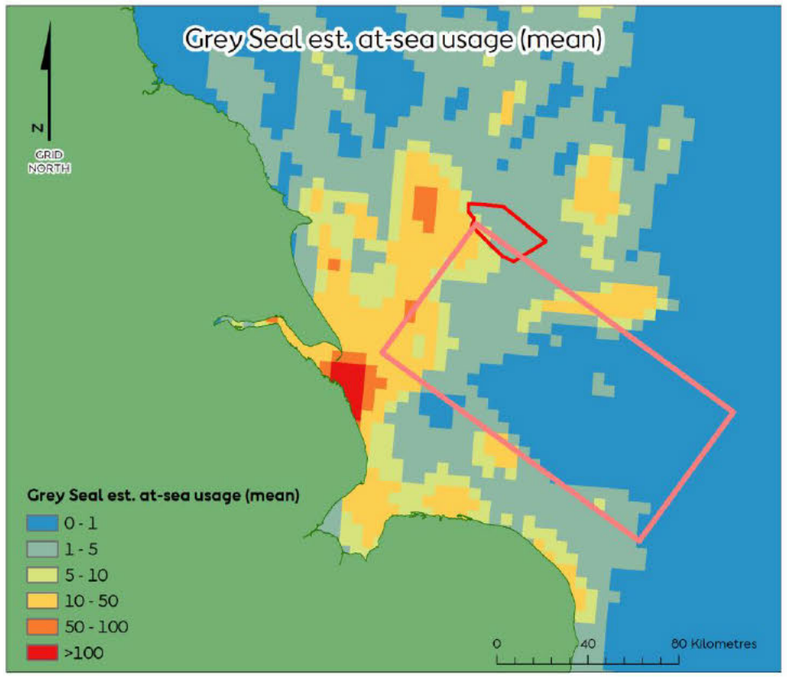
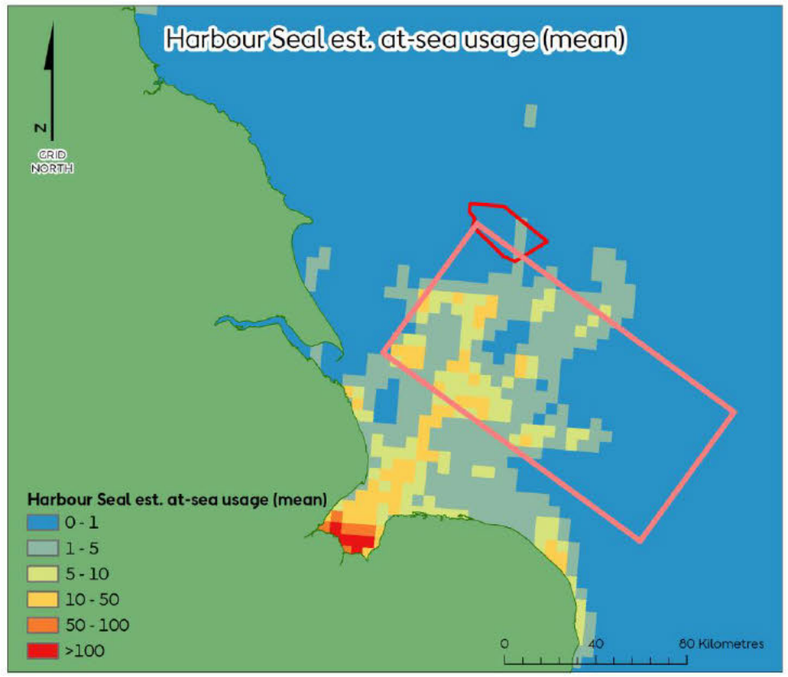
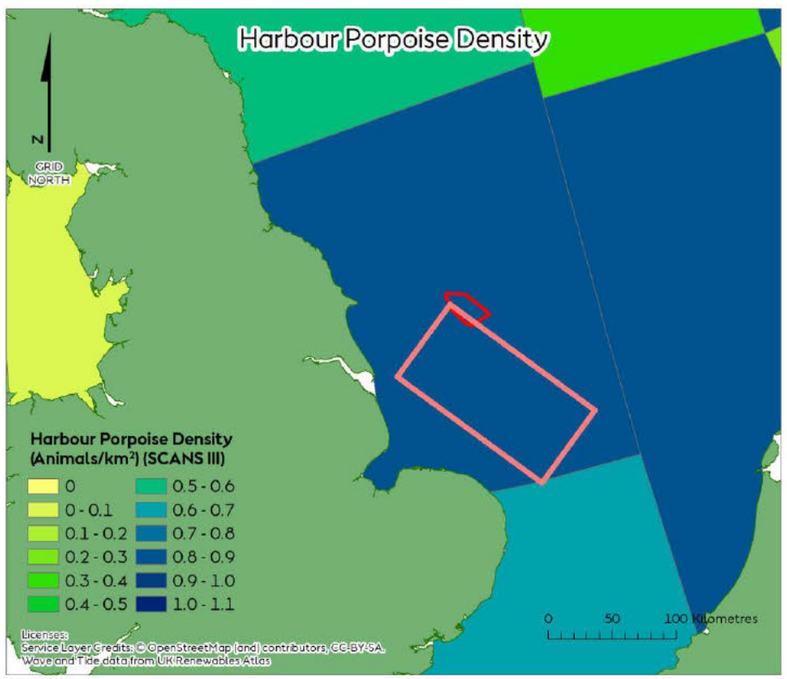
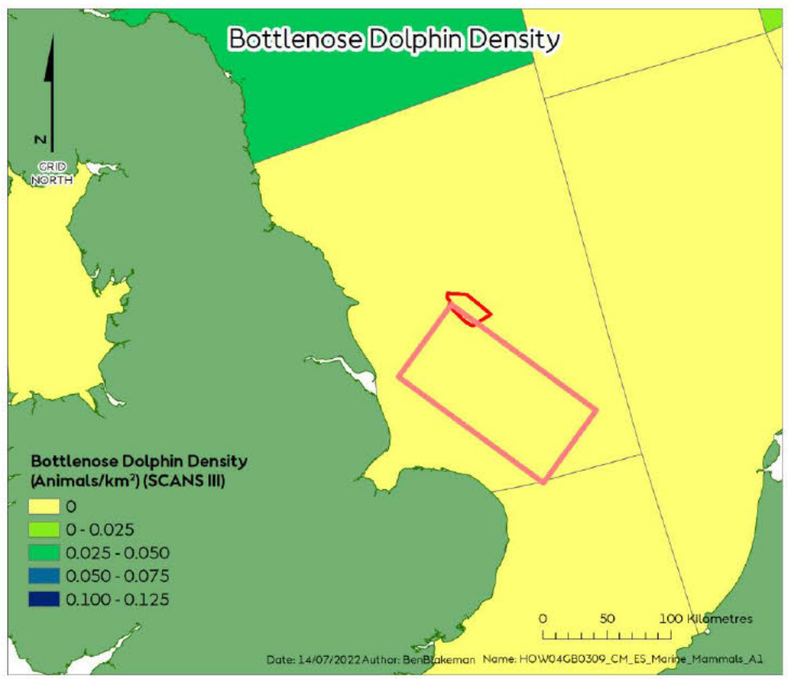


Figure 7: Compensation Measures Area of Search Offshore Nesting A1: Southern North Sea Fish.









Hornsea Four

Compensation Measures
Areas of Search
Offshore Nesting
Southern North Sea
Marine Mammals

Array Area
Offshore Nesting Area of Search

Estimated at-sea Distribution of Grey and Harbour Seals maps data from Sea Mammal Research Unit (SMRU) and Marine Scotland, 2017

Coordinate system: ETRS 1989 UTM Zone 31N

REV	REMARK	DATE
-	First Issue	14/07/2022
A	Second Issue - Refined Search Areas	14/07/2022

Compensation Measures
Marine Mammals
Document no: HOW04GB0309
Created by: BPHB
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Approved by: LK

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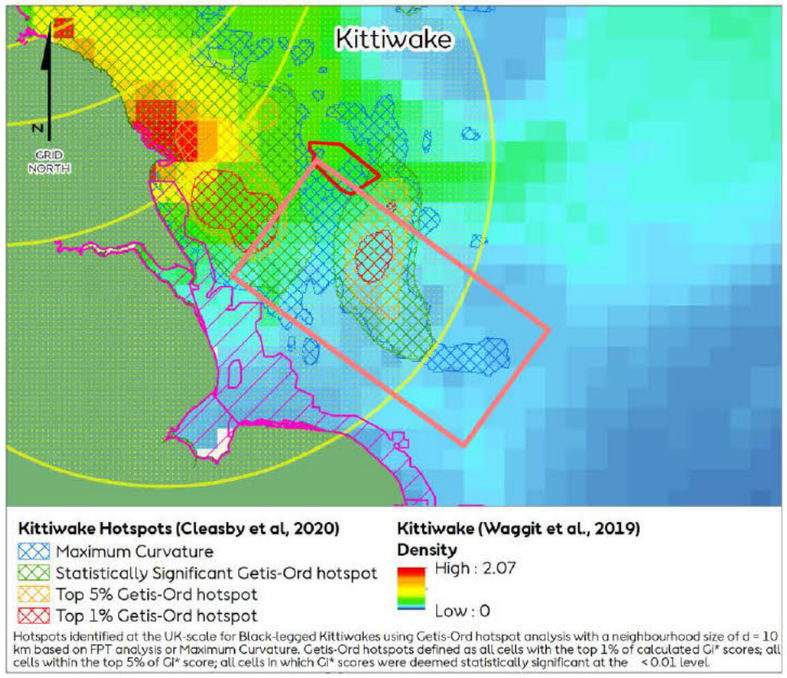
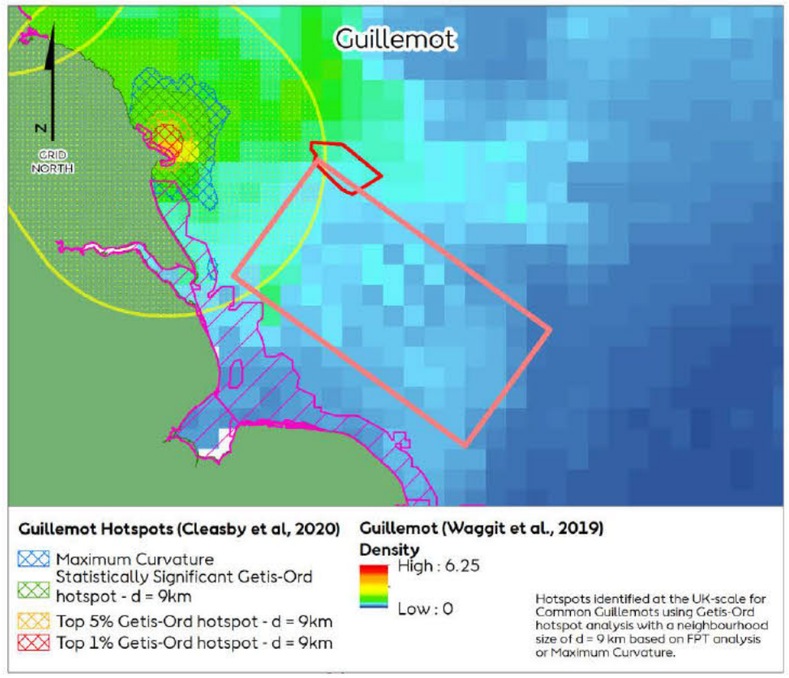
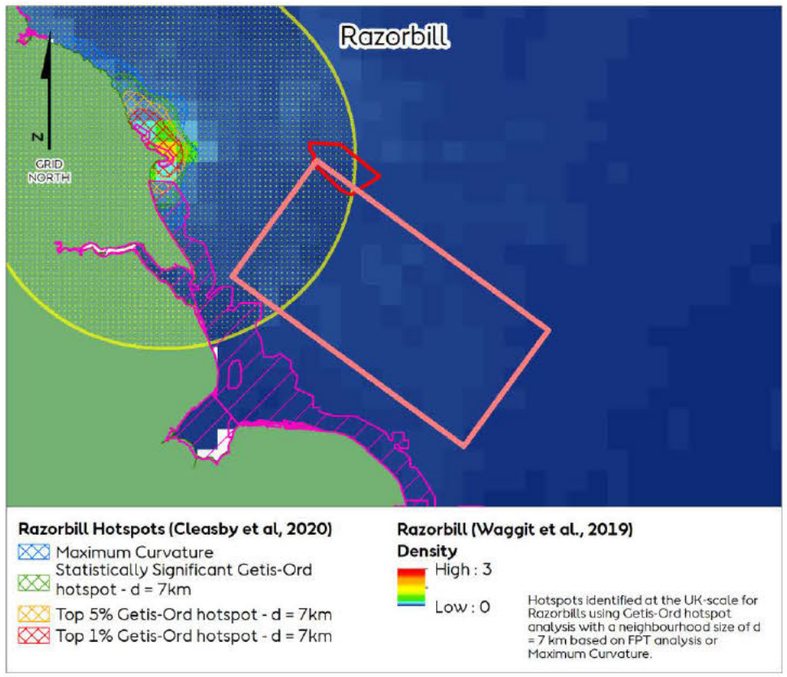
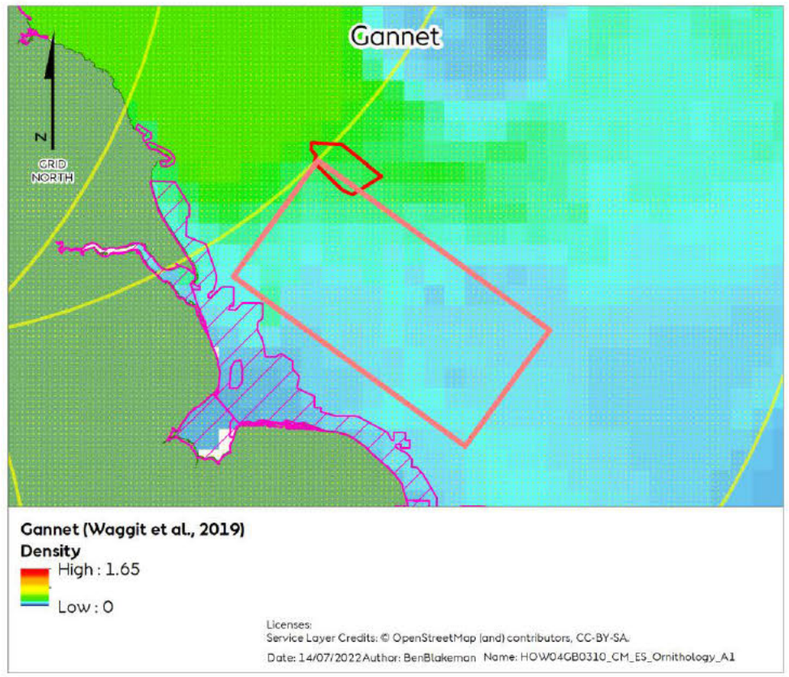
Figure 8: Compensation Measures Area of Search Offshore Nesting A1: Southern North Sea Marine Mammals.









Hornsea Four

Compensation Measures
Areas of Search
Offshore Nesting
Southern North Sea
Ornithology

Array Area
Offshore Nesting Area of Search
Special Protection Area (SPA) with Marine Components

Mean-Max Foraging Range (Woodward 2019)
Common Guillemot - 73.2km Buffer
Gannet - 315.2km Buffer
Kittiwake - 156.1km Buffer
Razorbill - 88.7km Buffer

Waggitt et al 2019 densities data. Spatial variation in predicted densities (animals per km) of seabird species in July in the North-East Atlantic. Values are provided at 10km resolution.

Coordinate system: ETRS 1989 UTM Zone 31N

0 50 100 Kilometres
0 25 50 Nautical Miles

REV	REMARK	DATE
---	First Issue	14/07/2022
A	Second Issue - Refined Search Areas	14/07/2022

Compensation Measures
Ornithology
Document no: HOW04GB0310
Created by: BPHB
Checked by: TB
Approved by: LK

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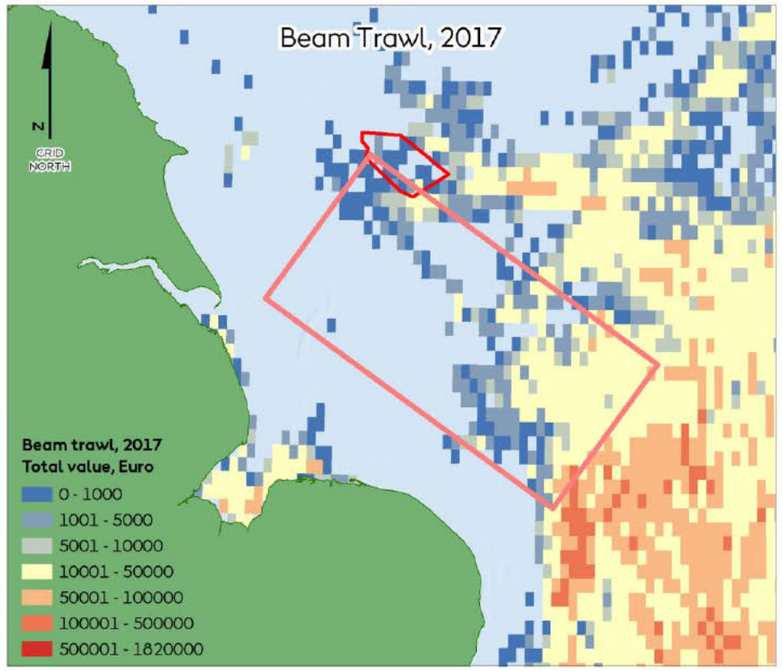
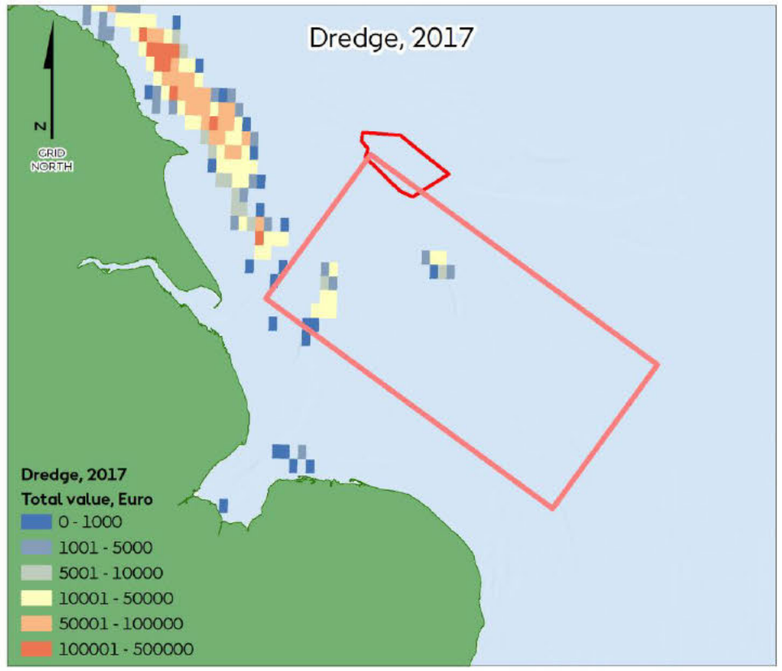
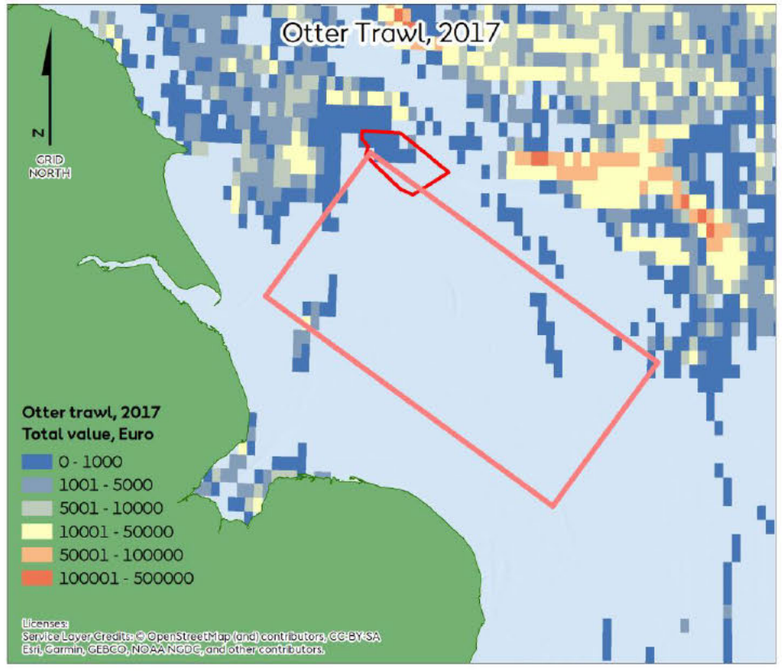
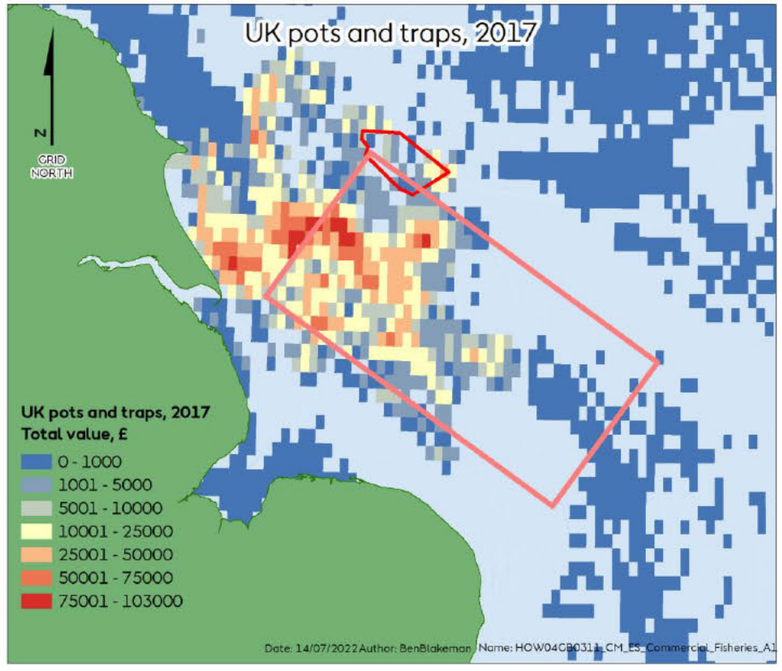
Figure 9: Compensation Measures Area of Search Offshore Nesting A1: Southern North Sea Ornithology.









Hornsea Four
Compensation Measures
Areas of Search
Offshore Nesting
Southern North Sea
Commercial Fisheries

Array Area
Offshore Nesting Area of Search

Coordinate system: ETRS 1989 UTM Zone 31N

0 50 100 Kilometres
0 25 50 Nautical Miles

REV	REMARK	DATE
---	First Issue	14/07/2022
A	Second Issue - Refined Search Areas	14/07/2022

Compensation Measures
Commercial Fisheries
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Checked by: TB
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Figure 10: Compensation Measures Area of Search Offshore Nesting A1: Southern North Sea Commercial Fisheries.

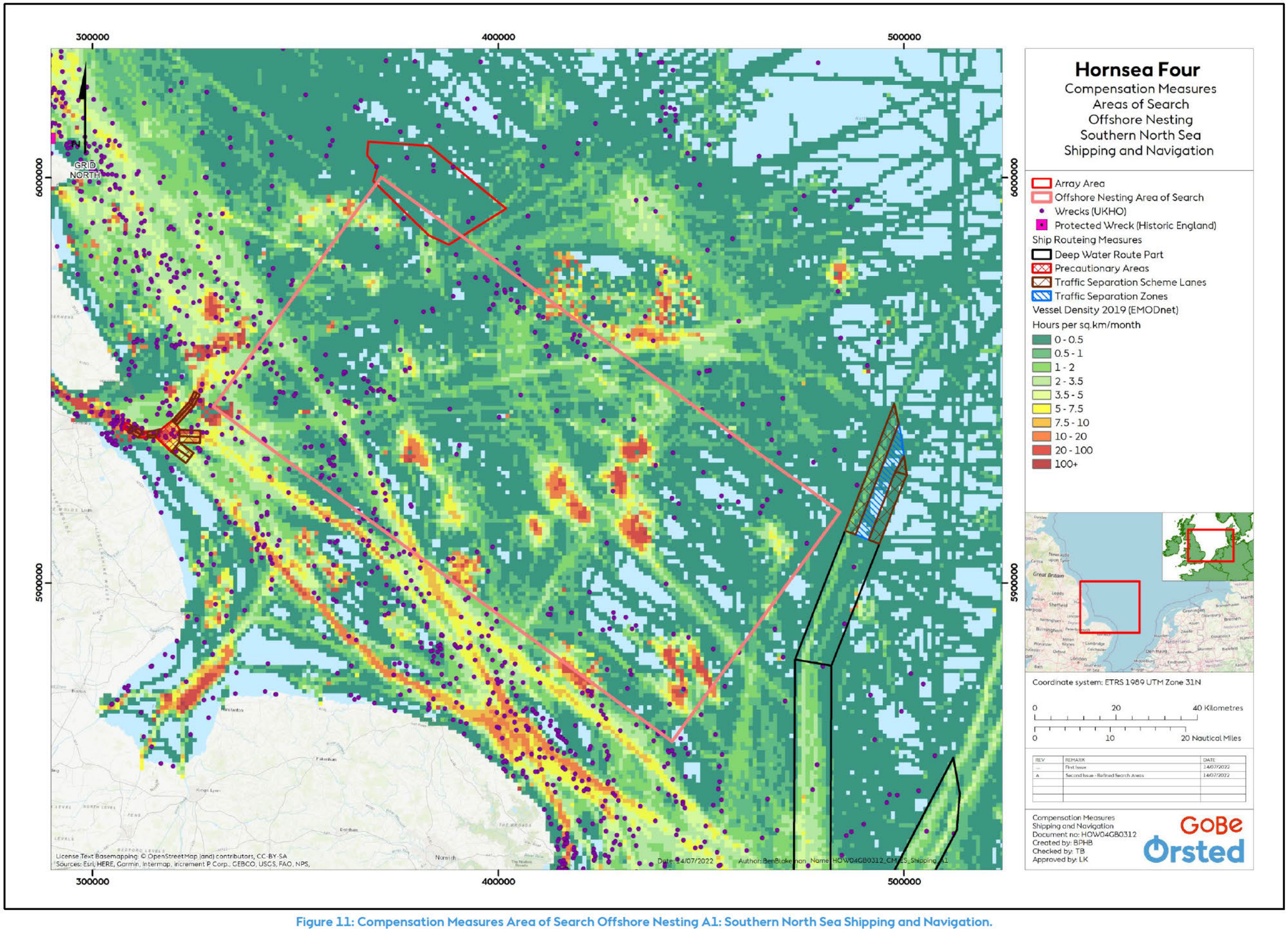


Figure 11: Compensation Measures Area of Search Offshore Nesting A1: Southern North Sea Shipping and Navigation.

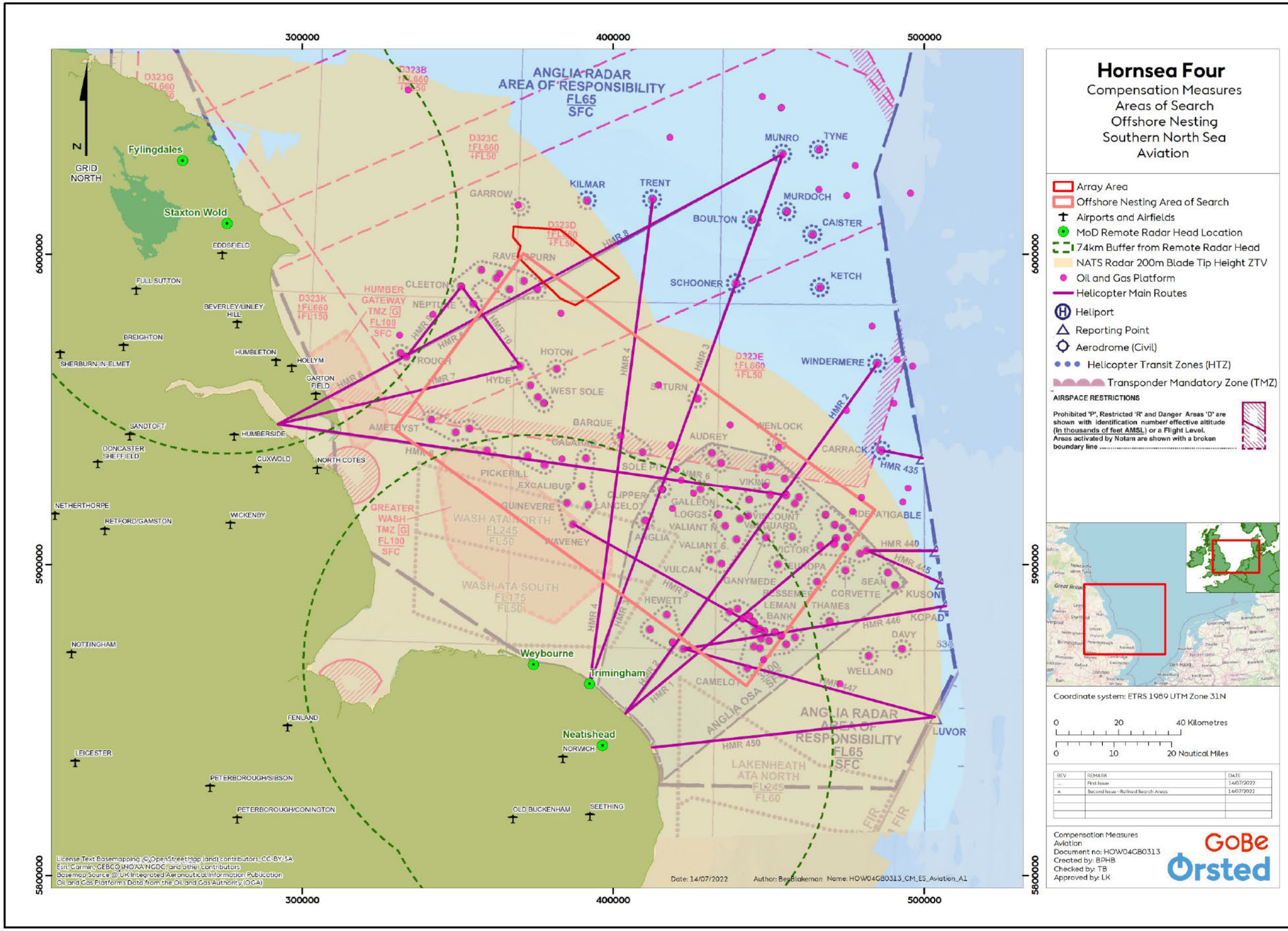


Figure 12: Compensation Measures Area of Search Offshore Nesting A1: Southern North Sea Aviation.

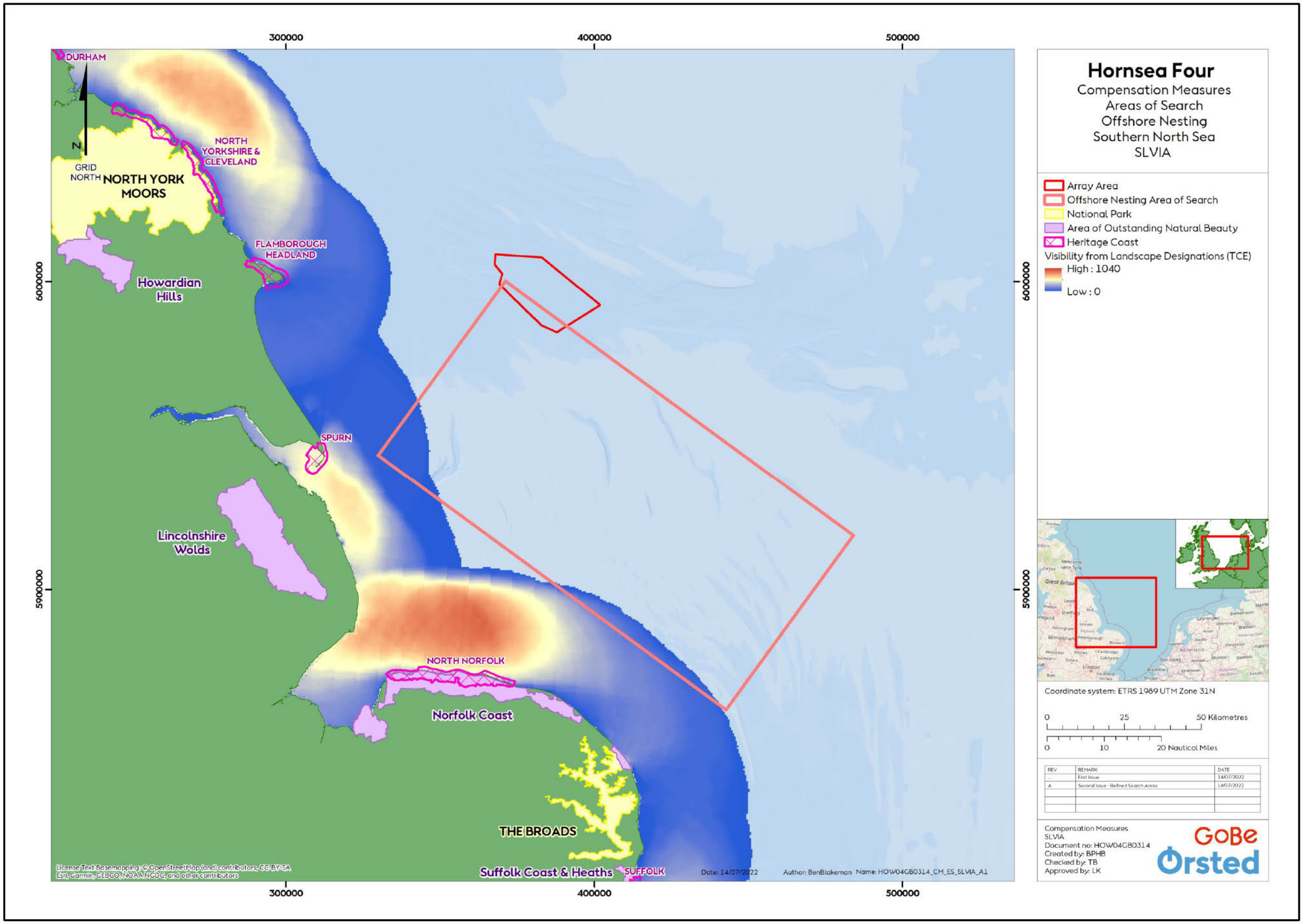


Figure 13: Compensation Measures Area of Search Offshore Nesting A1: Southern North Sea SLVIA.

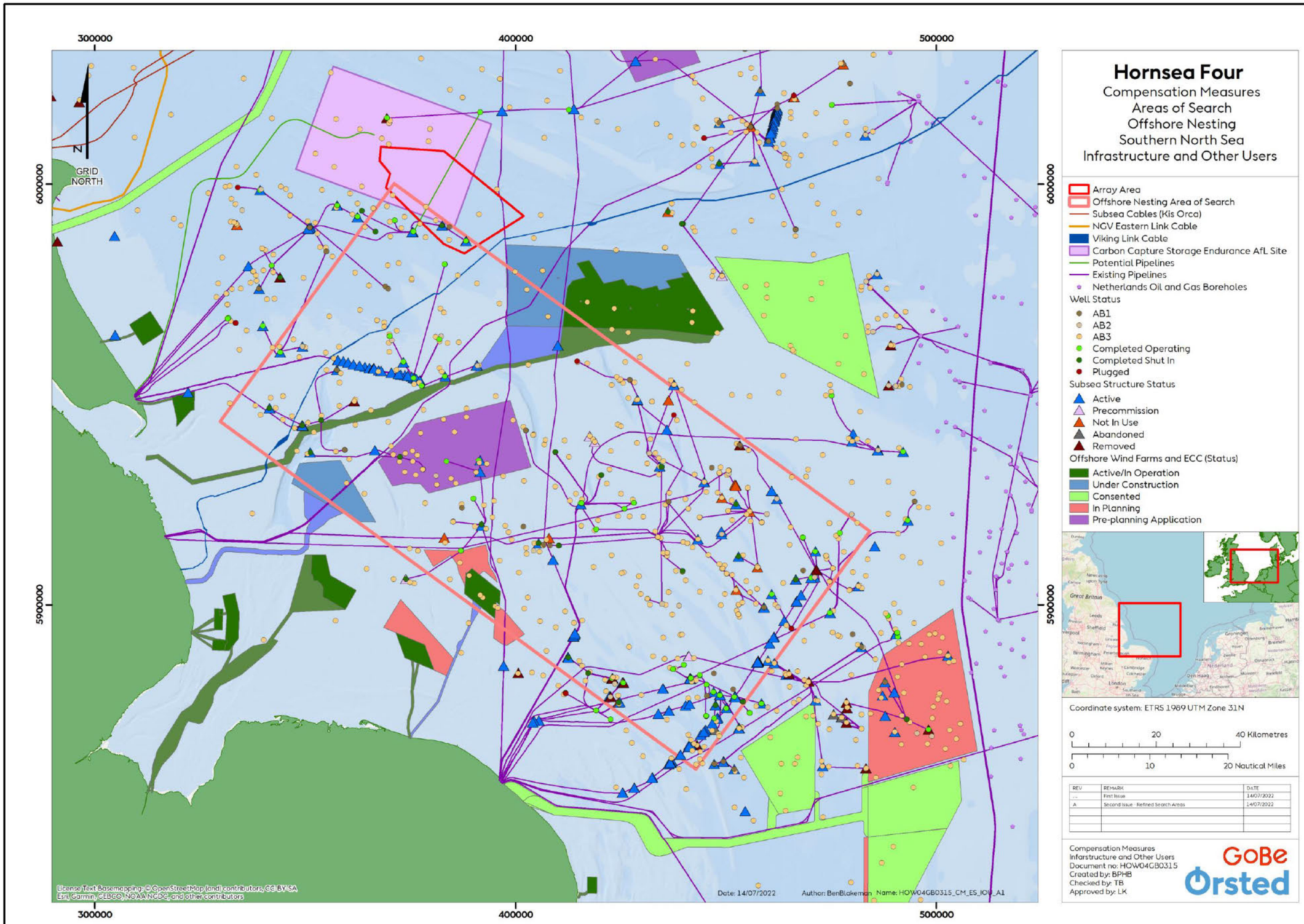


Figure 14: Compensation Measures Area of Search Offshore Nesting A1: Southern North Sea Infrastructure and Other Users.

7.3 Assessment

7.3.1 Identification of Impacts and Scope of Assessment

7.3.1.1 Based on the information presented in ~~Volume A4, Annex~~A4. ~~6~~6.1: Compensation Project Description (Deadline 7 submission~~APP-057~~) (and detailed in Section 4.1.5), all activities associated with the construction, implementation/O&M, and decommissioning of the new offshore artificial nesting ~~structures~~structure Compensation Measure were defined and potential impact pathways identified.

7.3.1.2 Table 7 details the impacts that were scoped out of the assessment at this stage alongside justification as to why each impact was scoped out.

7.3.1.3 All impacts considered to be scoped into the assessment are detailed in ~~Volume A4, Annex~~A4. 6.3: Compensation Impacts Register (Deadline ~~6~~7 submission).

Table 7: New Offshore Artificial Nesting ~~Structures~~Structure – Impacts Scoped Out of Assessment.

EIA Topic	Phase	Potential Impact	Justification for Scoping Out
Benthic and Intertidal Ecology Fish and Shellfish Ecology Marine Mammals Offshore and Intertidal Ornithology	All Phases	Accidental release of pollutants (e.g. from accidental spillage/leakage) and resulting in potential effects on receptors.	The magnitude of an accidental spill incident will be limited by the size of chemical or oil inventory on construction vessels. In addition, released hydrocarbons would be subject to rapid dilution, weathering and dispersion and would be unlikely to persist in the marine environment. The likelihood of an incident will be reduced by implementation of a Project Environmental Management and Monitoring Plan (PEMMP), undertaken in accordance with CoC-OFF-7 (~~Volume A4, Annex~~ A4.6.4: Compensation Commitments Register (Deadline ~~6~~7 submission)~~(APP-060)~~). This impact has therefore been scoped out of the assessment.
Benthic and Intertidal Ecology Fish and Shellfish Ecology	All Phases	Seabed disturbances leading to the release of sediment contaminants and resulting in potential effects on receptors.	Following any seabed disturbances, the majority of resuspended sediments are expected to be deposited within the immediate vicinity of the works. The release of any potential contaminants that may be present within the small proportion of fine sediments is likely to be rapidly dispersed with the tide and/or currents therefore increased bioavailability resulting in adverse eco-toxicological effects are not expected. As such and combined with the limited extent and duration of any seabed disturbances, the impact has been scoped out of the assessment.
Aviation and Radar	All Phases	Creation of aviation obstacle to fixed wing and rotary aircraft operating offshore.	The locations, heights and lighting status of the offshore nesting ~~structures~~structure will be reported to the Defence Infrastructure Organisation (DIO) and the Civil Aviation Authority (CAA)to allow inclusion on Aviation Charts in accordance with CoC-OFF-5 (~~Volume A4, Annex~~A4.~~6~~.4: Compensation Commitments Register (Deadline ~~6~~7 submission)~~(APP-060)~~). As such, the impact has been scoped out of the assessment.
Marine Archaeology	All Phases	Disturbance, removal, intrusion, compression and/or penetration of sediments containing archaeological receptors (material or contexts) leading to total or partial loss.	As a result of the implementation of a Marine Written Scheme of Archaeological Investigation (WSI) in accordance with CoC-OFF-2 and pre-construction surveys in accordance with CoC-OFF-14 (~~Volume A4, Annex~~A4.~~6~~.4: Compensation Commitments Register (Deadline ~~6~~7 submission)~~(APP-060)~~), and the impact being highly limited in extent, the impact has been scoped out of the assessment.
Marine Archaeology	Implementation/ O&M	Scour, penetration, draw down and compression effects caused by the presence of the foundations, impacting archaeological receptors and exposing such	

EIA Topic	Phase	Potential Impact	Justification for Scoping Out
		material to natural, chemical or biological processes and causing or accelerating loss of the same.	
Marine Archaeology	Implementation/ O&M	Penetration and compression effects on seabed caused by corrective and preventative operation and maintenance activities (via jack-up vessels or divers) leading to total or partial loss of archaeological receptors (material or contexts).	
Seascape, Landscape and Visual Resources	All Phases	All potential impacts on seascape, landscape and visual resources are scoped out due to lack of impact pathways.	The AoS is relatively well developed with oil and gas infrastructure. As such, the development is considered to be characteristic of the surrounding marine area and all potential impacts on seascape, landscape and visual resources from all phases of the Compensation Measure are scoped out of the assessment.
Infrastructure and Other Users	All Phases	All potential impacts on aggregate dredging activities, disposal sites, Carbon Capture and Storage (CCS) sites, cables and pipelines, Oil & Gas (O&G) activities.	In accordance with CoC-OFF-13 (~~Volume A4, Annex~~A4.~~6~~6.4: Compensation Commitments Register (Deadline ~~6~~7 submission)~~(APP-060)~~), the offshore nesting structure will not be sited in immediate proximity to aggregate dredging activities, disposal sites, CCS sites, cables and pipelines, and Oil & Gas (O&G) activities. As such, all potential impacts on these receptors have been scoped out of the assessment.

7.3.2 Impact Assessment

7.3.2.1 ~~Volume A4, Annex~~A4.~~6.3: Compensation Impacts Register~~ (Deadline 7 submission)~~(APP-059)~~ identifies the potential scoped in impacts that could result from the installation/construction, implementation/O&M, and decommissioning of the new offshore artificial nesting structure Compensation Measure, relating to each technical topic under consideration in the EIA process. Each of these impacts have been considered, following the process outlined in **Section 6**, with the MDS defined, magnitude of impact and sensitivity of receptor considered and the level of significance derived by the matrix approach. The Compensation Impacts Register is presented in ~~Volume A4, Annex~~A4.~~6.3: Compensation Impacts Register~~ (Deadline 7 submission)~~(APP-059)~~.

7.3.2.2 As presented in ~~Volume A4, Annex~~A4.~~6.3: Compensation Impacts Register~~ (Deadline 7 submission)~~(APP-059)~~, it has been concluded that that no LSE is predicted for any of the potential impacts arising from the installation/construction, implementation/O&M and decommissioning of the new offshore artificial nesting structure Compensation Measure. As such, the potential effects to all receptors are therefore **not significant** in terms of the EIA Regulations (~~Volume A1, Chapter~~A1.~~5: Environmental Impact Assessment Methodology~~ (APP-011)).

8 EIA – Repurposed Offshore Artificial Nesting ~~Structures~~Structure

8.1 Introduction

8.1.1.1 This section considers the potential impacts arising from the repurposed offshore artificial nesting ~~structures~~structure Compensation Measure. A regional environmental characterisation of the physical, biological and human environmental baseline is presented alongside the results of an assessment of potential significant effects arising from the proposed Compensation Measure. Only one AoS has been identified for the repurposed offshore artificial nesting ~~structures~~structure Compensation Measure (A1: Southern North Sea) and as such, the baseline and assessment within this section relates to this AoS alone.

8.2 Baseline

8.2.1.1 Due to the nature of this compensation measure, the baseline environment is the same as that described for the new offshore artificial nesting ~~structures~~structure and therefore the summary of the baseline environment for AoS A1 is described in **Table 6** in **Section 7.2** above.

8.3 Assessment

8.3.1 Identification of Impacts and Scope of Assessment

8.3.1.1 Based on the information presented in ~~**Volume A4, Annex**~~A4. ~~6.1: Compensation Project Description~~ (Deadline 7 submission)~~(APP-057)~~ (and summarised in **Section 4.1.5**). all activities associated with the construction, implementation/O&M and decommissioning of the new offshore artificial nesting ~~structures~~structure Compensation Measure were defined and potential impact pathways identified.

8.3.1.2 **Table 7** details the impacts that were scoped out of the assessment at this stage alongside justification as to why each impact was scoped out.

8.3.1.3 All impacts considered to be scoped into the assessment are detailed in ~~**Volume A4, Annex**~~A4. **6.3: Compensation Impacts Register** (Deadline 7 submission)~~(APP-059)~~.

Table 8: Repurposed Offshore Artificial Nesting ~~Structures~~Structure – Impacts Scoped Out of Assessment.

EIA Topic	Phase	Potential Impact	Justification for Scoping Out
Marine Geology, Oceanography and Physical Processes	Implementation/ O&M	Scour of seabed sediments around foundation.	Existing structure forms part of the baseline environment. As such, this impact has been scoped out of the assessment.
Benthic and Intertidal Ecology Fish and Shellfish Ecology Marine Mammals Offshore and Intertidal Ornithology	All Phases	Accidental release of pollutants (e.g. from accidental spillage/leakage) and resulting in potential effects on receptors.	The magnitude of an accidental spill incident will be limited by the size of chemical or oil inventory on construction vessels. In addition, released hydrocarbons would be subject to rapid dilution, weathering and dispersion and would be unlikely to persist in the marine environment. The likelihood of an incident will be reduced by implementation of a Project Environmental Management and Monitoring Plan (PEMMP), undertaken in accordance with CoC-OFF-7 (~~Volume A4, Annex~~A4.~~ 6.4: Compensation Commitments Register~~ (Deadline 7 submission)~~(APP-060)~~). This impact has therefore been scoped out of the assessment.
Benthic and Intertidal Ecology Fish and Shellfish Ecology	All Phases	Seabed disturbances leading to the release of sediment contaminants and resulting in potential effects on receptors.	Following any seabed disturbances, the majority of resuspended sediments are expected to be deposited within the immediate vicinity of the works. The release of any potential contaminants that may be present within the small proportion of fine sediments is likely to be rapidly dispersed with the tide and/or currents therefore increased bioavailability resulting in adverse eco-toxicological effects are not expected. As such and combined with the limited extent and duration of any seabed disturbances, the impact has been scoped out of the assessment.
Offshore and Intertidal Ornithology	Implementation/ O&M	The impact of physical displacement from an area around the ~~structures~~structure may result in effective habitat loss and reduction in survival or fitness rates.	Existing structure forms part of the baseline environment. As such, this impact has been scoped out of the assessment.
Offshore and Intertidal Ornithology		The impact of barrier effects caused by the physical presence of the ~~structures~~structure may prevent clear transit of birds between foraging and breeding sites, or on migration.	Existing structure forms part of the baseline environment. As such, this impact has been scoped out of the assessment.

EIA Topic	Phase	Potential Impact	Justification for Scoping Out
Offshore and Intertidal Ornithology		The impact of attraction to lit ~~structures~~structure by migrating birds in particular may cause disorientation, reduction in fitness and possible mortality.	Existing structure forms part of the baseline environment. As such, this impact has been scoped out of the assessment.
Marine Mammals Offshore and Intertidal Ornithology	All Phases	Increased vessel traffic resulting in disturbance to receptors	Existing structure forms part of the baseline environment. As such, this impact has been scoped out of the assessment.
Commercial Fisheries	Implementation/ O&M	Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from the structure leading to interference with fishing activity.	Existing structure forms part of the baseline environment. As such, this impact has been scoped out of the assessment.
Shipping & Navigation	Installation/ Construction	Structure will create powered and drifting allision risk for all vessels.	Existing structure forms part of the baseline environment. As such, this impact has been scoped out of the assessment.
Shipping & Navigation	Implementation/ O&M	Presence of structure may cause vessels to be deviated leading to increased encounters and therefore increased vessel to vessel collision risk for all vessel in all weather conditions.	Existing structure forms part of the baseline environment. As such, this impact has been scoped out of the assessment.
Shipping & Navigation	Implementation/ O&M	Maintenance activities may cause vessels to be deviated leading to increased encounters and therefore may also lead to increased vessel to vessel collision risk for all vessels in all weather conditions.	Existing structure forms part of the baseline environment. As such, this impact has been scoped out of the assessment.
Aviation and Radar	All Phases	Continuation of aviation obstacle to fixed wing and rotary aircraft operating offshore.	Existing structure forms part of the baseline environment. As such, this impact has been scoped out of the assessment.
Marine Archaeology	All Phases	Disturbance, removal, intrusion, compression and/or penetration of sediments containing archaeological receptors (material or contexts) leading to total or partial loss.	As a result of the implementation of a Marine Written Scheme of Archaeological Investigation (WSI) in accordance with CoC-OFF-2 and pre-construction surveys in accordance with CoC-OFF-14 (~~Volume A4, Annex~~A4.~~-~~6.4: Compensation Commitments Register (Deadline 7 submission)~~(APP-060)~~), and the impact being highly limited in extent, the impact has been scoped out of the assessment.
Marine Archaeology	Implementation/ O&M	Scour, penetration, draw down and compression effects caused by the presence of the foundations,	

EIA Topic	Phase	Potential Impact	Justification for Scoping Out
		impacting archaeological receptors and exposing such material to natural, chemical or biological processes and causing or accelerating loss of the same.	
Marine Archaeology	Implementation/ O&M	Penetration and compression effects on seabed caused by corrective and preventative operation and maintenance activities (via jack-up vessels or divers) leading to total or partial loss of archaeological receptors (material or contexts).	
Seascape, Landscape and Visual Resources	All Phases	All potential impacts on seascape, landscape and visual resources are scoped out due to lack of impact pathways.	Existing structure forms part of the baseline environment. As such, this impact has been scoped out of the assessment.
Infrastructure and Other Users	All Phases	All potential impacts on aggregate dredging activities, disposal sites, Carbon Capture and Storage (CCS) sites, cables and pipelines, Oil & Gas (O&G) activities, recreational craft, and recreational fishing vessels.	Existing structure forms part of the baseline environment. As such, this impact has been scoped out of the assessment.

8.3.2 Impact Assessment

8.3.2.1 ~~Volume A4, Annex~~A4.~~6.3: Compensation Impacts Register~~ (Deadline 7 submission) ~~(APP-059)~~ identifies the potential scoped in impacts that could result from the installation/construction, implementation/O&M, and decommissioning of the repurposed offshore artificial nesting ~~structures~~structure Compensation Measure, relating to each technical topic under consideration in the EIA process. Each of these impacts have been considered, following the process outlined in **Section 6**, with the MDS defined, magnitude of impact and sensitivity of receptor considered and the level of significance derived by the matrix approach. The Compensation Impacts Register is presented in ~~Volume A4, Annex~~A4.~~6.3: Compensation Impacts Register~~ (Deadline 7 submission)~~(APP-059)~~.

8.3.2.2 As presented in ~~Volume A4, Annex~~A4.~~6.3: Compensation Impacts Register~~ (Deadline 7 submission)~~(APP-059)~~, it has been conclude that no LSE is predicted for any of the potential impacts arising from the installation/construction, implementation/O&M and decommissioning of the repurposed offshore artificial nesting ~~structures~~structure Compensation Measure. As such, the potential effects to all receptors are therefore **not significant** in terms of the EIA Regulations (~~Volume A1, Chapter~~A1.~~5: Environmental Impact Assessment Methodology~~ (APP-011)).

9 EIA – New Onshore Artificial Nesting ~~Structures~~Structure

9.1 Introduction

9.1.1.1 This section considers the potential impacts arising from the new onshore artificial nesting ~~structures~~structure Compensation Measure. A regional environmental characterisation of the physical, biological and human environmental baseline is presented alongside the results of an assessment of potential significant effects arising from the proposed Compensation Measure. One~~Two~~ AoS has been identified for the new onshore artificial nesting ~~structures~~structure Compensation Measure: B1 (C~~l~~ayton Bay to Newbiggin by the Sea). ~~and B2 (Suffolk Coast).~~

9.2 Baseline

9.2.1.1 **Table 9** provides a summary of the baseline environment for AoS B1 (C~~l~~ayton Bay to Newbiggin by the Sea). ~~and **Table 10** provides a summary of the baseline environment for AoS B2 (Suffolk Coast).~~

9.2.1.2 **Figure 15** to ~~**Figure 23**~~**Figure 20** identify statutory, non-statutory and historic environment designations within ~~each of~~ the ~~two~~ AoS (where spatial data is publicly available). Due to the scale of AoS B1, the figures have been split into north and south.

Table 9: Summary of baseline environment in relation to the Area of Search (C~~l~~ayton Bay to Newbiggin by the Sea~~Blyth~~) for new onshore nesting ~~structures~~structure.

Topic	Summary of Baseline Environment
Geology and Ground Conditions	• The Bedrock Aquifer Designation ranges from predominately Principal north of Hartlepool to Secondary B and Secondary (undifferentiated) between Hartlepool to Redcar. The remainder to the south is Secondary A. • The Superficial Drift Aquifer Designation is predominately Secondary (undifferentiated) within the entirety of the AoS.
Hydrology and Flood Risk	• The majority of coastline is within Flood Zone 3 and there are several main rivers within the AoS including the River Tyne, River Wear, River Tees and River Esk.
Historic Environment	• 2506 Listed Buildings • 70 Scheduled Monuments • One World Heritage Site within the AoS (*Frontiers of the Roman Empire (Hadrian's Wall)*) • One Registered Battlefield (*Battle of Newburn Ford 1640)*
Ecology	• 39 Local Nature Reserves • 31 SSSIs • Four SACs (*Beast Cliff-Whitby (Robin Hood's Bay), Castle Eden Dene, Durham Coast* and *North York Moors*) • Four SPAs (*North York Moors, Northumberland Marine, Northumbria Coast and Teesmouth* and *Cleveland Coast*) • Two Ramsar sites (*Northumbria Coast and Teesmouth* and *Cleveland Coast*) • One RSPB Reserve (*Saltholme*) and two RSPB Important Bird Areas (*North Yorkshire Moors, Northumbria Coast and Teesmouth* and *Cleveland Coast*)
Landscape and Visual	• No AONBs within AoS • This AoS includes several National Character Areas
Land Use and Agriculture	• Land use is predominately rural. However, there are urbanised and industrialised cities within the AoS such as Newcastle Upon Tyne, Sunderland and Hartlepool. • The majority of AoS is Agricultural Land Classification Grade 3.
Traffic and Transport	• No baseline information been collated due to the scale of the AoS, however the road network includes those within Newcastle upon Tyne, Sunderland, Hartlepool and Middlesbrough as well as a number of routes in parallel with the coastline.
Noise and Vibration	• Defra strategic noise map data identifies a number of Noise Important Areas along the length of the AoS. These are predominately located along roads within urban areas such as Scarborough, Coatham, Sunderland, South Shields and Newcastle. Baseline noise levels are highest along major roads within the previously mentioned locations. Baseline noise levels are low within the AoS in rural locations where the nesting structure is likely to be located.
Air Quality	• There are several Air Quality Management Areas (AQMAs) within the AoS (Scarborough AQMA – declared for Particulate Matter PM_{10} and several within the urban areas of Newcastle Upon Tyne)
Socio-Economic	• The AoS contains a wide range of economic activities including agriculture, tourism and industrial. Parts of the AoS in south Northumberland, North Tyneside, Newcastle upon Tyne, Sunderland, Hartlepool, Middlesbrough, Redcar and North Yorkshire include areas within the most 10% economically deprived neighbourhoods in England.
Health	• Parts of the AoS in south Northumberland, North Tyneside, Newcastle upon Tyne, Sunderland, Hartlepool, Middlesbrough, Redcar and North Yorkshire include areas within the most 10% health deprived neighbourhoods in England.

Table 10: Summary of baseline environment in relation to the Area of Search (Suffolk coast) for new onshore nesting structuresstructure.

Topic	Suffolk coast: New Onshore Nesting StructuresStructure
Geology and Ground Conditions	• The Bedrock Aquifer Designation is Principal within the entirety of the AoS. • The Superficial Drift Aquifer Designation is Secondary A and Secondary (undifferentiated) in the areas surrounding Great Yarmouth and Lowestoft.
Hydrology and Flood Risk	• The majority of coastline is within Flood Zone 3 and there are several main river within the AoS including *the River Blyth, River Waveney* and *River Yare*.
Historic Environment	• 428 Listed Buildings • Seven Scheduled Monuments • There are no World Heritage Sites within the AoS.)
Ecology	• Three Local Nature Reserves (*Gunton Warren and Corton Woods, Gunton Wood* and *The Haven, Aldeburgh*) • Six SSSIs • Three SACs (*Benacre to Easton Bavents Lagoons, Minsmere to Walberswick Heaths & Marshes* and *Southern North Sea*) • Five SPAs (*Great Yarmouth North Denes, Minsmere-Walberswick, Outer Thames Estuary* and *Sandlings*) • One Ramsar site (*Minsmere-Walberswick*) • Five RSPB Reserves (*Alde - Ore Estuary, Benacre to Easton Bavents, Great Yarmouth North Denes, Minsmere – Walberswick* and *Suffolk Sandlings*) and three RSPB Important Bird Areas (*Dingle Marshes, Minsmere, North Warren*)
Landscape and Visual	• One AONB (*Suffolk Coast and Heaths*) • The majority of the AoS falls within the *Suffolk Coast and Heaths* National Character Area (ref: 82)
Land Use and Agriculture	• Land use is predominately rural. However, there are urbanised and industrialised cities within the AoS such as Lowestoft and Great Yarmouth. • The majority of AoS is Agricultural Land Classification Grade 4 or Non-agricultural.
Traffic and Transport	• The most significant road networks within the AoS are the urban roads within Lowestoft and Great Yarmouth.
Noise and Vibration	• Defra strategic noise map data identifies Noise Important Areas along the length of the AoS. These are found within the urban areas of Lowestoft and Great Yarmouth. Baseline noise levels are highest along major roads within the previously mentioned locations. Baseline noise levels are low within the AoS in rural locations where the nesting structure is likely to be located.
Air Quality	• There are no AQMAs within the AoS.
Socio-Economic	• The AoS includes a number of tourism locations, with agriculture also present outside of the urban areas. Both Lowestoft and Great Yarmouth include areas within the most 10% economically deprived neighbourhoods in England.
Health	• Both Lowestoft and Great Yarmouth include areas within the most 10% health deprived neighbourhoods in England.

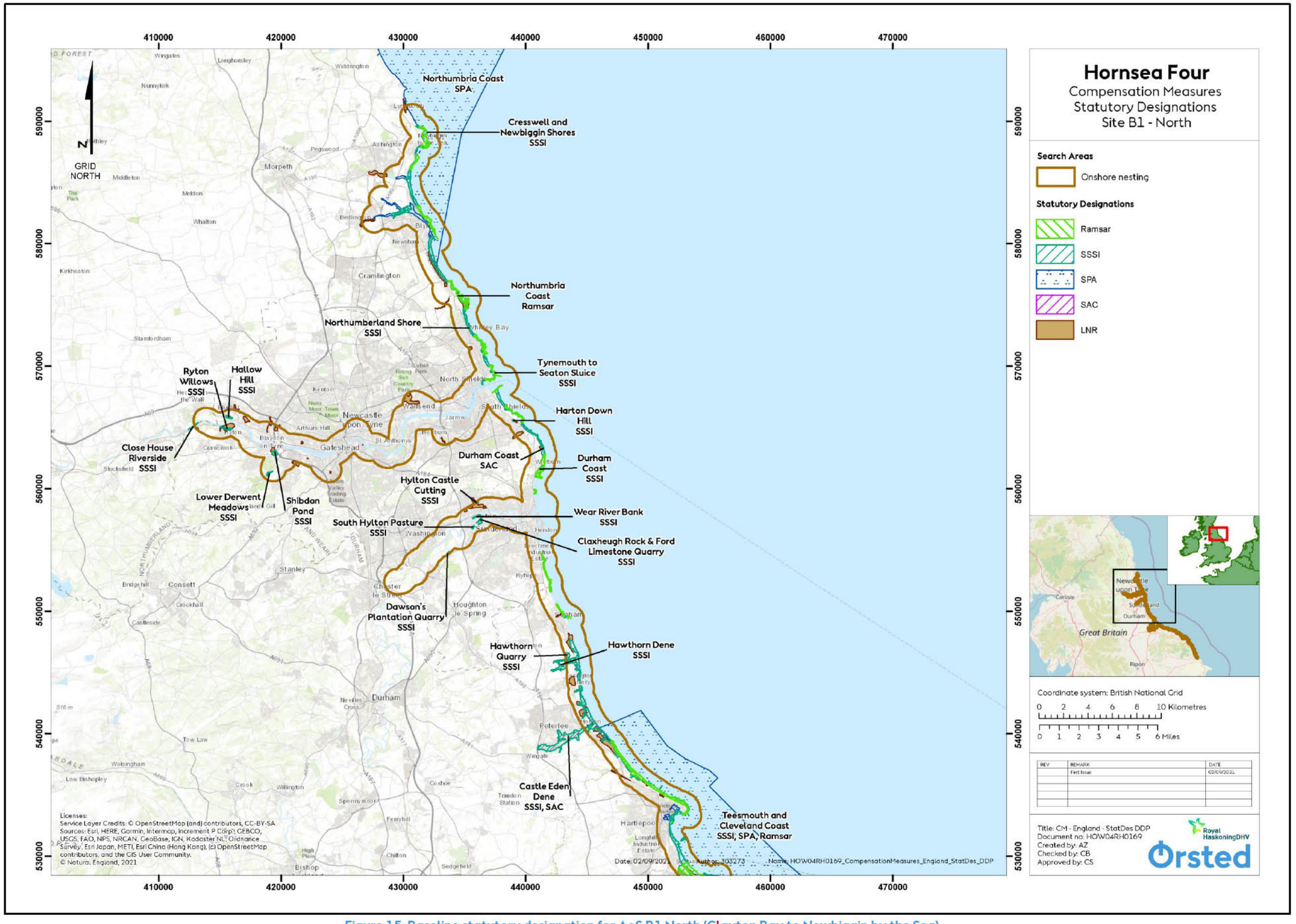


Figure 15: Baseline statutory designation for AoS B1 North (Clayton Bay to Newbiggin by the Sea).

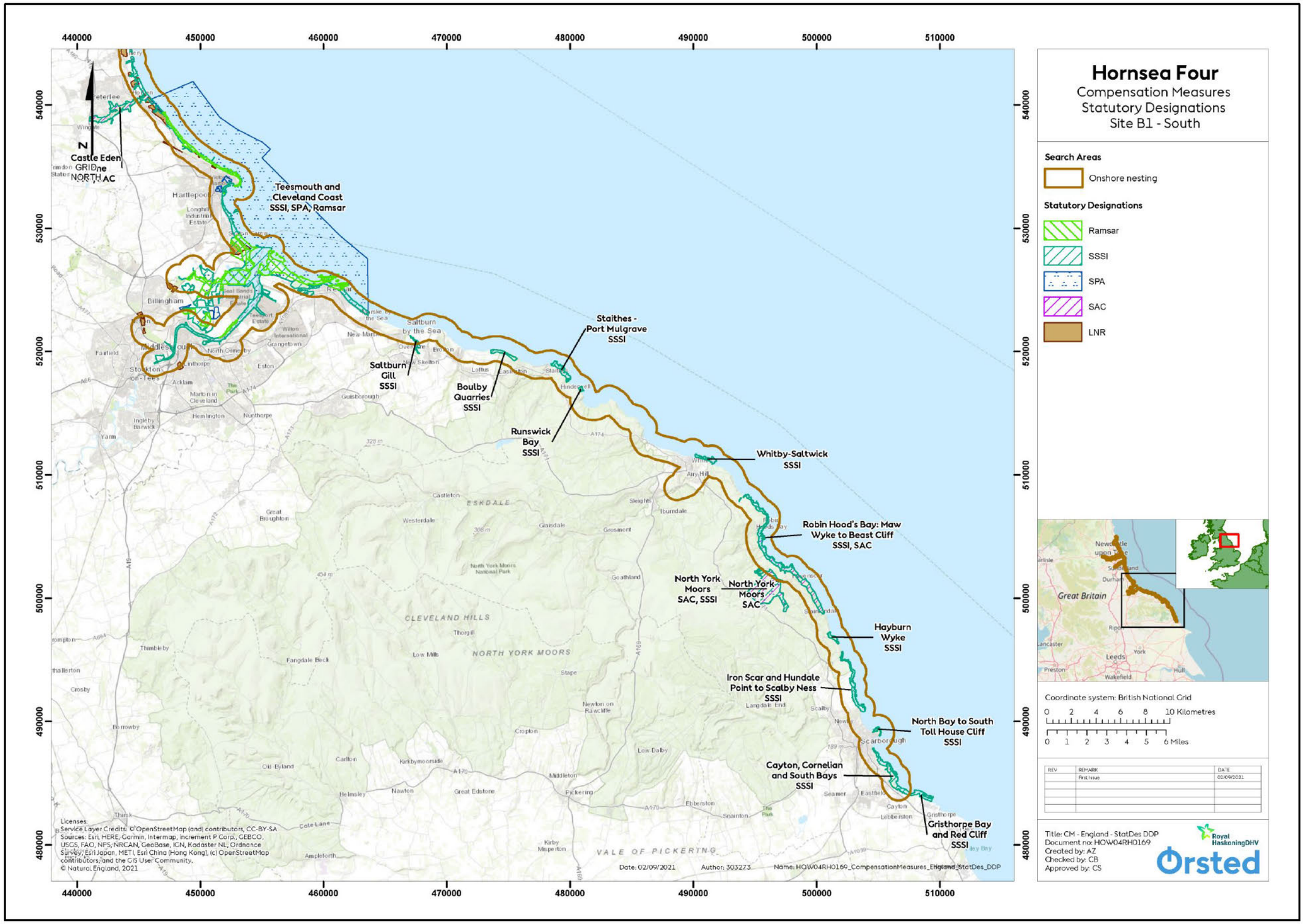


Figure 16: Baseline statutory designation for AoS B1 South (Clayton Bay to Newbiggin by the Sea).

Figure 17: Baseline non-statutory designation for AoS B1 North (Clayton Bay to Newbiggin by the Sea).

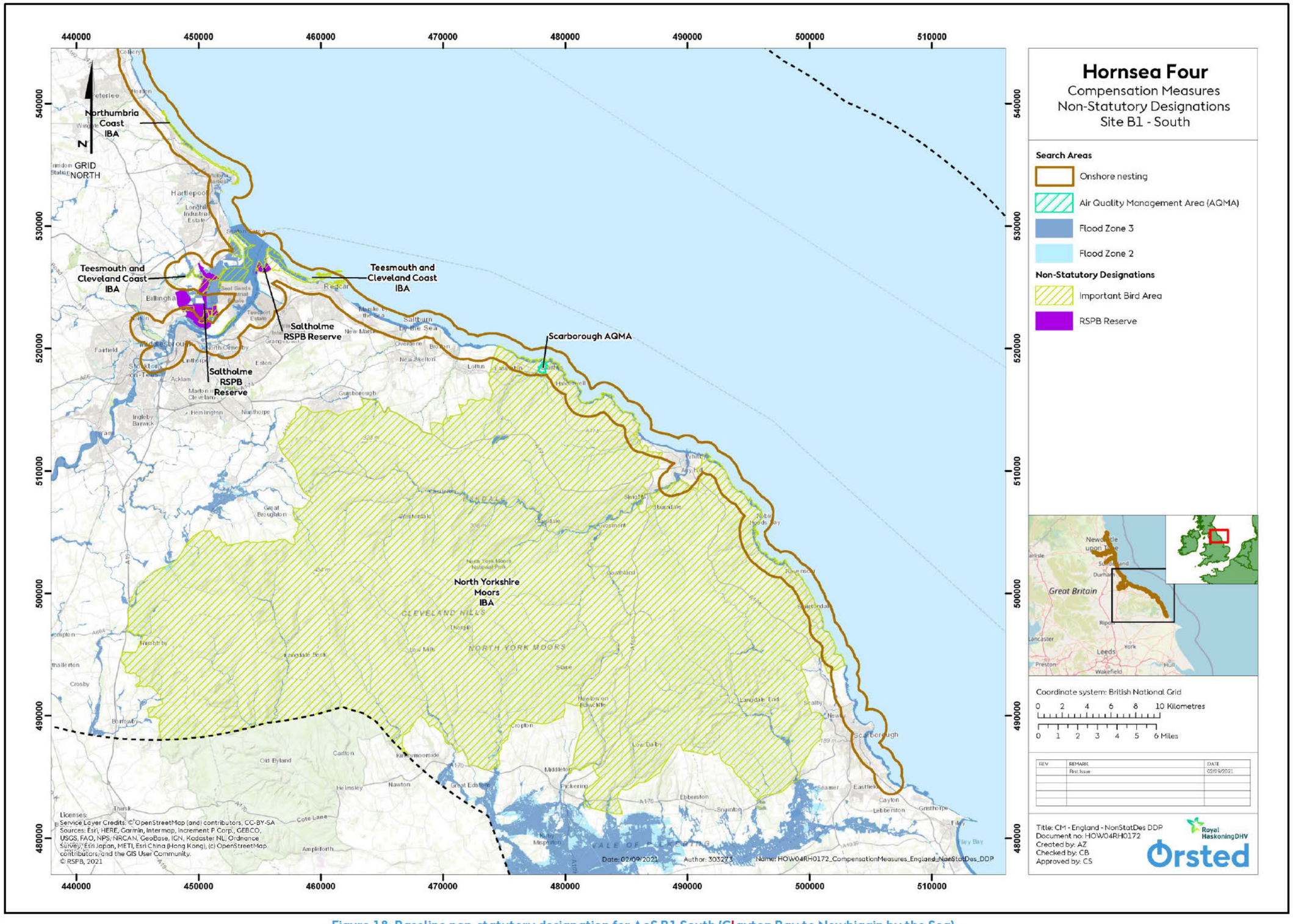


Figure 18: Baseline non-statutory designation for AoS B1 South (Clayton Bay to Newbiggin by the Sea).

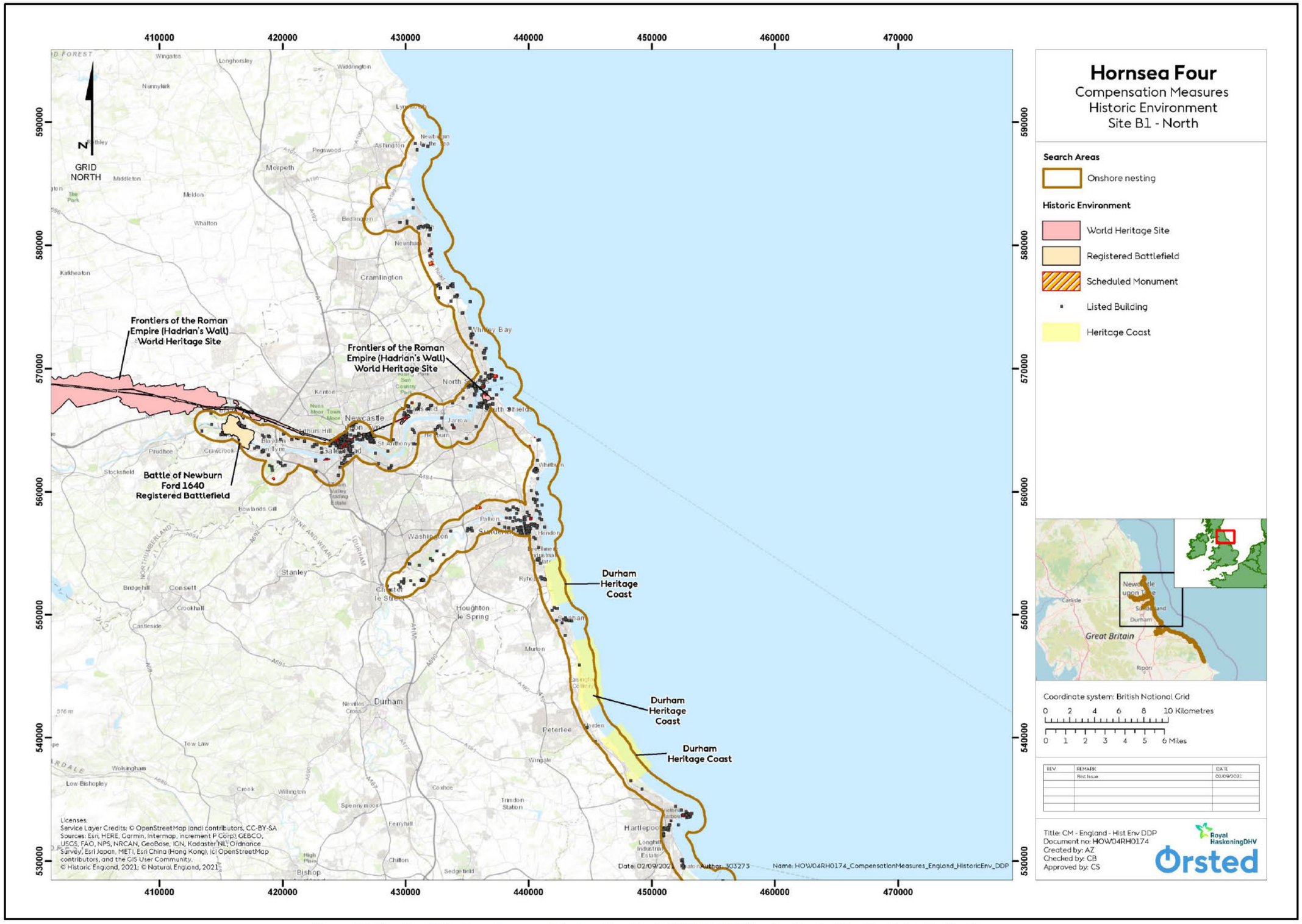


Figure 19: Baseline historic environment designation for AoS B1 North (Clayton Bay to Newbiggin by the Sea).

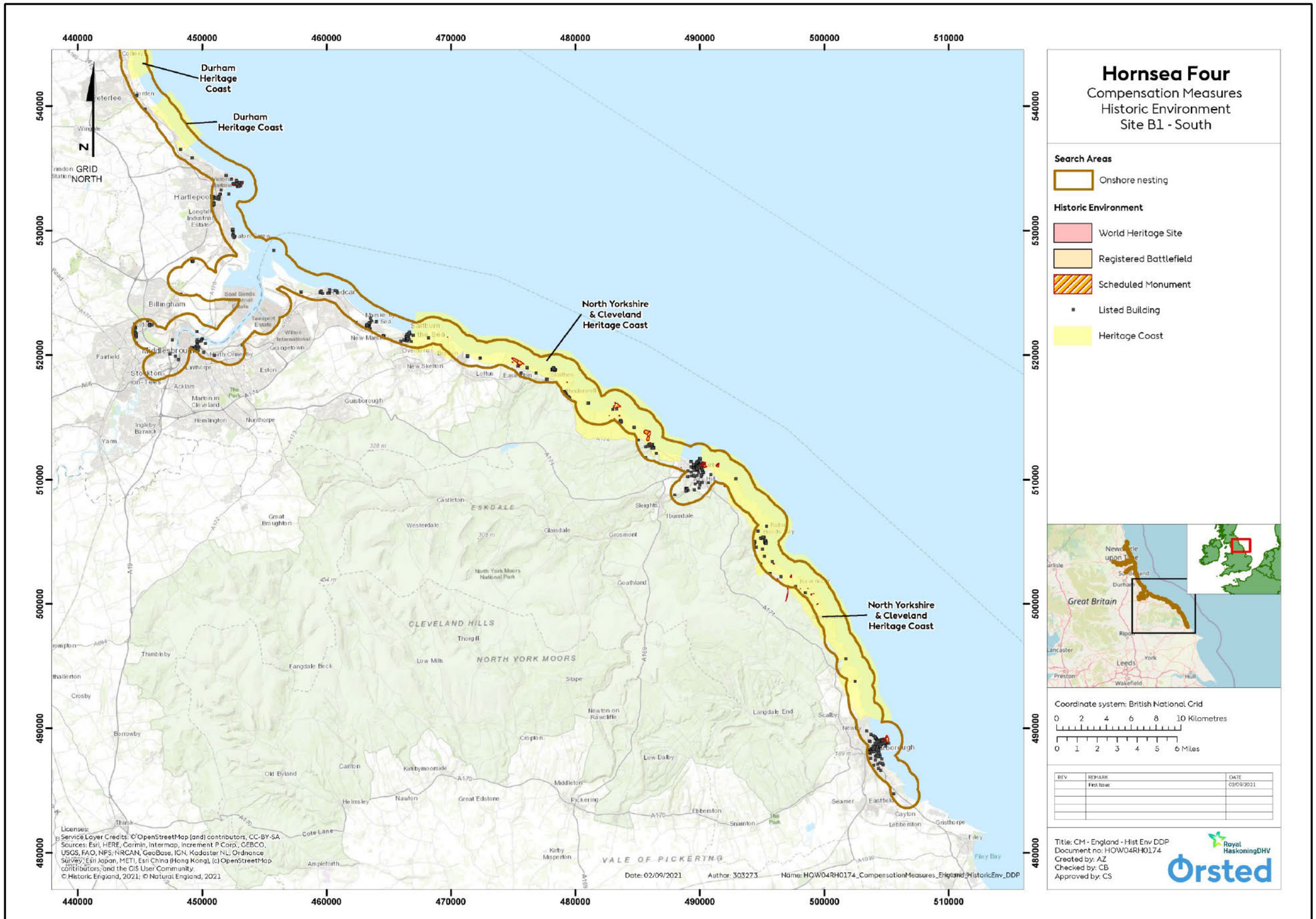
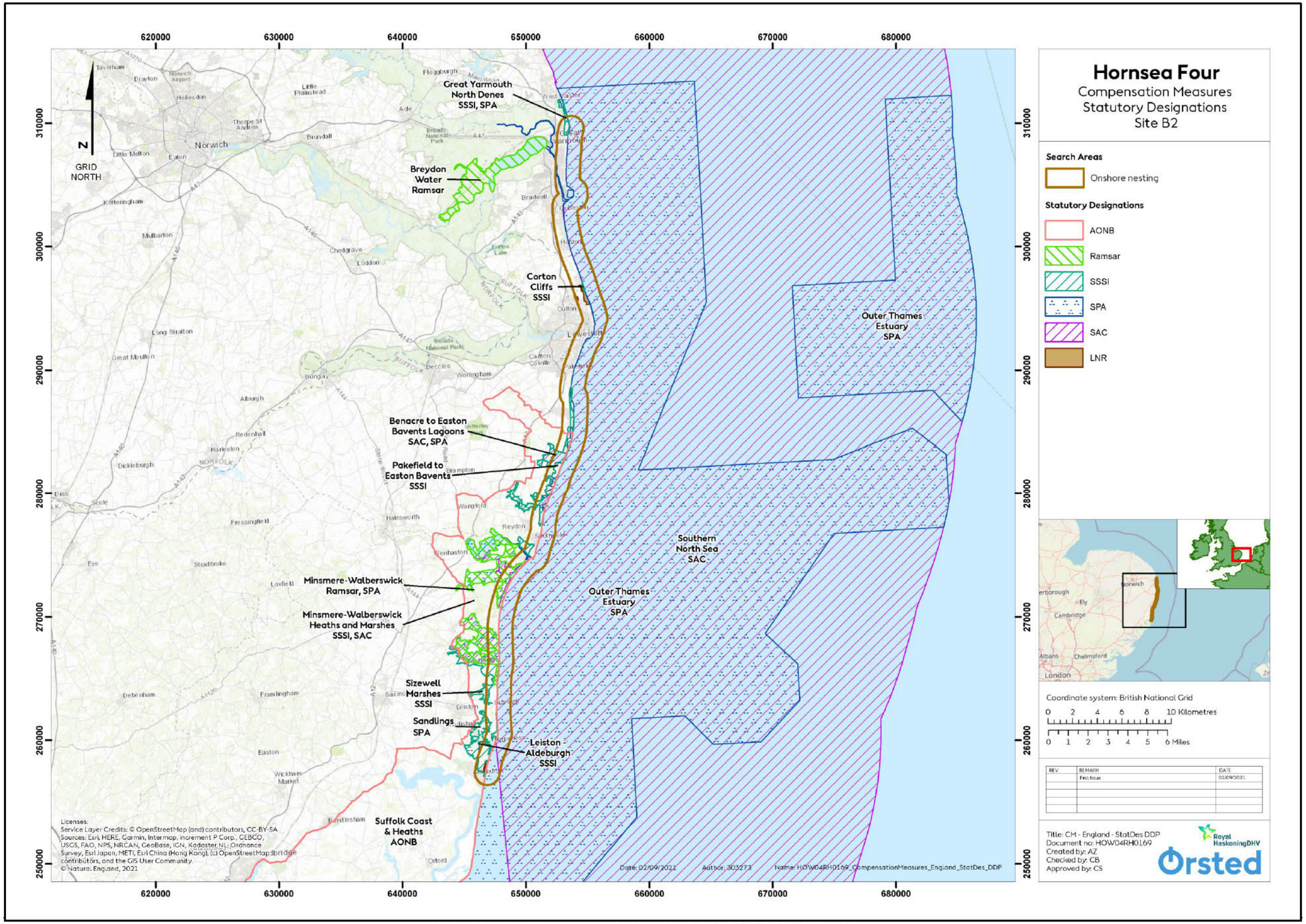
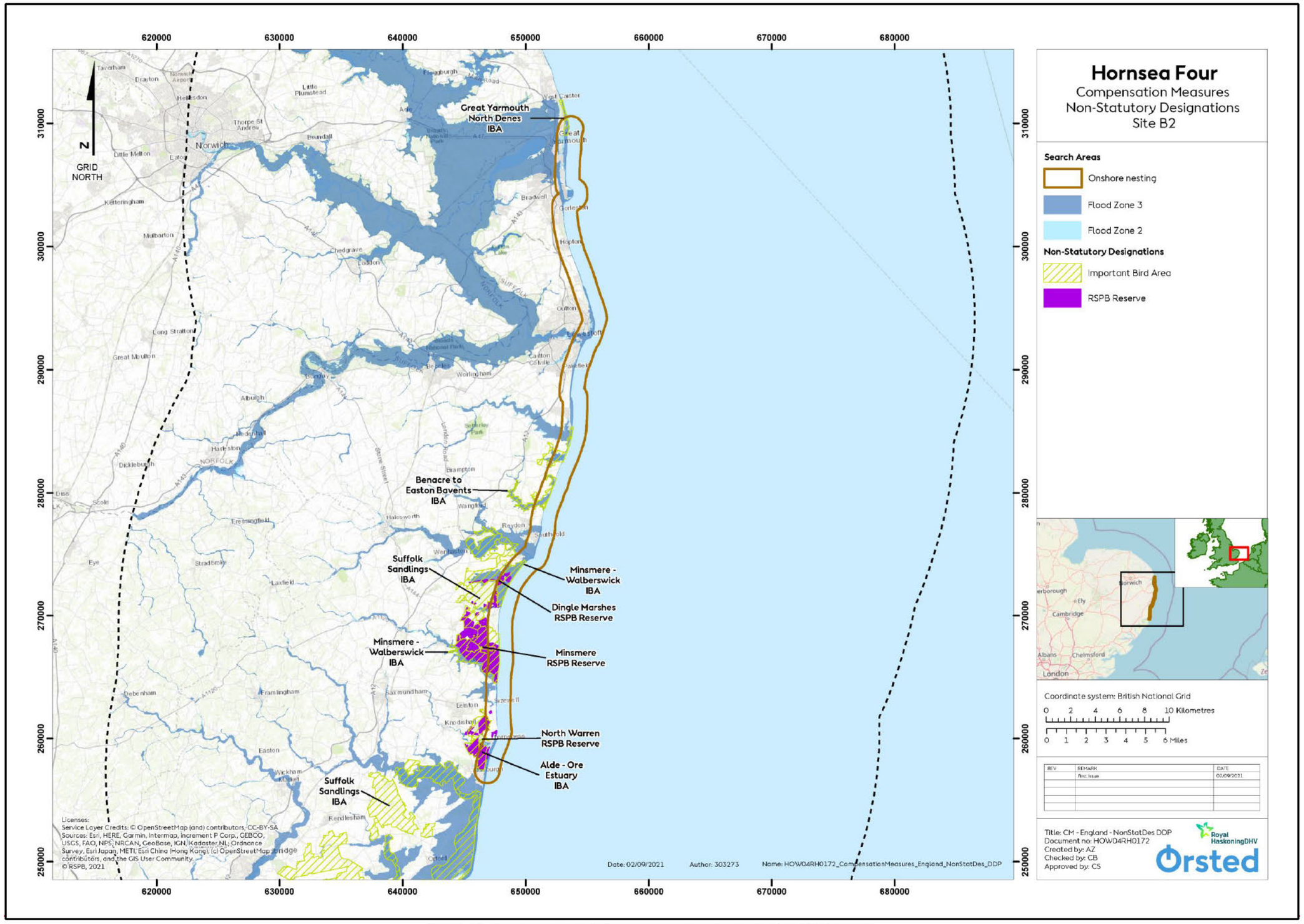


Figure 20: Baseline historic environment designation for AoS B1 South (Clayton Bay to Newbiggin by the Sea).



~~Figure 21: Baseline statutory designation for AoS B2 (Suffolk Coast).~~



Hornsea Four
Compensation Measures
Non-Statutory Designations
Site B2

Search Areas
- Onshore nesting
- Flood Zone 3
- Flood Zone 2

Non-Statutory Designations
- Important Bird Area
- RSPB Reserve

REV	REMARK	DATE
	First Issue	02/09/2021

Title: CM - England - NonStatDes DDP
Document no: HOW04RH0172
Created by: AZ
Checked by: CB
Approved by: CS

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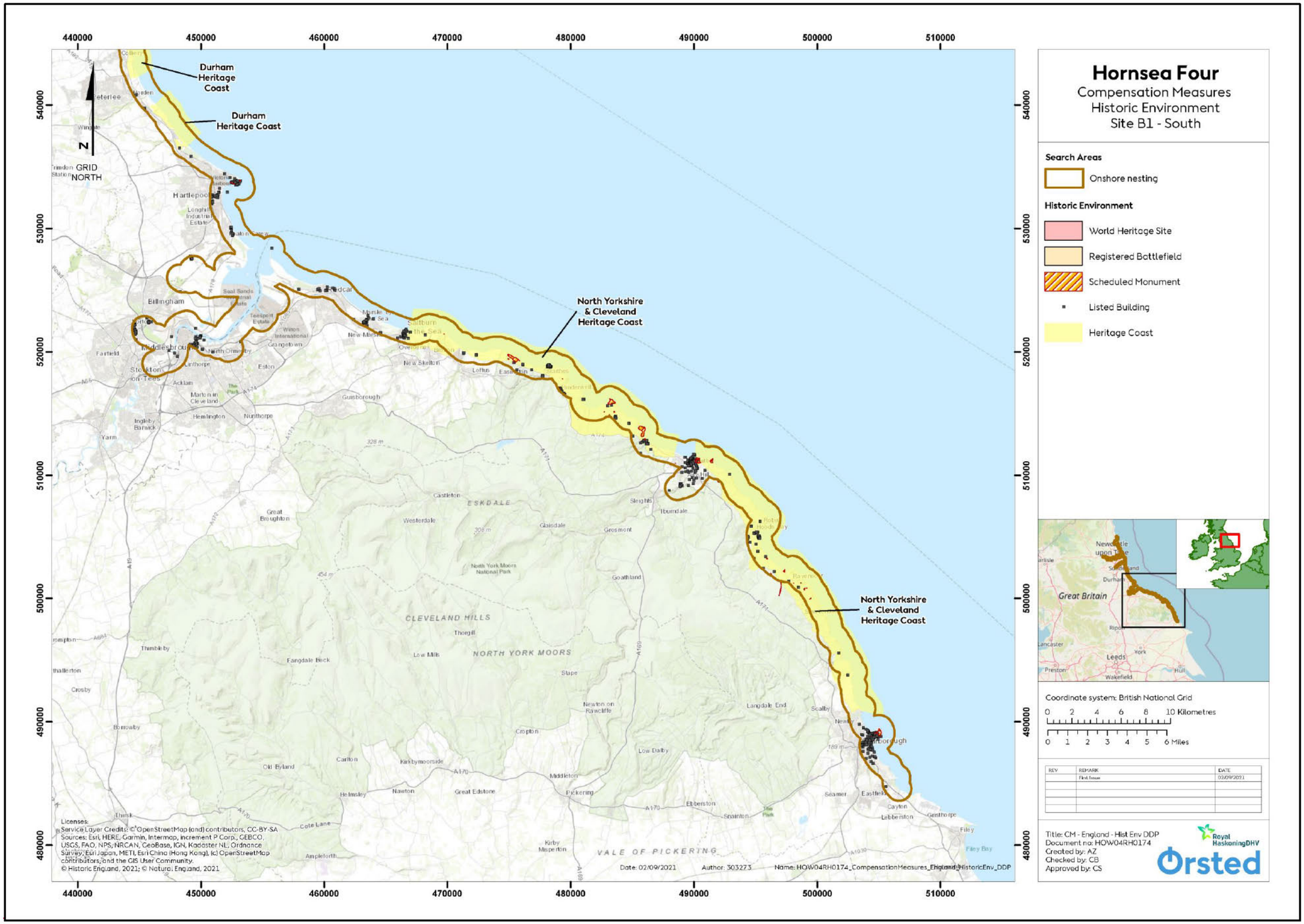
~~Figure 22: Baseline non-statutory designation for AoS B2 (Suffolk Coast).~~



~~Figure 23: Baseline historic environment designation for AoS B2 (Suffolk Coast).~~

9.3 Assessment

9.3.1 Identification of Impacts and Scope of Assessment

9.3.1.1 Based on the information presented in ~~Volume A4, Annex~~A4.~~ 6.1: Compensation Project Description~~ (Deadline 7 submission) ~~(APP-057)~~ (and summarised in **Section 4.1.6**), all activities associated with the construction, implementation/O&M and decommissioning of the new onshore artificial nesting ~~structures~~structure Compensation Measure were defined and potential impact pathways identified.

9.3.1.2 All impacts considered to be scoped into the assessment are detailed in ~~Volume A4, Annex~~ A4.~~6~~.3: Compensation Impacts Register (Deadline 7 submission)~~(APP-059)~~. No impacts were scoped out of the assessment.

9.3.2 Impact Assessment

9.3.2.1 ~~Volume A4, Annex~~A4.~~ 6.3: Compensation Impacts Register~~ (Deadline 7 submission) ~~(APP-059)~~ identifies the potential scoped in impacts that could result from the installation/construction, implementation/operation, and decommissioning of the new onshore nesting structure Compensation Measure, relating to each technical topic under consideration in the EIA process. Each of these impacts have been considered, following the process outlined in **Section 6**, with the MDS defined, magnitude of impact and sensitivity of receptor considered and the level of significance derived by the matrix approach. The Compensation Impacts Register is presented in ~~Volume A4, Annex~~A4.~~ 6.3: Compensation Impacts Register~~ (Deadline 7 submission)~~(APP-059)~~.

9.3.2.2 No impacts are identified in the 'Onshore Nesting Structure' tab of ~~Volume A4, Annex~~A4.~~ 6.3: Compensation Impacts Register~~ (Deadline 7 submission) ~~(APP-059)~~ as having potential for LSE in relation to the installation/construction, implementation/operation, and decommissioning of the predator eradication Compensation Measure.

9.4 Summary: New Onshore Artificial Nesting ~~Structures~~Structure EIA

9.4.1.1 As outlined above, no impacts are identified as having potential for LSE in relation to the installation/construction, implementation/operation, and decommissioning of the Onshore Artificial Nesting ~~Structures~~Structure Compensation Measure. Further assessment is required at a later stage for impacts relating to currently unknown MDS parameters.

10 EIA – Bycatch Reduction Technology

10.1 Introduction

10.1.1.1 This section considers the potential impacts arising from the bycatch reduction technology Compensation Measure. The~~wo~~ AoS has~~ve~~ been identified for the bycatch reduction technology Compensation Measure (~~the Thames Estuary and~~ the South coast of England ~~from Broadstairs, Kent down to Plymouth, Devon~~).

10.2 Assessment and Baseline

10.2.1.1 As detailed in **Section 6.5,** the scope of baseline characterisation has been made relevant to the scope of the EIA in that if a specific EIA topic has been scoped out of the assessment in relation to particular Compensation Measure, then the baseline for that particular topic is not presented. Based on the information presented in ~~**Volume A4, Annex**~~A4. ~~6.1: Compensation Project Description~~ (Deadline 7 submission)~~(APP-057)~~ (and detailed in **Section 4~~0~~**), all activities associated with the construction, implementation/O&M, and decommissioning of the bycatch reduction technology Compensation Measure were defined and potential impact pathways identified. As presented in ~~**Volume A4, Annex**~~A4. ~~6.3: Compensation Impacts Register~~ (Deadline 7 submission)~~(APP-059)~~, no impact pathways have been identified, therefore there are no impacts to be assessed and no baseline characterisation is required.

11 EIA – Predator Eradication

11.1 Introduction

11.1.1.1 This section considers the potential impacts arising from the predator eradication Compensation Measure. A regional environmental characterisation of the physical, biological and human environmental baseline is presented alongside the results of an assessment of potential significant effects arising from the proposed Compensation Measure. ~~Four~~ One AoS ~~have~~ has been identified for the Predator Eradication Compensation Measure ~~D1 (Isles of Scilly), D2 (Rathlin Island, Northern Island), D3 (Torquay Devon) and~~ D1~~4~~ (Bailiwick of Guernsey~~(Guernsey and Alderney~~).

11.2 Baseline

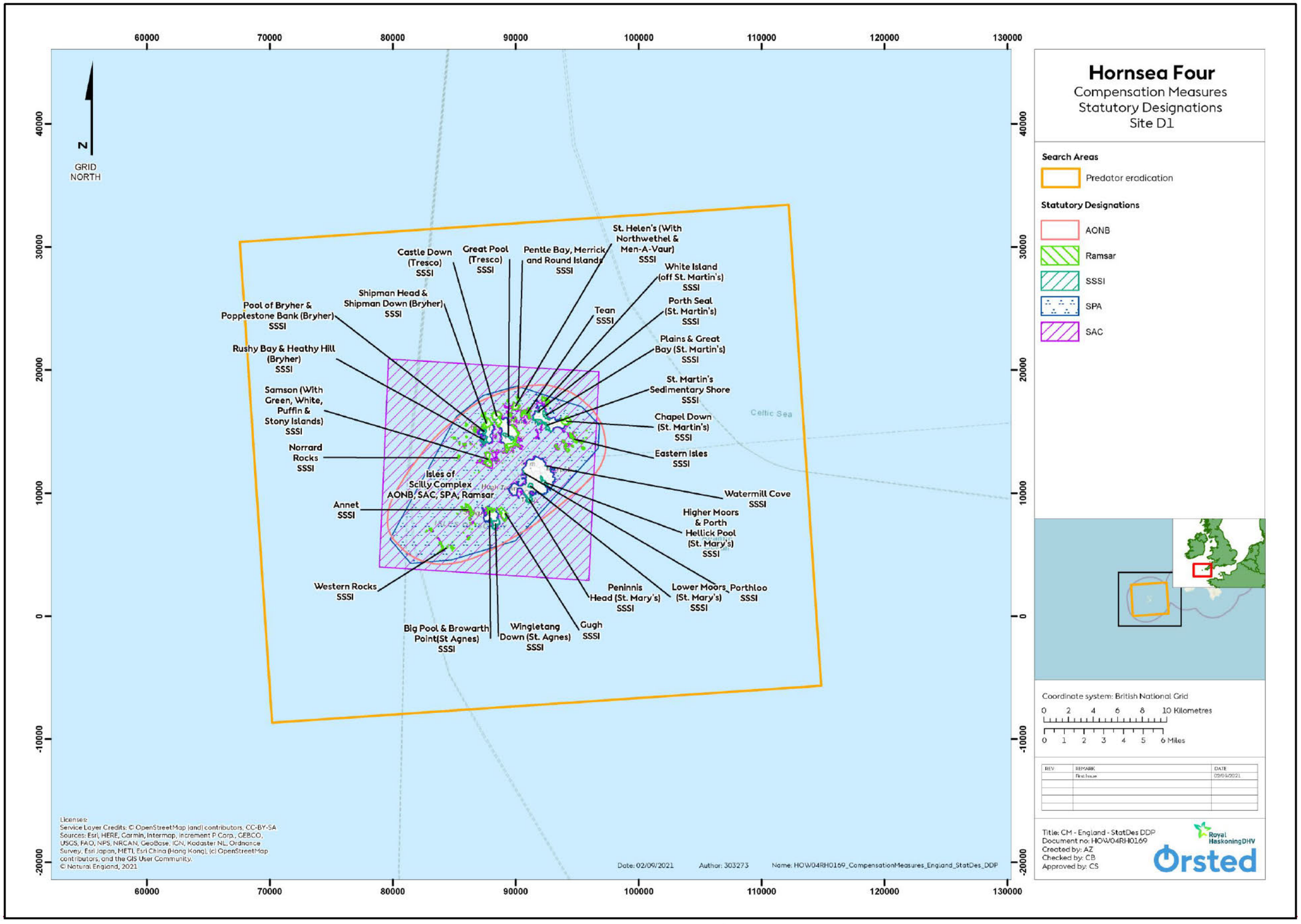
11.2.1.1 **Table 10** provides a summary of the baseline environment for AoS ~~D1 (Isles of Scilly), AoS D2 (Rathlin Island, Northern Island), AoS D3 (Torquay Devon) and AoS~~ D1~~4~~ (Bailiwick of Guernsey ~~and Alderney~~).

11.2.1.2 ~~**Figure 24 to**~~ **Figure 21** identifies~~y~~ statutory, non-statutory and historic environment designations within ~~each of~~ the ~~four~~ AoS (where spatial data is publicly available).

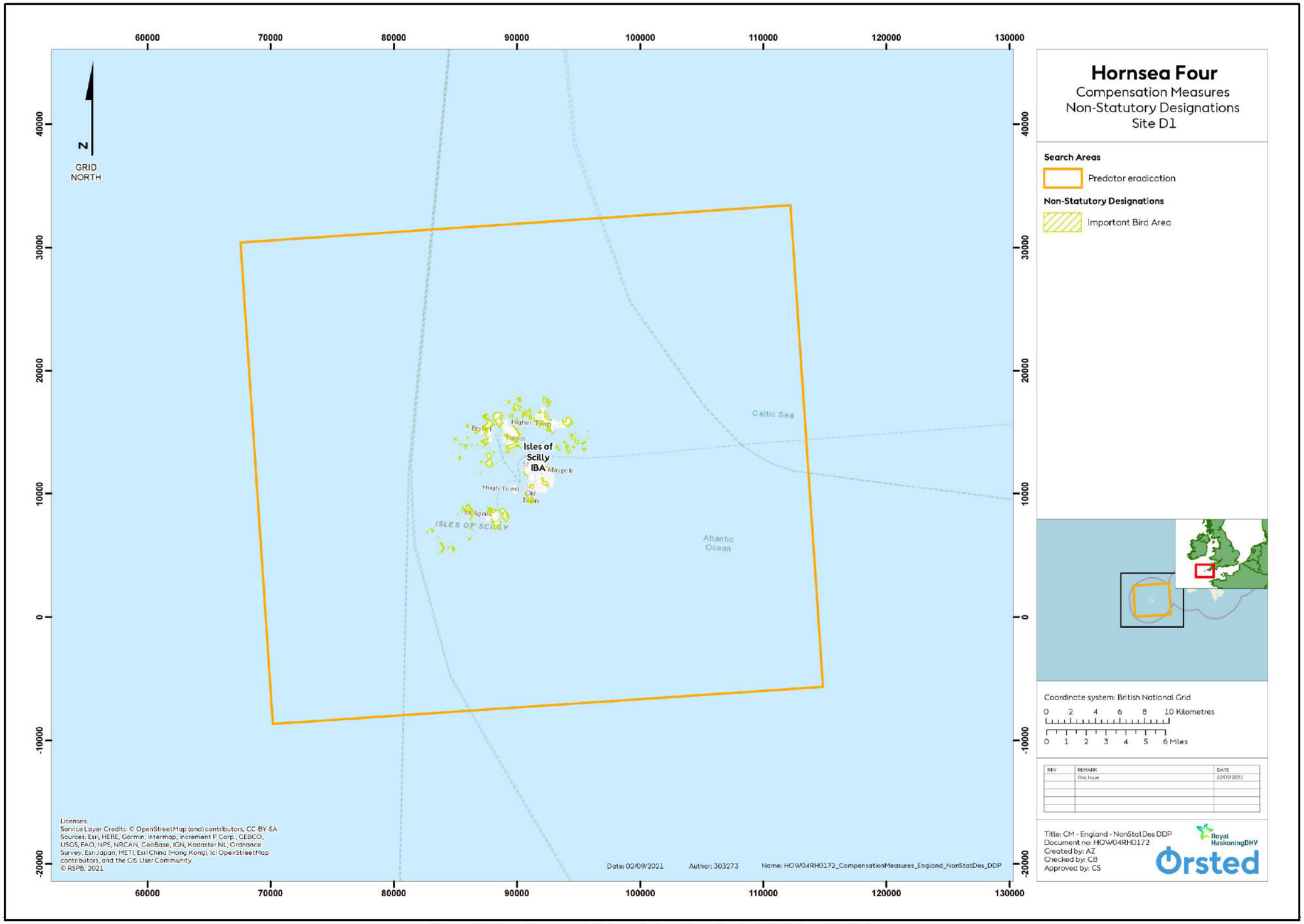
Table 10: Summary of baseline environment in relation to the ~~D1 (Isles of Scilly), D2 (Rathlin Island, Northern Island), D3 (Torquay Devon) and~~ D14 (Bailiwick of Guernsey ~~and Alderney~~) Area~~s~~ of Search for predator eradication.

Topic	AoS D14 (Bailiwick of Guernsey ~~and Alderney~~)
Geology and Ground Conditions	• Geology and ground conditions baseline information has not been collated to date due to a lack of easily obtainable publicly available information.
Hydrology and Flood Risk	• Flood risk or hydrogeology. baseline information has not been collated to date due to a lack of easily obtainable publicly available information.
Historic Environment	• The States of Guernsey Protected Trees, Buildings & Monuments Webmap[6]identifies a high number of protected monuments and buildings in the AoS
Ecology	• Four~~Two~~ Ramsar (*Gouliot Caves, ~~and~~ Headland and Herm, Jethou and The Humps, Lihou Island & L'Erée Island, and Alderney West Coast & the Burhou Islands*) • Ten SSSIs • Many areas are designated Areas of Biodiversity Importance.
Landscape and Visual	• No AONBs • No Heritage Coasts
Land Use and Agriculture	• Land use is predominately agricultural.
Traffic and Transport	• Traffic and transport baseline information has not been collated to date due to a lack of easily obtainable publicly available information. Levels of traffic are expected to be low.
Noise and Vibration	• Noise and vibration baseline conditions are likely to be as expected for a quiet rural location in most areas, however some noisier areas are within the AoS (inc. St.Peter Port and the airport)
Air Quality	• Air quality baseline information has not been collated to date due to a lack of easily obtainable publicly available information. Air pollution is expected to be very low.
Socio-Economic	• The AoS includes a number of tourism locations, with agriculture also present outside of the urban areas. Urban areas in Guernsey are situated around St. Peters Port and around St. Anne in Alderney.
Health	• Health baseline information has not been collated to date due to a lack of publicly available information.

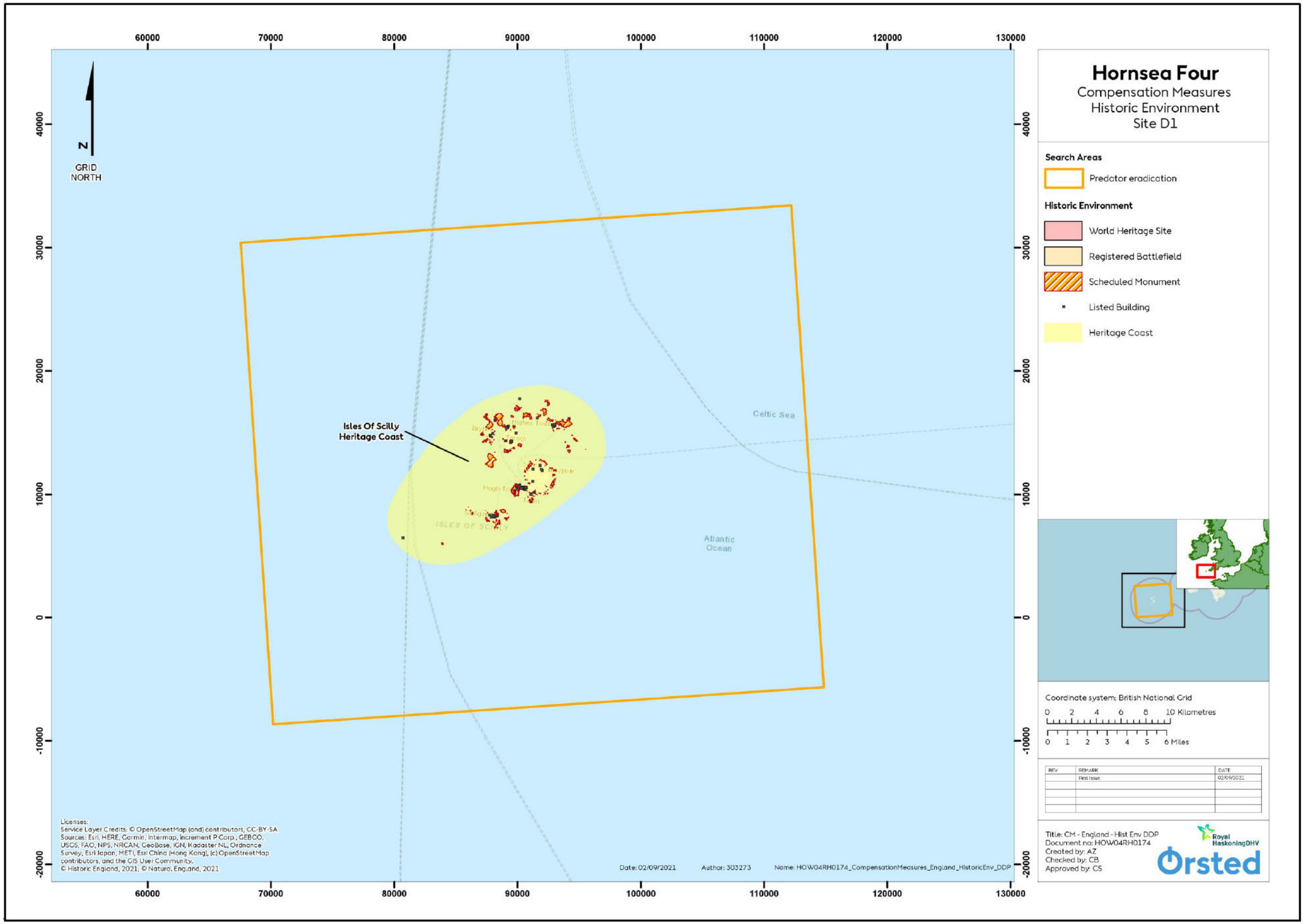
[6] Environment : Protected Trees, Buildings and Monuments Webmap. (gov.gg)



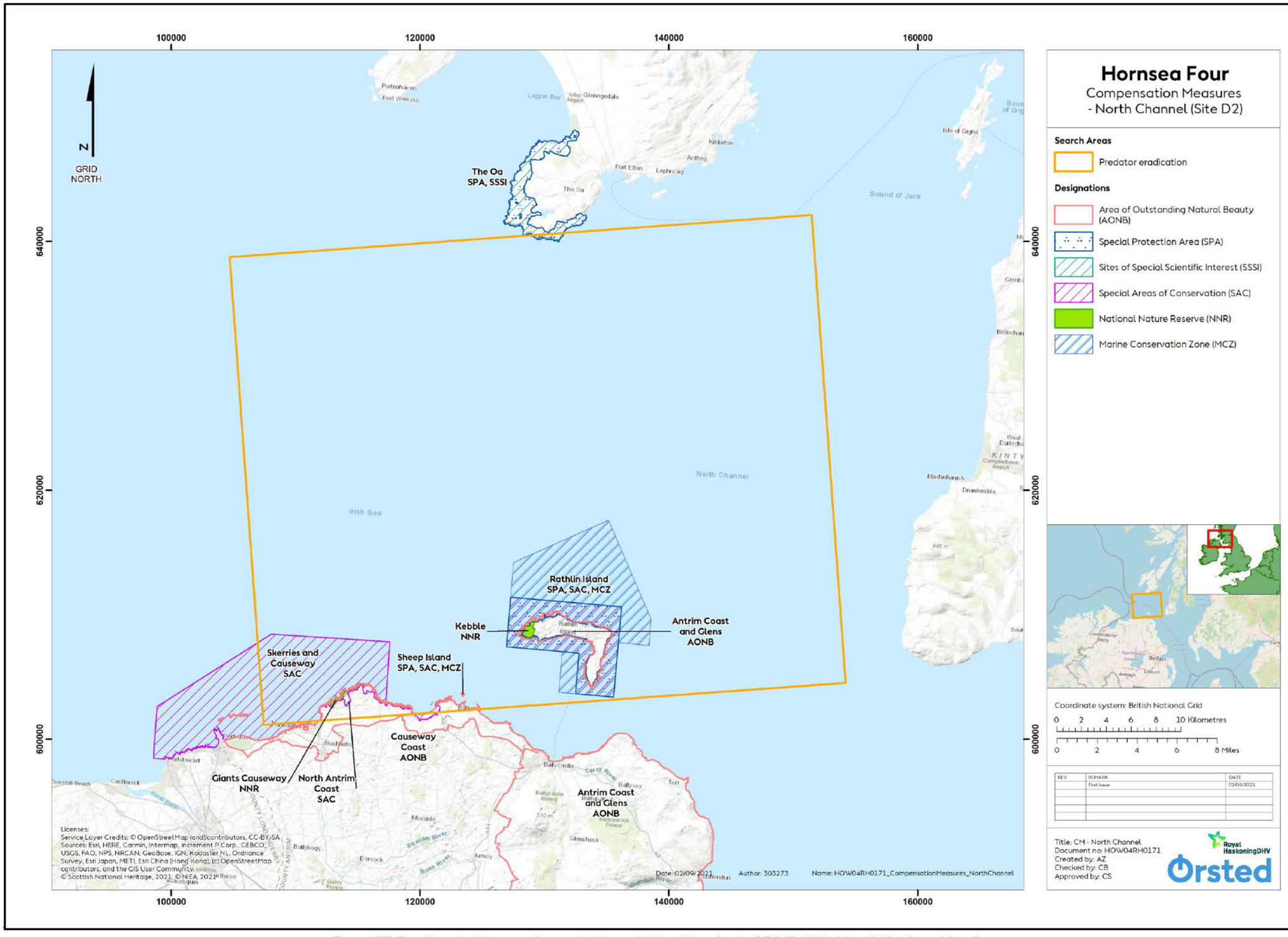
~~Figure 24: Baseline statutory designation for AoS D1 (Isles of Scilly).~~



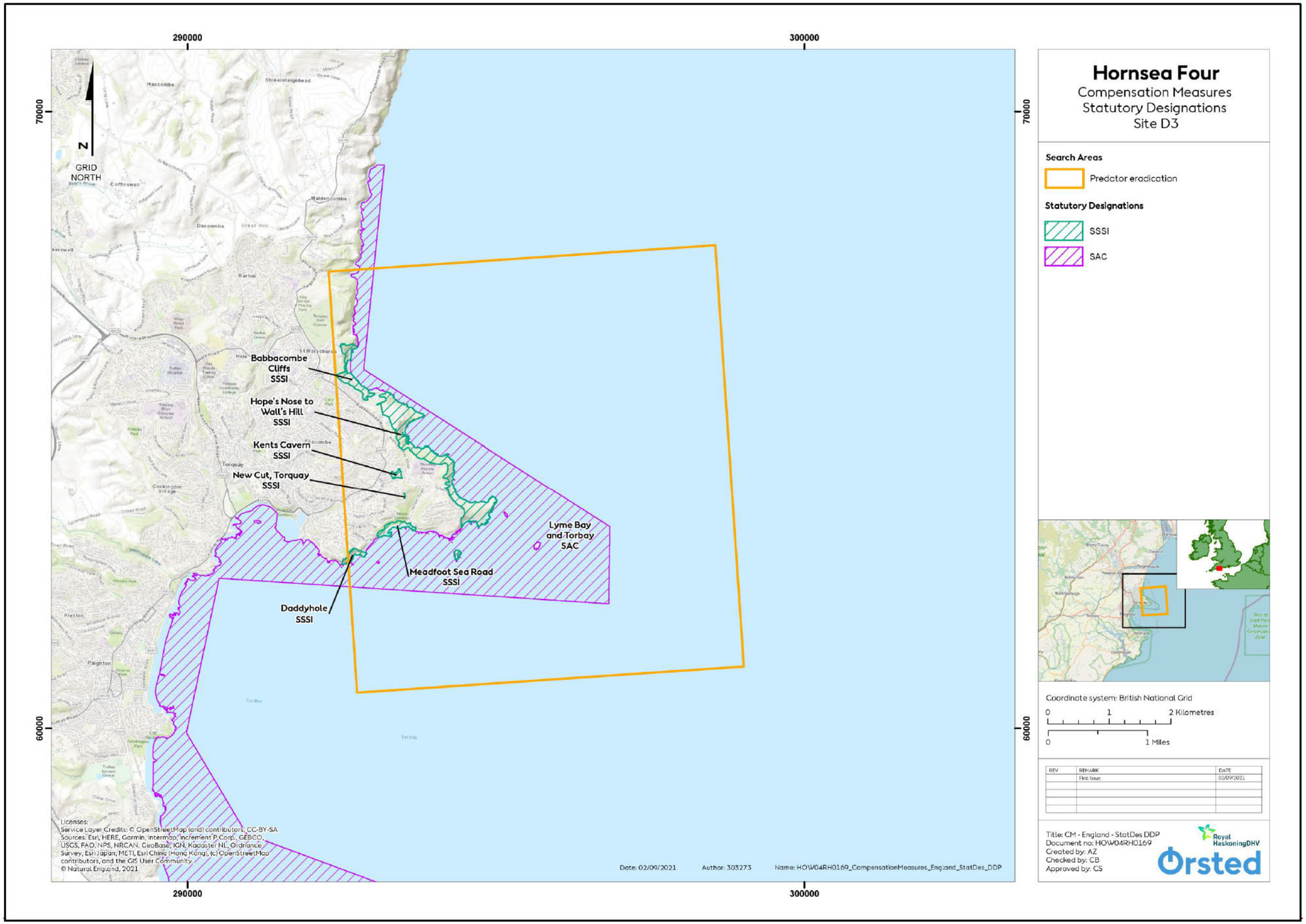
~~Figure 25: Baseline non-statutory designations for AoS D1 (Isles of Scilly).~~



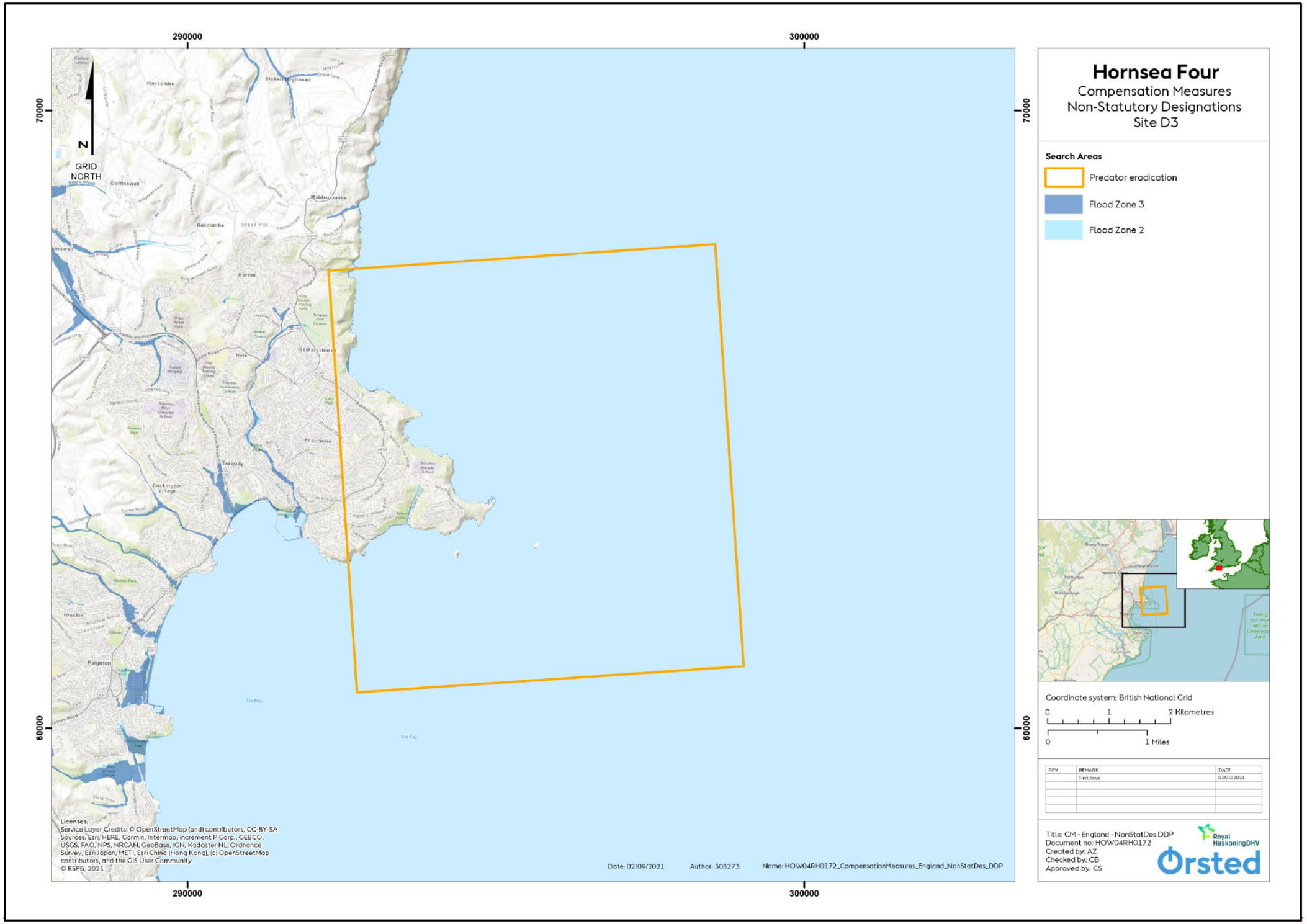
~~Figure 26: Baseline historic environment designations for AoS D1 (Isles of Scilly).~~



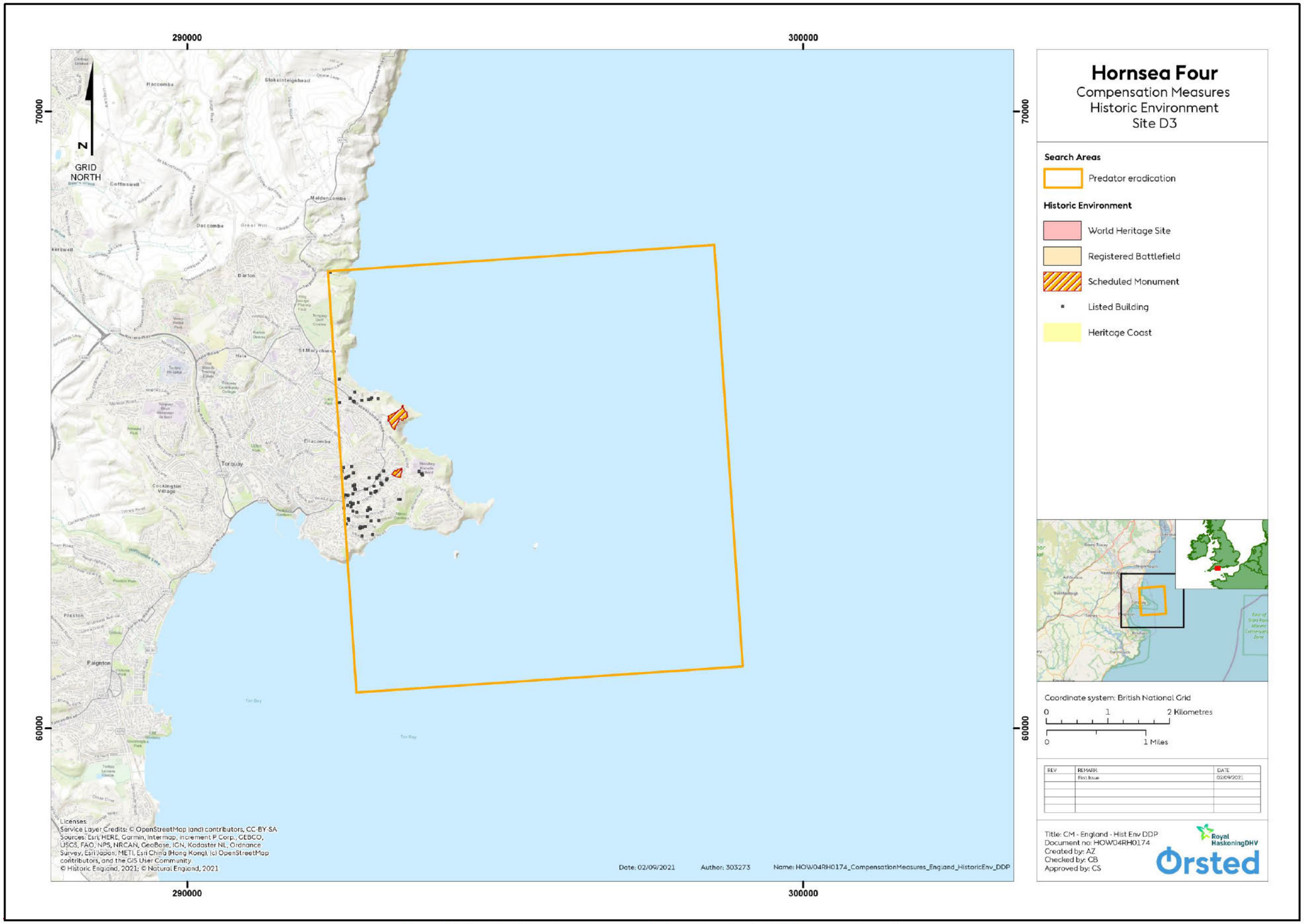
~~Figure 27: Baseline statutory and non-statutory designations for AoS D2 (Rathlin Island, Northern Island).~~



~~Figure 28: Baseline statutory designation for AoS D3 (Torquay Devon).~~



~~Figure 29: Baseline non-statutory designations for AoS D3 (Torquay Devon).~~



~~Figure 30: Baseline historic environment designations for AoS D3 (Torquay Devon).~~

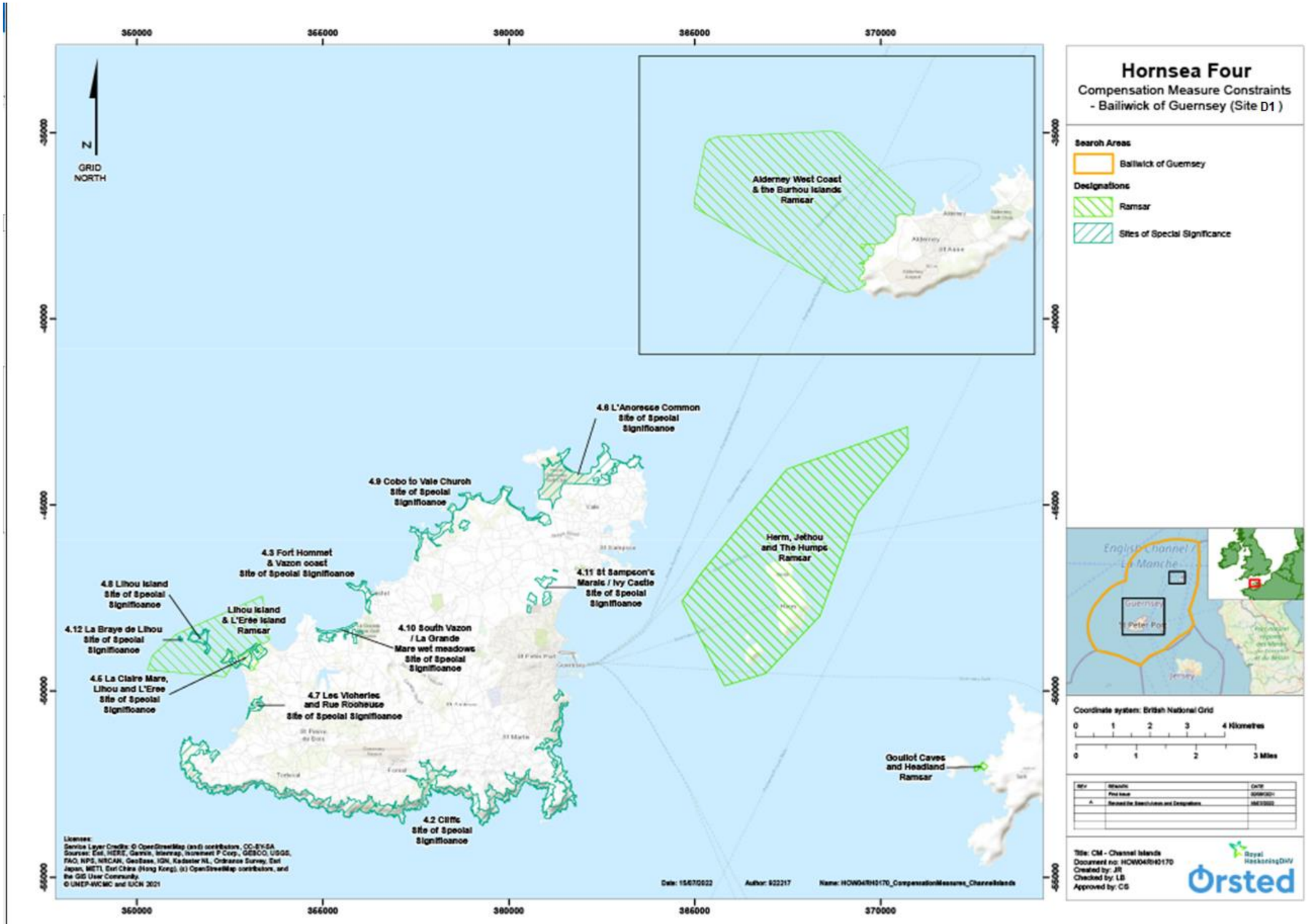


Figure 21: Baseline designation for AoS D1~~4~~ (Bailiwick of Guernsey) ~~and Alderney)~~.

11.3 Assessment

11.3.1 Identification of Impacts and Scope of Assessment

11.3.1.1 Based on the information presented in ~~Volume A4, Annex~~A4.~~6.1: Compensation Project Description~~ (Deadline 7 submission)~~(APP-057)~~ (and summarised in Section 4.1.8) all activities associated with the construction, operation and decommissioning of the predator eradication Compensation Measure were defined and potential impact pathways identified.

11.3.1.2 All impacts considered to be scoped into the assessment are detailed in ~~Volume A4, Annex~~A4. 6.3: Compensation Impacts Register (Deadline 7 submission)~~(APP-059)~~. No impacts were scoped out of the assessment.

11.3.2 Impact Assessment

11.3.2.1 ~~Volume A4, Annex~~A4.~~6.3: Compensation Impacts Register~~ (Deadline 7 submission) ~~(APP-059)~~ identifies the potential scoped in impacts that could result from the installation/construction, implementation/operation, and decommissioning of the new predator eradication Compensation Measure, relating to each technical topic under consideration in the EIA process. Each of these impacts have been considered, following the process outlined in Section 6, with the MDS defined, magnitude of impact and sensitivity of receptor considered and the level of significance derived by the matrix approach. The Compensation Impacts Register is presented in ~~Volume A4, Annex~~A4.~~6.3: Compensation Impacts Register~~ (Deadline 7 submission)~~(APP-059)~~.

11.3.2.2 No impacts are identified in the 'Predator Eradication' tab of ~~Volume A4, Annex~~A4.~~6.3: Compensation Impacts Register~~ (Deadline 7 submission) ~~(APP-059)~~ as having potential for LSE in relation to the installation/construction, implementation/operation, and decommissioning of the Predator Eradication Compensation Measure.

11.4 Summary: Predator Eradication EIA

11.4.1.1 As outlined above, no impacts are identified as having potential for LSE in relation to the installation/construction, implementation/operation, and decommissioning of the predator eradication Compensation Measure. Further assessment is required at a later stage for impacts relating to currently unknown MDS parameters.

12 EIA – Resilience Measure – Fish Habitat Enhancement (Seagrass)

12.1 Introduction

12.1.1.1 This section considers the potential impacts arising from the resilience measure – fish habitat enhancement (seagrass). A regional environmental characterisation of the physical, biological and human environmental baseline is presented alongside the results of an assessment of potential significant effects arising from the proposed Resilience Measure. One~~Seven~~ AoS has~~ve~~ been identified for the resilience measure~~—~~ fish habitat enhancement (seagrass) i.e.~~:~~ E1 – Humber Estuary.~~:~~

- ~~E1 – Rathlin Island, Northern Island;~~
- ~~E2 – Isles of Scilly;~~
- ~~E3 – Celtic Sea, Wales;~~

- ~~E4 Plymouth Sound to Helford River, Cornwall;~~
- ~~E5 The Solent;~~
- ~~E6 Essex Estuaries; and~~
- ~~E7 Humber Estuary.~~

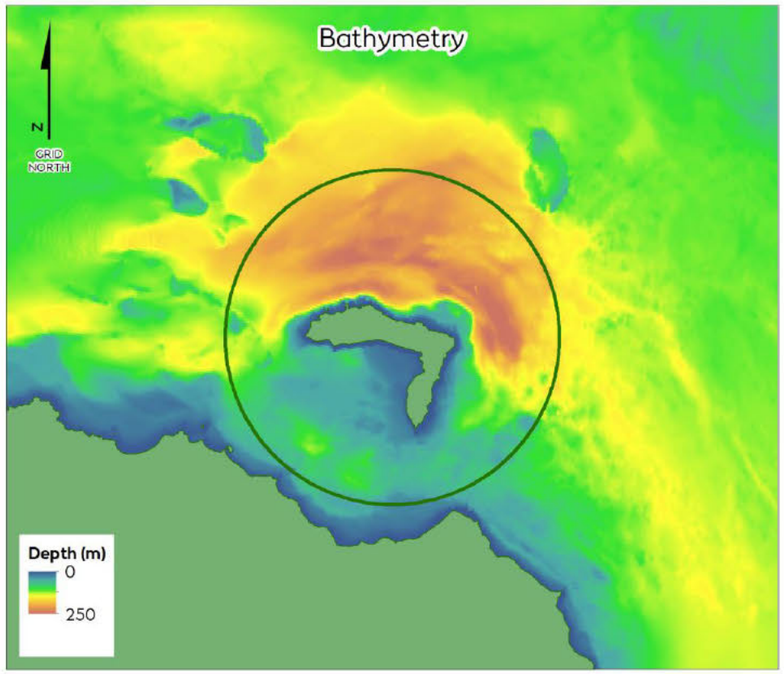
12.2 Baseline

12.2.1.1 ~~Table 12 to~~ Table 11 provide~~s~~ a summary of the baseline environment for the ~~seven~~ AoS.

Table 12: Summary of baseline environment in relation to the Area of Search E1 (Rathlin Island) for resilience measure - fish habitat enhancement (seagrass).

Topic	Summary of Baseline Environment
Marine Geology, Oceanography and Physical Processes	The baseline environment for physical processes is illustrated in **Figure 32**. • Rathlin Island is surrounded by a wide range of rocky habitats. • Strong tidal streams prevail around most of the island and there is little silt, resulting in low turbidity. • The lower rock strata on which the island stands are cretaceous limestone laid down in beds 1-2 m thick. Basalt was laid over this in a series of lava flows and forms much of the island currently above sea level. The basalt / limestone junction often forms a shelf in the sublittoral. The limestone is patchily exposed in the sublittoral; where it is exposed it tends to weather forming fissures and caves (Goodwin et al. 2011).
Benthic and Intertidal Ecology	The baseline environment for benthic ecology is illustrated in **Figure 33**. • Rathlin island is designated as an SAC. • The immediate coastline is characterised by intertidal and submerged rock and biogenic reef. • Further offshore within the AoS, the seabed is dominated by coarse sediment, with patches of rock and biogenic reef. • There is a bed of *Zostera marina* seagrass located in Church Bay and lies around 6 m water depth on medium coarse sand. Surveys suggest that the seagrass is sparse (Goodwin et al. 2011).
Fish and Shellfish Ecology	The baseline environment for fish and shellfish ecology is illustrated in **Figure 34**. • The following fish species are known to inhabit the waters around Rathlin Island: a variety of rays, cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), whiting (*Merlangius merlangus*), ling (*Calluna vulgaris*), plaice (*Pleuronectes platessa*), common dab (*Limanda limanda*), red gurnard (*Chelidonichthys cuculus*) and conger eel (*Conger conger*). • Commercial kelp farms also operate in this AoS.
Marine Mammals	The baseline environment for marine mammals is illustrated in **Figure 35**. • While a range of marine mammals are known to inhabit the waters around both Britain and Ireland, the three considered to reliably be in the AoS are harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*) and minke whale (*Balaenoptera acutorostrata*) (Hammond et al. 2017). • It was observed in 1966 that there are only small numbers of grey seals around the Rathlin Island AoS (Lockley, 1966), and the up to date seal survey reports inidicate little to no grey seal presence in the area of Rathlin Island (SCOS, 2020). • The area betweemCarlingford Lough to the Copeland Islands (the Southeast of Northern Ireland) contains 80-85% of the total harbour seals observed in Northern Island (SCOS, 2020), therefore suggesting a low abundance/ density of organisms within the Rathlin Island AoS (SCOS, 2020).
Offshore and Intertidal Ornithology	The baseline environment for offshore and intertidal ornithology is illustrated in **Figure 36**. • Within the AoS there is a single SPA with offshore ornithology designated features, the Rathlin Island SPA. • This site is designated for razorbill (*Alca torda*), peregrine falcon (*Falco peregrinus*), kittiwake (*Rissa tridactyla*) and guillemot (*Uria aalge*) (JNCC, 2018). • During the summer months Rathlin's sea cliffs and sea stacks provide nesting sites for a variety of seabird species including guillemots (*Uria aalge*), razorbills and kittiwakes.
Commercial Fisheries	The baseline environment for commercial fisheries is illustrated in **Figure 37**.

Topic	Summary of Baseline Environment
	• Fishing for sea fish using demersal mobile gear is prohibited in the waters within the Rathlin Zone. The boundaries of the Rathlin Zone correspond to the seaward boundaries of the Rathlin Island SAC (DEFRA, 2016).
Shipping and Navigation	The baseline environment for shipping and navigation is illustrated in **Figure 38**. • The vessel density in the AoS varies from 1 to >200,000 route(s)/ 0.08 km^2/ year. While there are several common routes around the island, the only major route is the ferry route between Ballycastle and Rathlin Island which is where the maximum rate vessel traffic occurs (Marine Traffic, 2021).
Marine Archaeology	The baseline environment for marine archaeology is summarised below. • One of the most famous shipwrecks found in this AoS is that of the HMS Drake which can be found in Church Bay and is now protected via the Protection of Wrecks Act 1973 and a popular scuba destination (Wessex Archaeology, 2021).



Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E1: Rathlin Island, Northern Ireland
Marine Processes

Compensation Measures Areas of Search
Seagrass

EUNIS Habitats (UKSeaMap 2018)
- A4.12: Sponge communities on deep circalittoral rock
- A4.27: Faunal communities on deep moderate energy circalittoral rock
- A4.33: Faunal communities on deep low energy circalittoral rock
- A5.13: Infralittoral coarse sediment
- A5.14: Circalittoral coarse sediment
- A5.15: Deep circalittoral coarse sediment
- A5.23 or A5.24: Infralittoral fine sand or infralittoral muddy sand
- A5.25 or A5.26: Circalittoral fine sand or circalittoral muddy sand
- A5.27: Deep circalittoral sand
- A5.37: Deep circalittoral mud
- A5.43: Infralittoral mixed sediments
- A5.44: Circalittoral mixed sediments
- A5.45: Deep circalittoral mixed sediments
- No EUNIS habitat assigned

Coordinate system: ETRS 1989 UTM Zone 31N

0 5 10 Kilometres
0 2.5 5 Nautical Miles

REV	REMARK	DATE
---	First Issue	13/09/2021

Compensation Measures
Marine Processes
Document no: HOW04GB032062
Created by: BPHB
Checked by: TB
Approved by: LK

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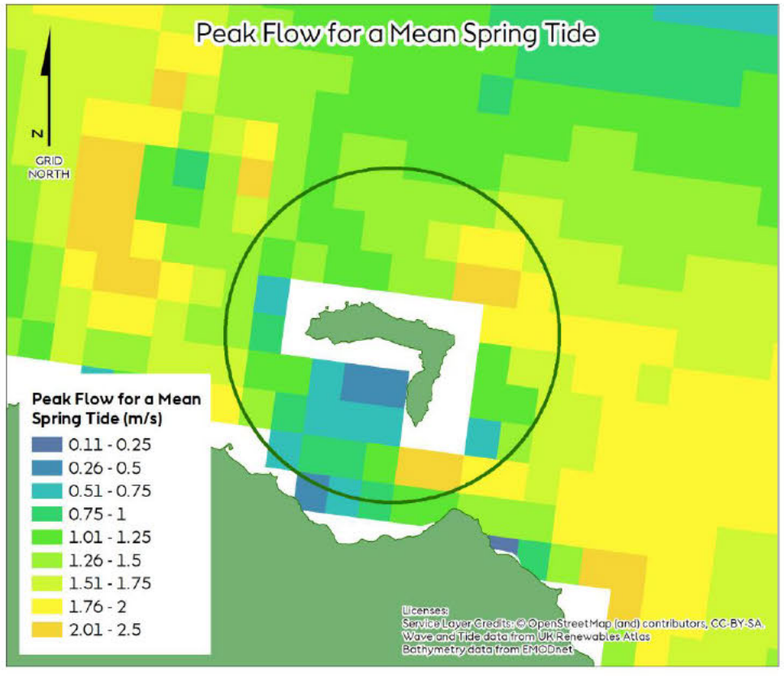
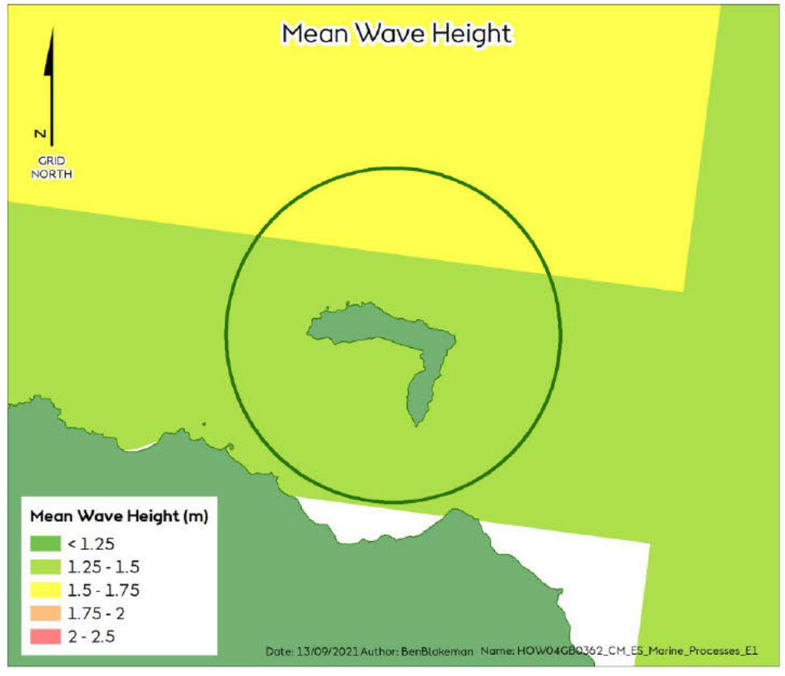
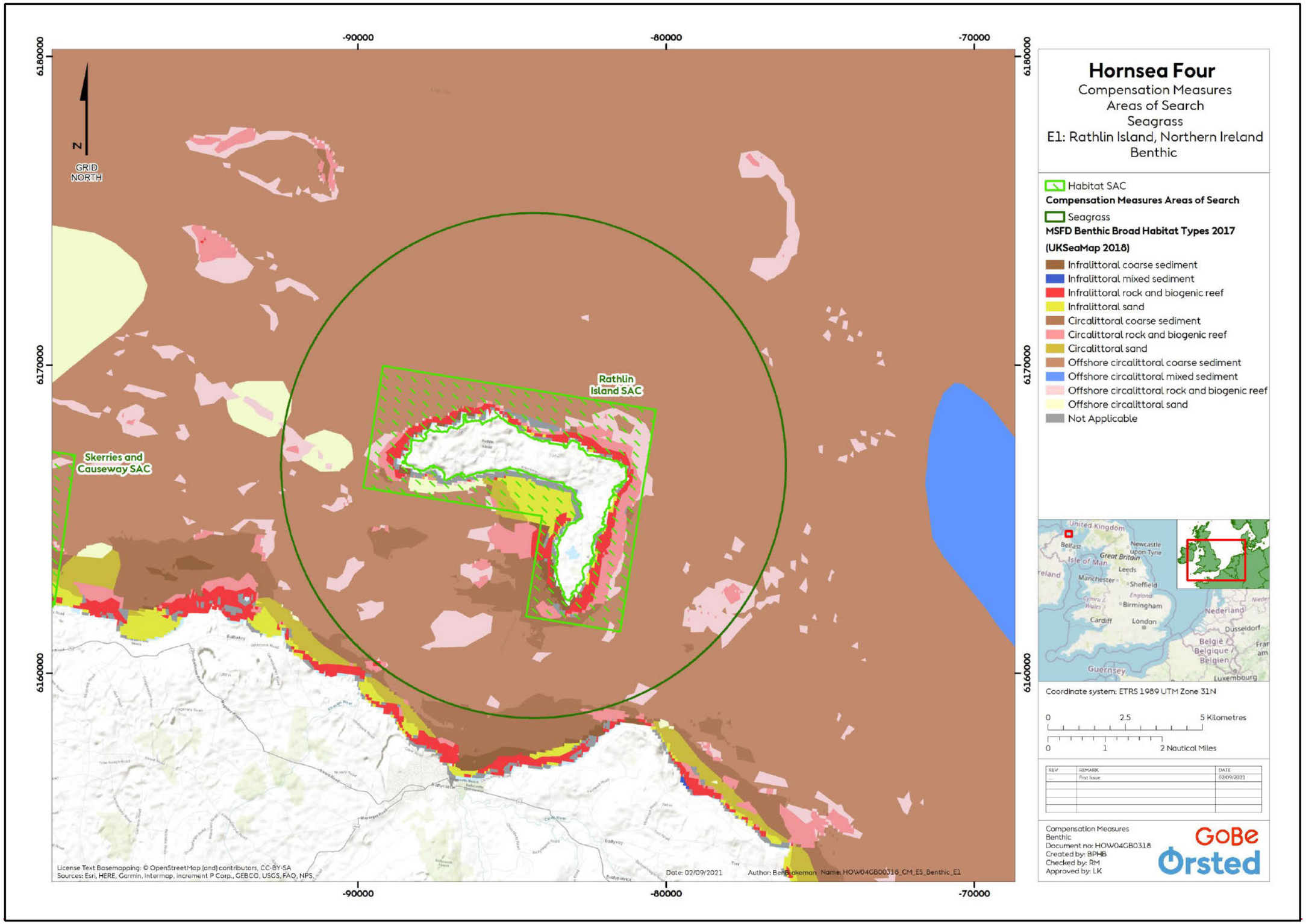
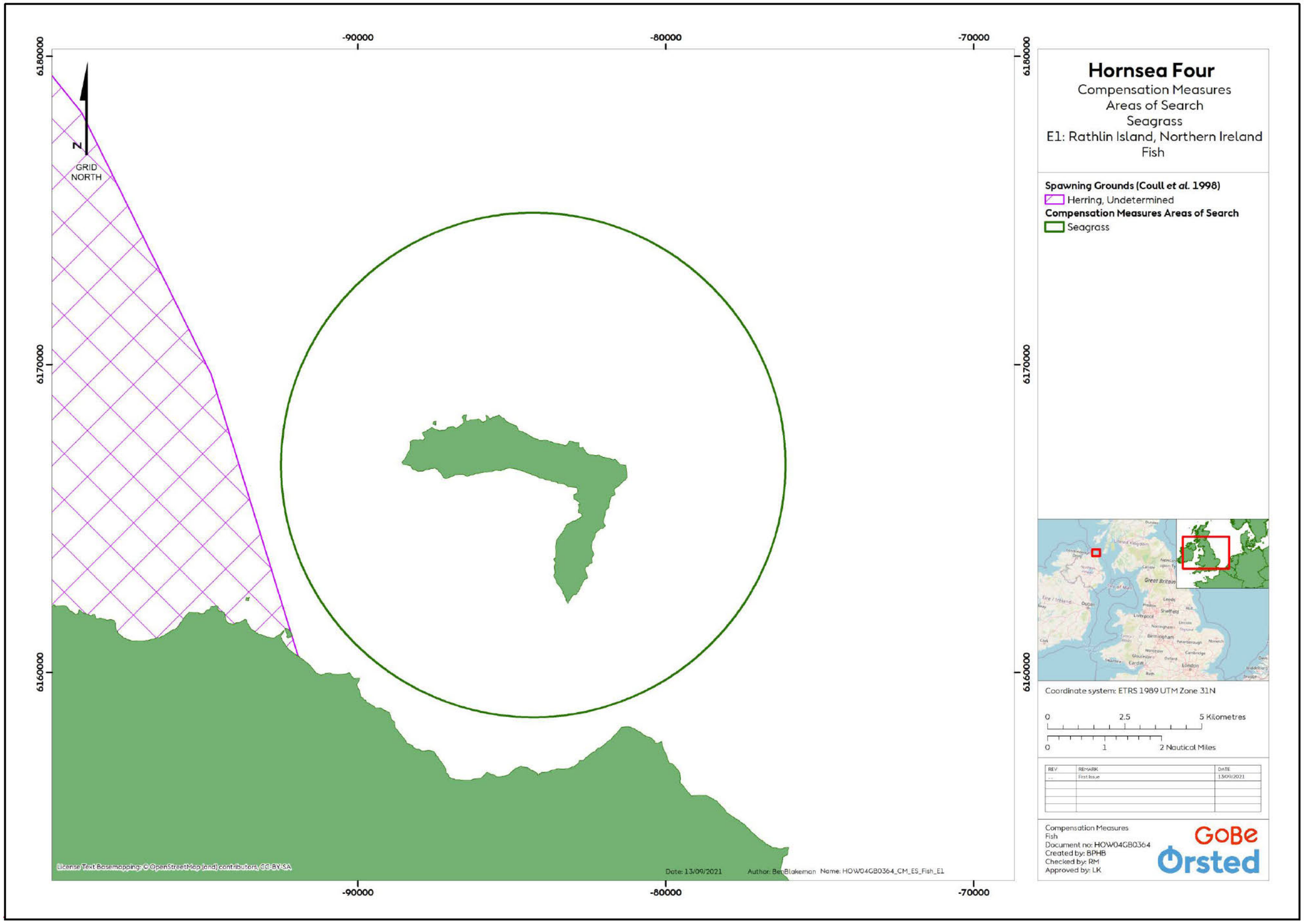




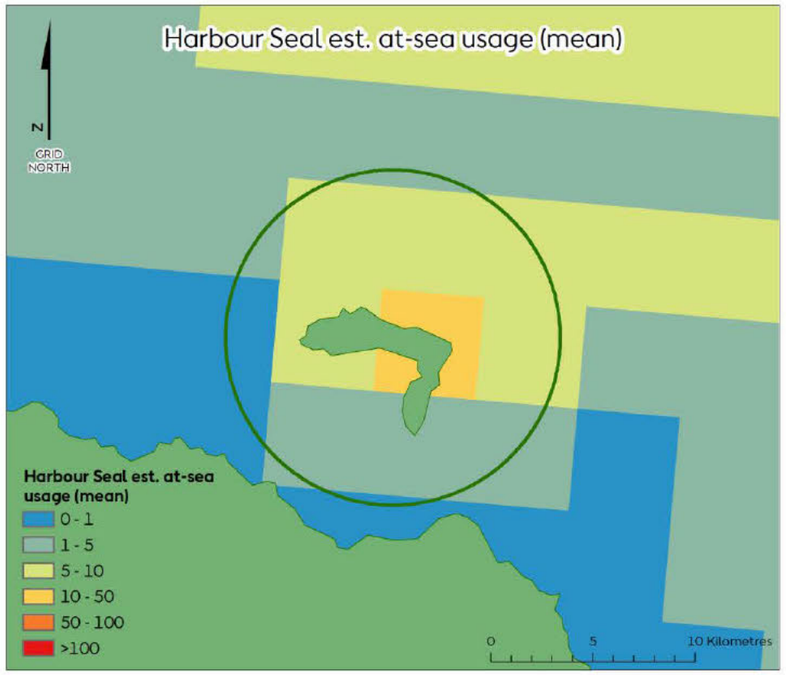
~~**Figure 32: Resilience Measures Areas of Search Seagrass E1: Rathlin Island, Northern Ireland Physical Processes**~~

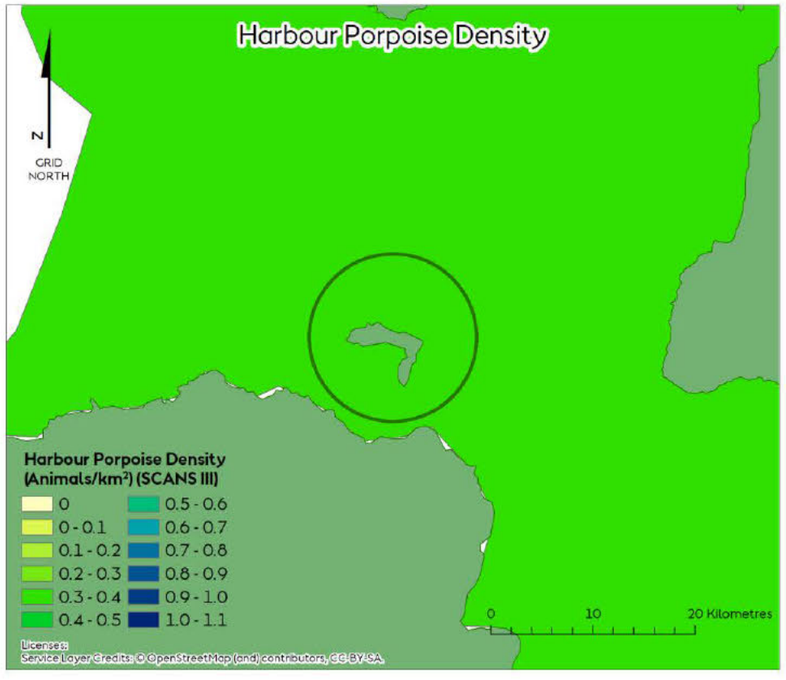


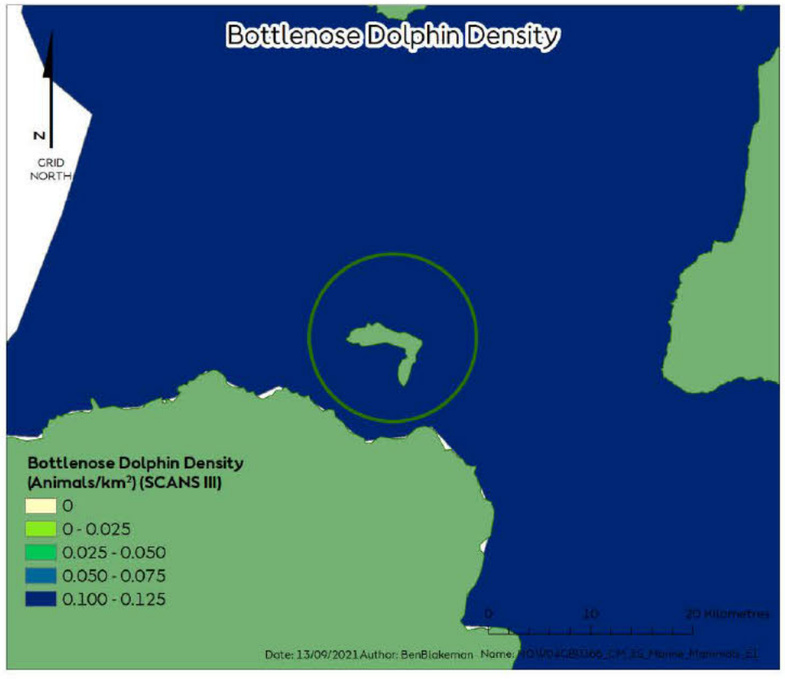
~~Figure 33: Resilience Measures Areas of Search Seagrass E1: Rathlin Island, Northern Ireland Benthic.~~



~~Figure 34: Resilience Measures Areas of Search Seagrass E1: Rathlin Island, Northern Ireland Fish and Shellfish.~~







Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E1: Rathlin Island, Northern Ireland
Marine Mammals

Compensation Measures Areas of Search
Seagrass

Estimated at-sea Distribution of Grey and Harbour Seals maps data from Sea Mammal Research Unit (SMRU) and Marine Scotland, 2017

Coordinate system: ETRS 1989 UTM Zone 31N

REV	REMARK	DATE
-	First Issue	13/09/2021

Compensation Measures
Marine Mammals
Document no: HOW04GB0366
Created by: BPHB
Checked by: TB
Approved by: LK

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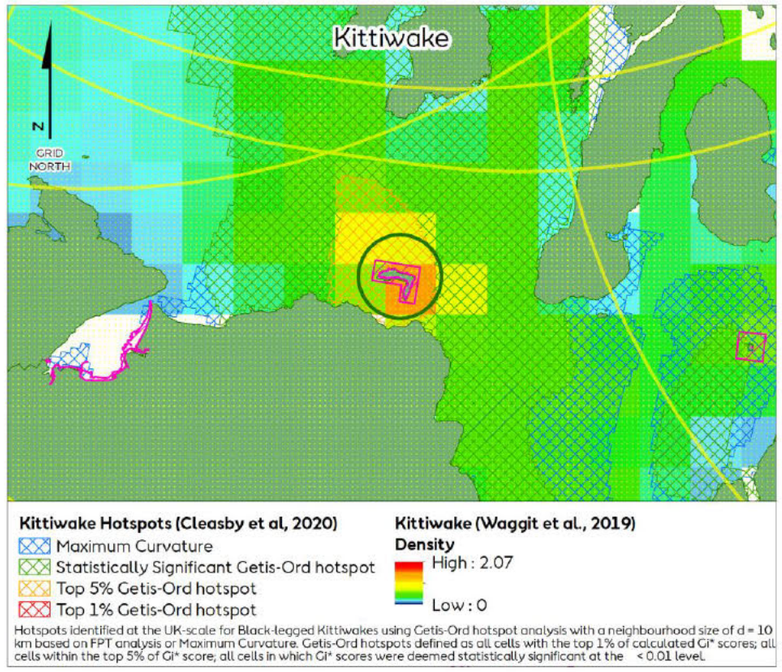
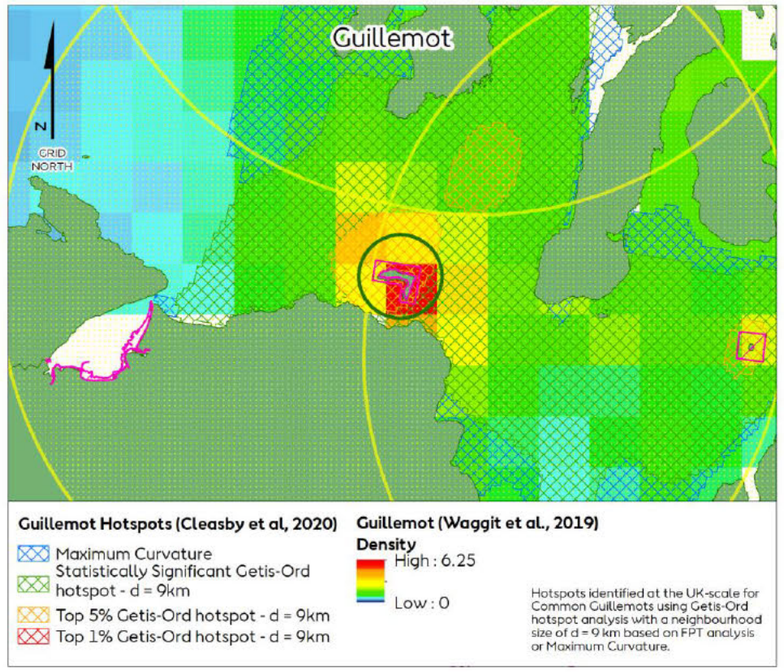
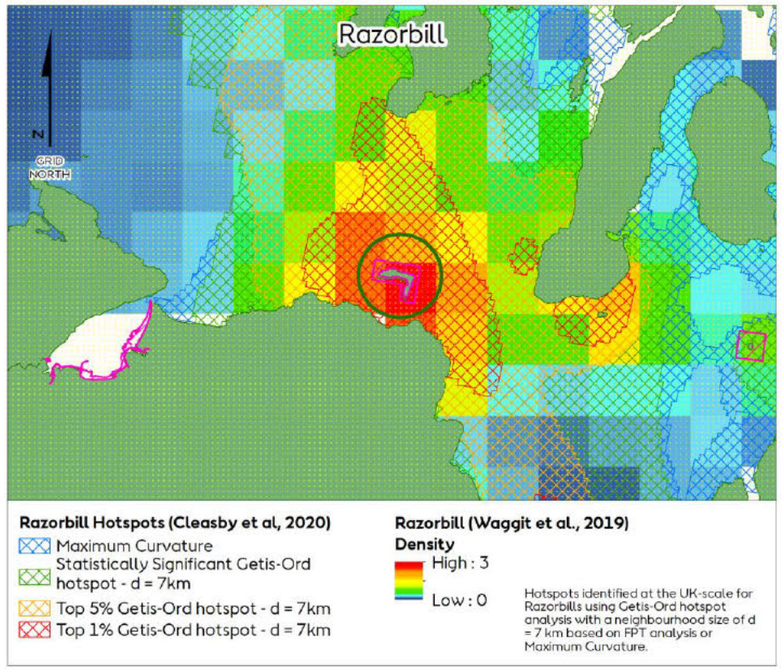
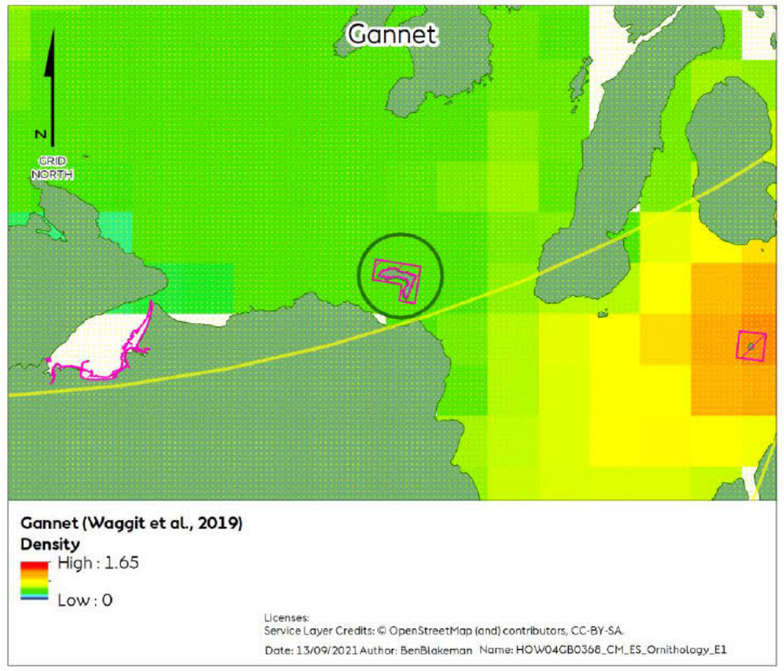
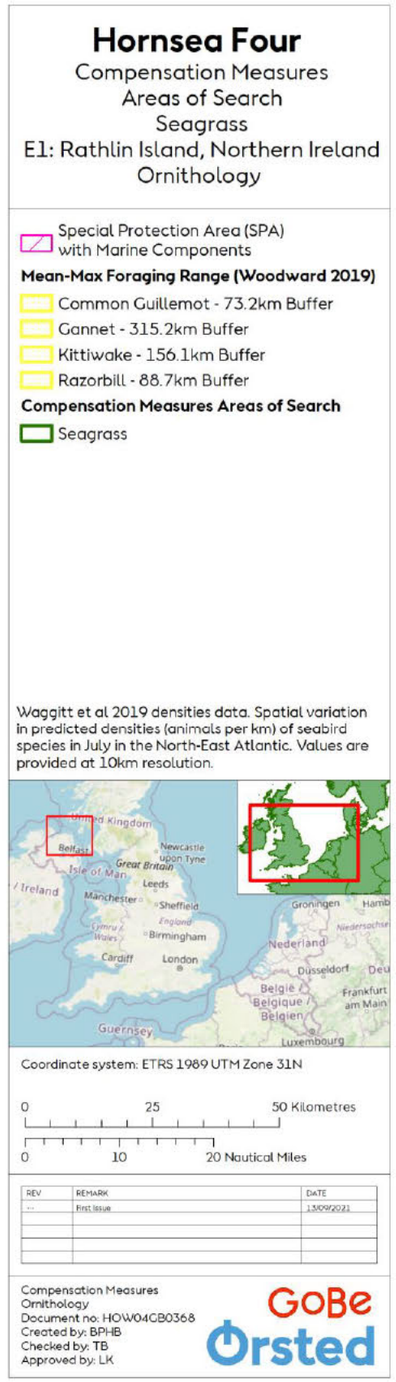
~~**Figure 35: Resilience Measures Areas of Search Seagrass E1: Rathlin Island, Northern Ireland Marine Mammals.**~~



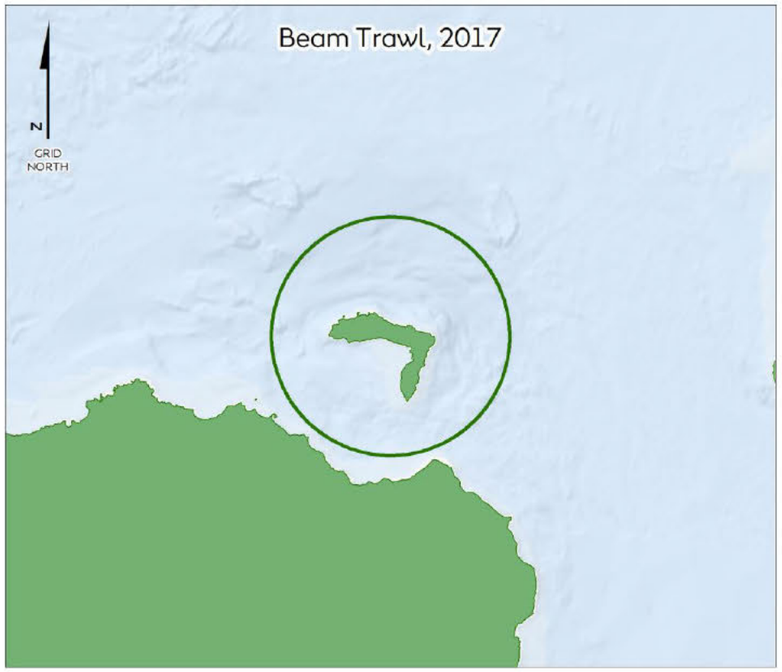


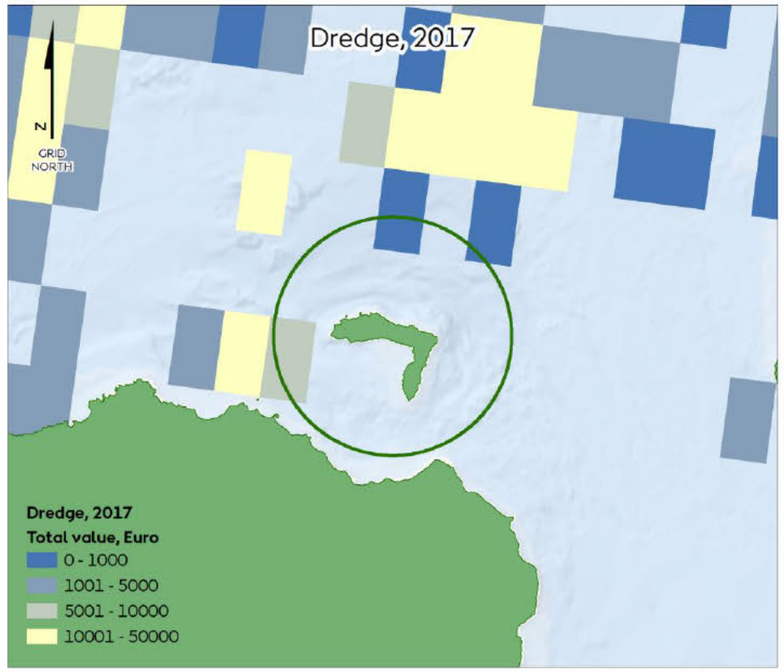


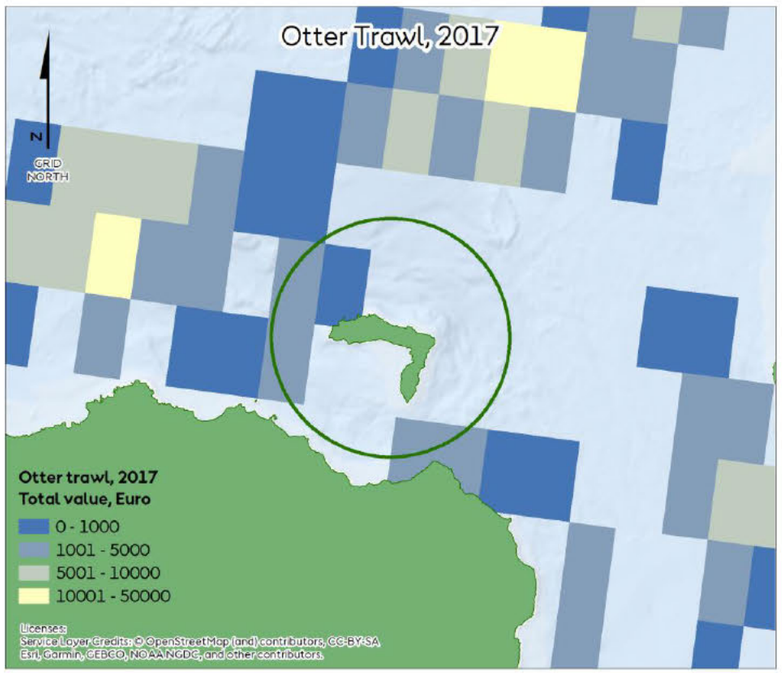


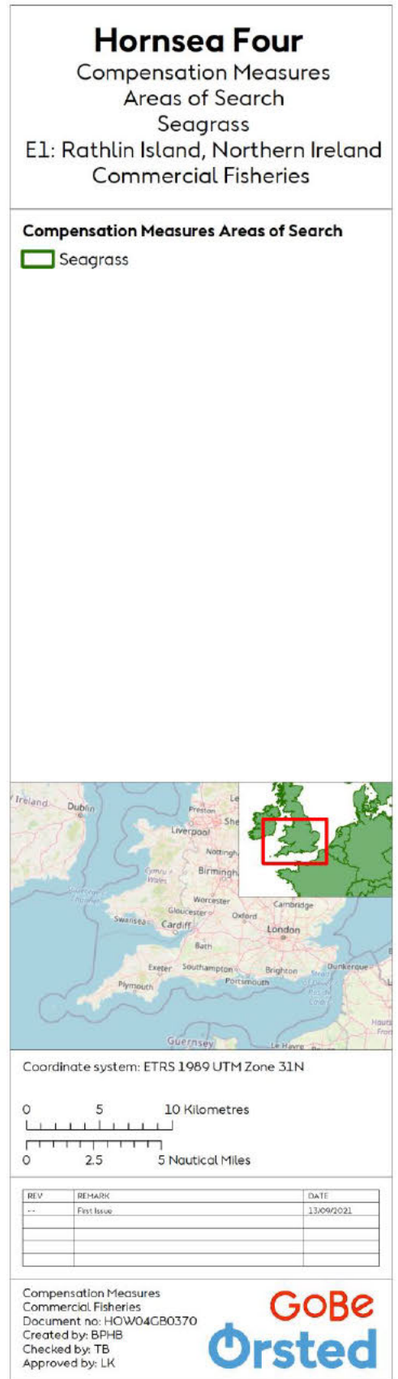


~~Figure 36: Resilience Measures Areas of Search Seagrass E1: Rathlin Island, Northern Ireland Ornithology.~~

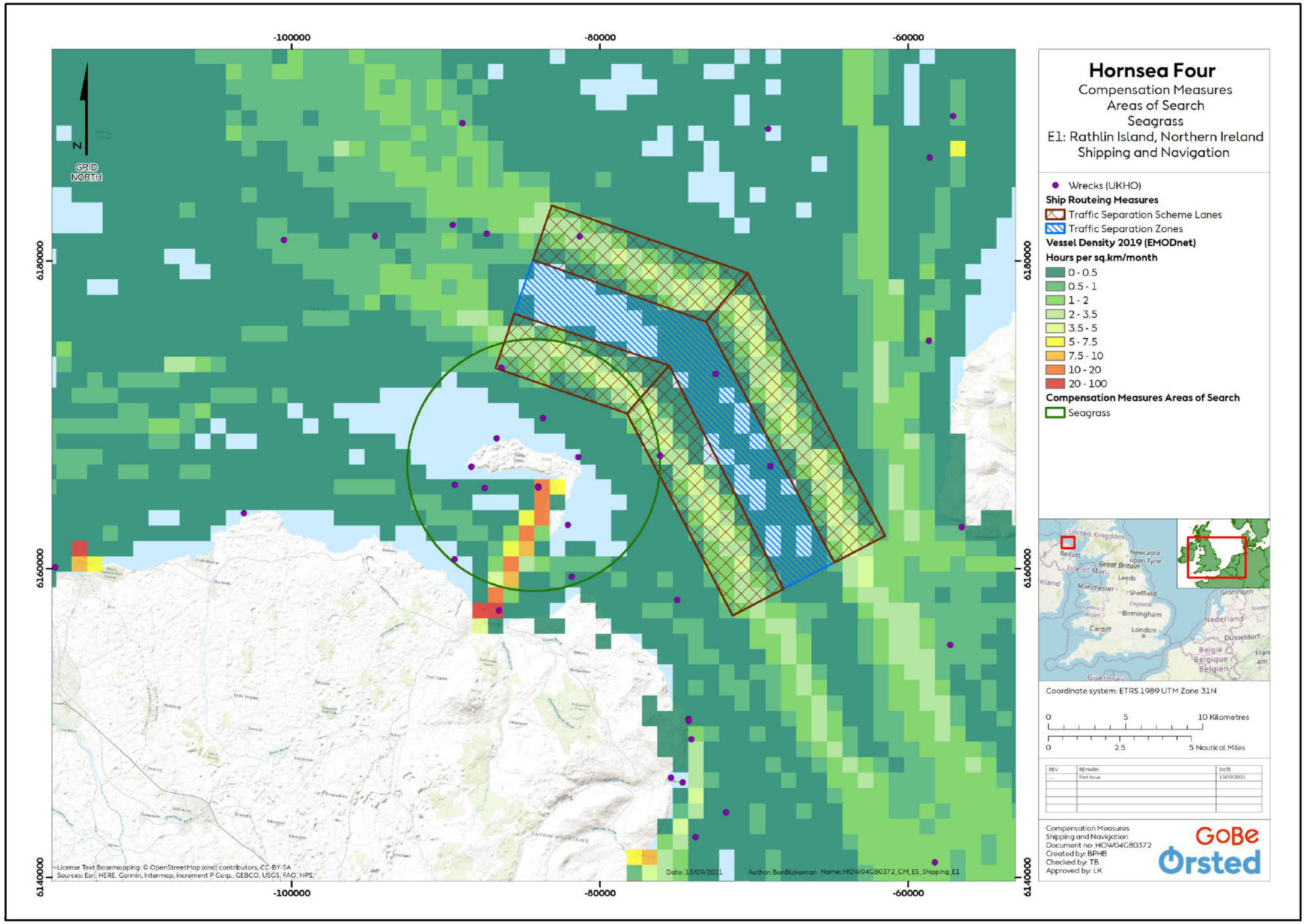








~~**Figure 37: Resilience Measures Areas of Search Seagrass E1: Rathlin Island, Northern Ireland Commercial Fisheries.**~~

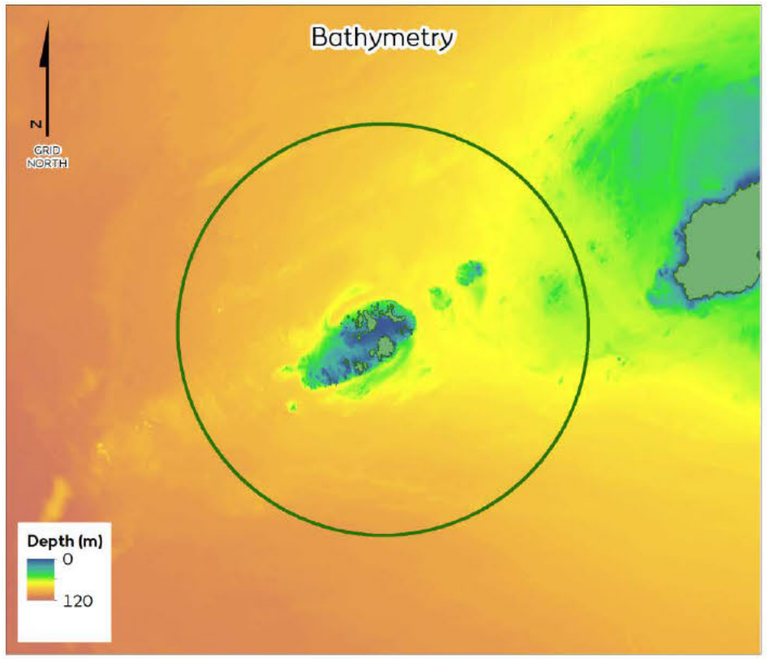


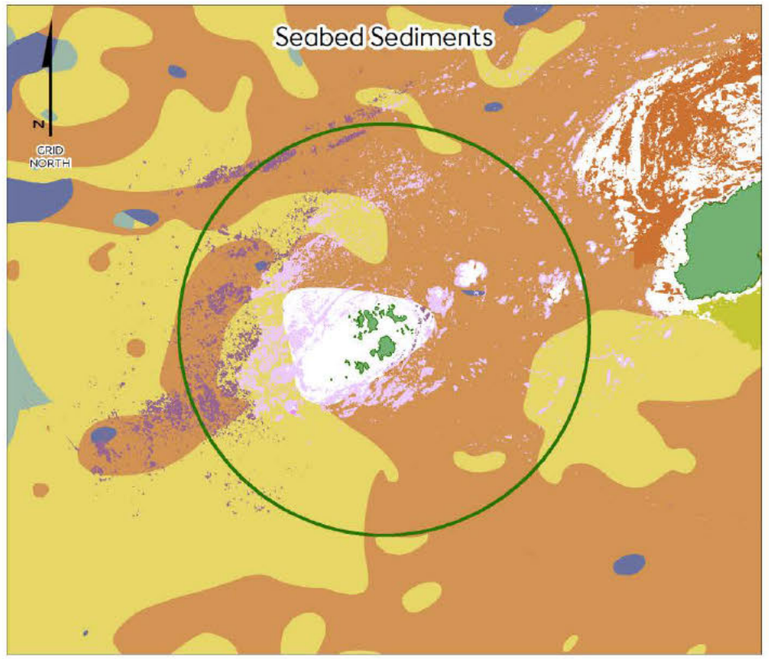
~~Figure 38: Resilience Measures Areas of Search Seagrass E1: Rathlin Island, Northern Ireland Shipping .~~

Table 13: Summary of baseline environment in relation to the Area of Search E2 (Isles of Scilly) for resilience measure - fish habitat enhancement (seagrass).

Topic	Summary of Baseline Environment
Marine Geology, Oceanography and Physical Processes	The baseline environment for physical processes is illustrated in Figure 39. • The Isles of Scilly represent the UK's largest group of tied islands, approximately 140 (Royal Haskoning, 2010), composed of an igneous, granite shoal (Evans, 1990) and characterised by sandy beaches of till and weathered granite (DECC, 2016a). • The water circulation is predominately controlled by the North Atlantic Circulation (DECC, 2016b), with a significant northerly coastal current present between the islands and Lundy Island (Pingree et al., 1999). In addition, there is a localised clockwise circulation around the Scilly Islands (Southward et al., 2005). • The mean spring tidal range for the AoS is between 4.01 and 5.00 m (ABPmer et al., 2011). Exposed to waves originating from the North Atlantic, the wave regime is dominated by westerly Atlantic swell waves (Royal Haskoning, 2011). The Isles of Scilly experience annual mean wave heights of 2.26 m to 2.5 m; seasonal variation occurs with wave heights of 1.26 m to 1.5 m and 3.01 m to 3.25 m shown for summer and winter, respectively (ABPmer et al., 2011).
Benthic and Intertidal Ecology	The baseline environment for benthic ecology is illustrated in Figure 40. • Seabed habitats: The Isles of Scilly are immediately surrounded by rock and biogenic reef, whilst the surrounding seabed is dominated by sand and coarse sediments, with patches of rock and biogenic reefs. • Designations: The Isles of Scilly are designated as an SAC, and there are numerous MCZs around the Isles of Scilly themselves. Also within the AoS is the South of the Isles of Scilly MCZ as well as a slight overlap with the Cape Bank MCZ in the north east of the AoS.
Fish and Shellfish Ecology	The baseline environment for fish and shellfish ecology is illustrated in Figure 41. • The Isles of Scilly is located as the Atlantic Ocean divides into the English Channel and the Celtic Sea. The mixing currents create oceanic fronts which are highly productive, forming a foundation of plankton which is the basis for a food chain that draws in species such as basking and blue sharks. This region is also one of the few places in the UK where the European crawfish or spiny lobster is still found and caught commercially. Some of the MCZs around Scilly have this species listed. There are two species of stalked jellyfish within the Isles of Scilly MCZ – *Haliclystus auricula* and *Lacernariopsis campanulata* (Isles of Scilly IFCA, 2021).
Marine Mammals	The baseline environment for marine mammals is illustrated in Figure 42 and Figure 43. • A range of marine mammals are known to inhabit the waters around the Isles of Scilly, including: harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), striped dolphin (*Stenella coeruleoalba*) and minke whale (*Balaenoptera acutorostrata*) (Hammond et al. 2017). • There are several seal haul outs identified as important in the AoS, including: Western Rocks, Eastern Isles and Norrad Rocks. At these three sites, a total of 359 grey seals were recorded (Leeney et al. 2010), indicating a significant presence within the AoS. The SCOS 2020 report does not identify this AoS as being of relevance to harbour seals (SCOSO, 2020).
Offshore and Intertidal Ornithology	The baseline environment for offshore and intertidal ornithology is illustrated in Figure 44.

Topic	Summary of Baseline Environment
	• Within the AoS there is a singe SPA with offshore ornithology designated features, the Isles of Scilly SPA. This site is designated for storm petrel (*Hydrobates pelagicus*), lesser black-backed gull (*Larus fuscus*), great black-backed gull (*Larus marinus*), and shag (*Phalacrocorax aristotelis*) (JNCC, 2020a).
Commercial Fisheries	The baseline environment for commercial fisheries is illustrated in Figure 45. • The most important methods for fishermen are potting (for European lobsters (*Homarus gammarus*) and brown (edible) crabs (*Cancer pagurus*)), tangle nets (for spiny lobster (*Palinurus elephas*) and species such as monkfish (*Lophius*)), gill nets (for pollack (*Pollachius pollachius*) and grey mullet (*Mugil cephalus*)), and trammel nets (for bait to be used in lobster and crab pots). • Less frequently used methods include handlines and rods (pollack (*Pollachius pollachius*)),and light otter trawls (haddock (*Melanogrammus aeglefinus*), Dover sole (*Solea solea*), megrim (*Lepidorhombus whiffiagonis*), plaice (*Pleuronectes platessa*) and john dory (*Zeus faber*)). • Fishing is seasonal and primarily takes place between March and November (Isles of Scilly IFCA, 2021).
Shipping and Navigation	The baseline environment for shipping and navigation is illustrated in Figure 46. • The vessel density in the AoS varies from 1 to >200,000 route(s)/0.08 km^2/ year. • The water between the islands is covered in a network of routes with many vessels using them (<100,000 routes/0.08 km^2/ year). Around the outside of the islands however, the vessel traffic is reduced with numbers ranging from 1-5 routes/0.08 km^2/ year (Marine Traffic, 2021).
Marine Archaeology	The baseline environment for marine archaeology is described below. • The Isles of Scilly are fortunate in having one of the densest concentrations of archaeological sites in Britain and is reflected in the Isles of Scilly Museum collections. • Around the Isles there are the remains of a least 700 wrecks, many of national and international importance, which, with other submerged features, point to an astounding marine archaeological resource yet largely unrecorded (Isles of Scilly Museum, 2021).

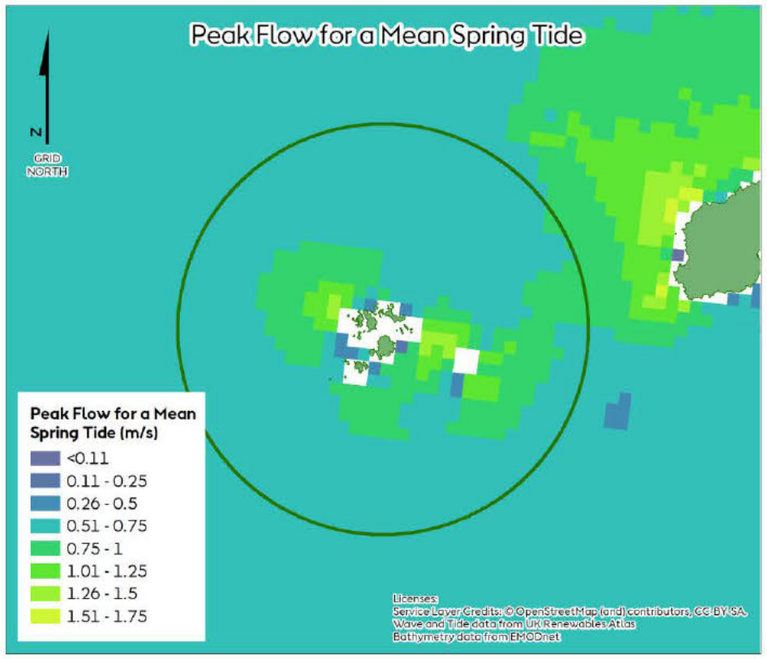


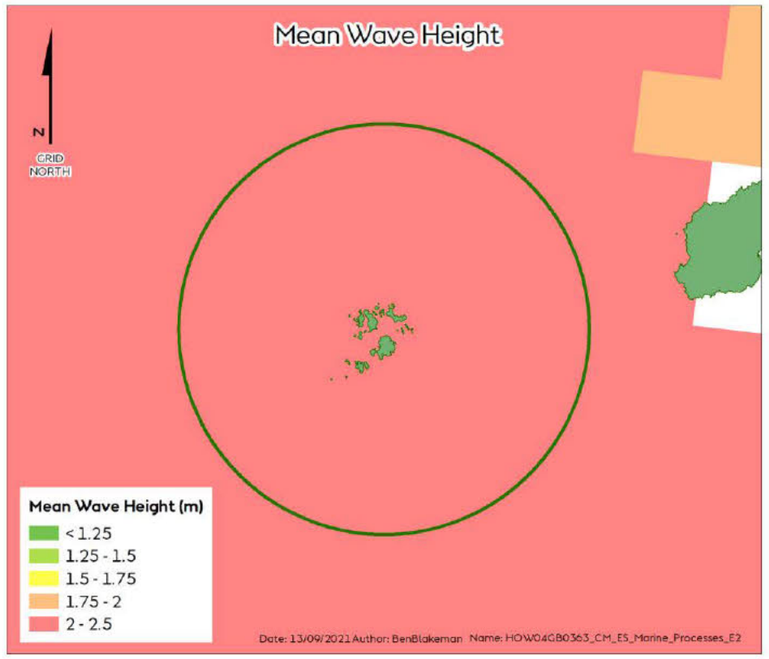


Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E2: Isles of Scilly
Marine Processes

Compensation Measures Areas of Search
Seagrass

EUNIS Habitats (UKSeaMap 2018)
- A4.12: Sponge communities on deep circalittoral rock
- A4.27: Faunal communities on deep moderate energy circalittoral rock
- A4.33: Faunal communities on deep low energy circalittoral rock
- A5.13: Infralittoral coarse sediment
- A5.14: Circalittoral coarse sediment
- A5.15: Deep circalittoral coarse sediment
- A5.23 or A5.24: Infralittoral fine sand or infralittoral muddy sand
- A5.25 or A5.26: Circalittoral fine sand or circalittoral muddy sand
- A5.27: Deep circalittoral sand
- A5.37: Deep circalittoral mud
- A5.45: Deep circalittoral mixed sediments
- No EUNIS habitat assigned





Coordinate system: ETRS 1989 UTM Zone 31N

0 20 40 Kilometres
0 10 20 Nautical Miles

REV	REMARK	DATE
---	First Issue	13/09/2021

Compensation Measures
Marine Processes
Document no: HOW04CB032063
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Checked by: TB
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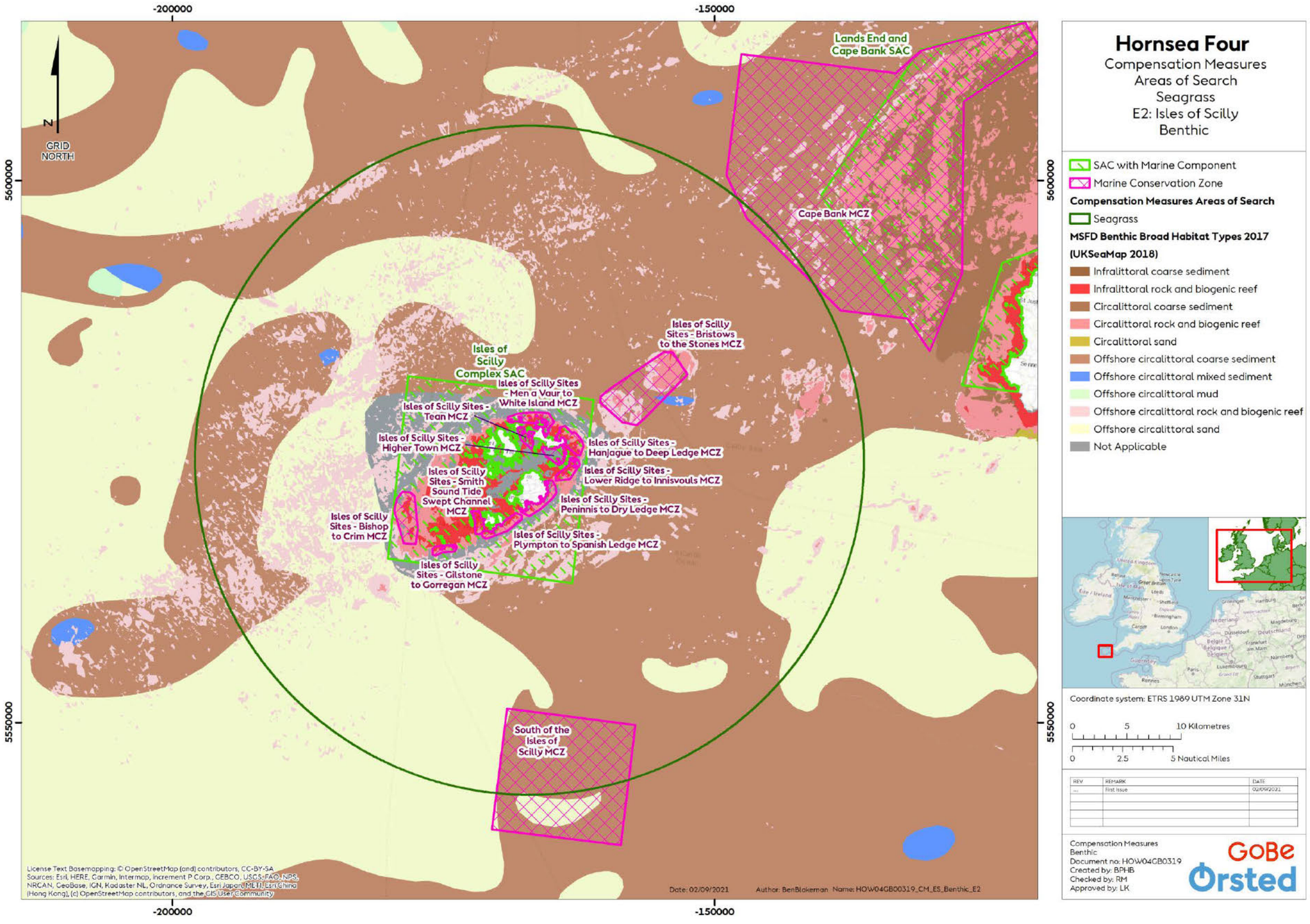
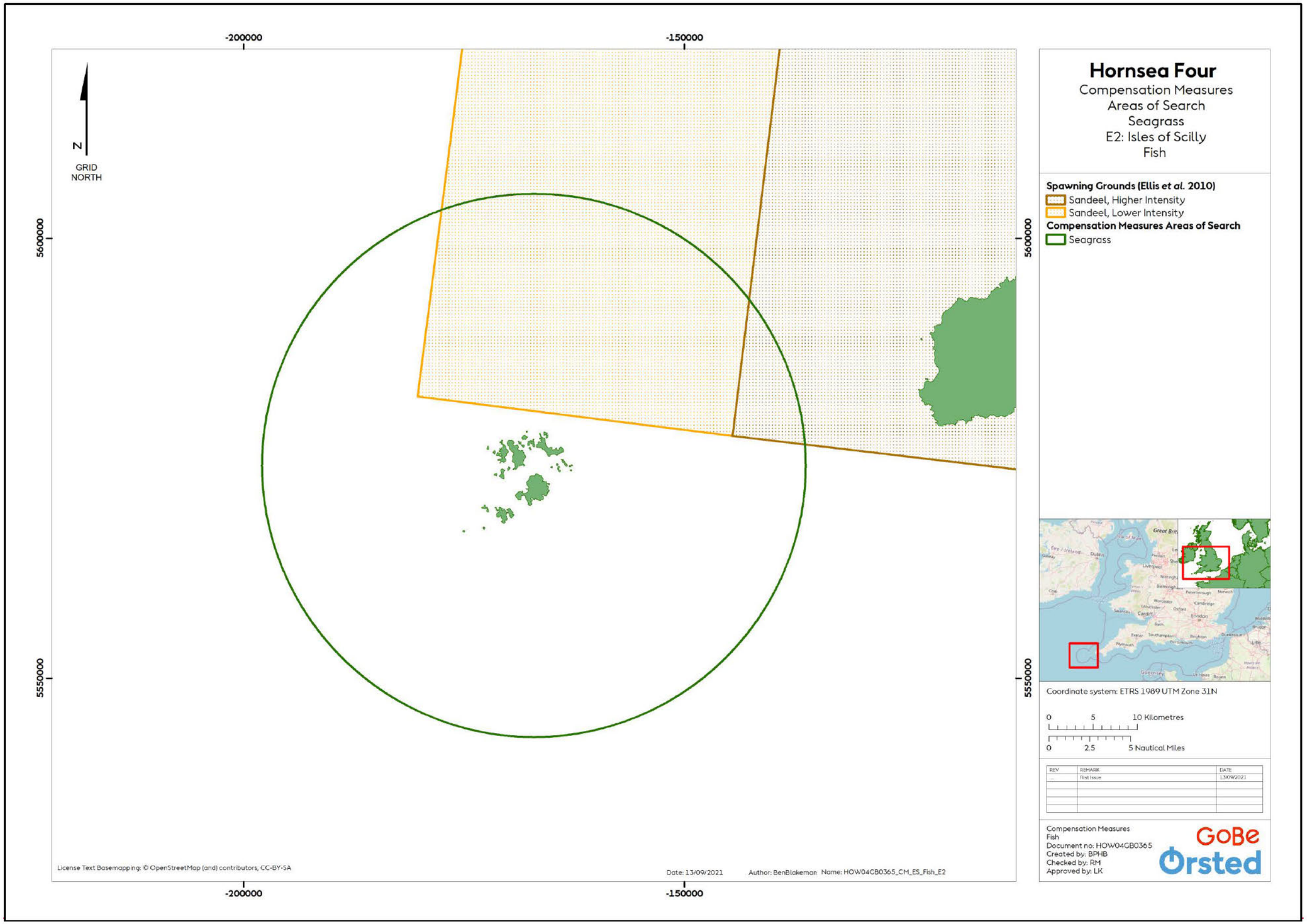
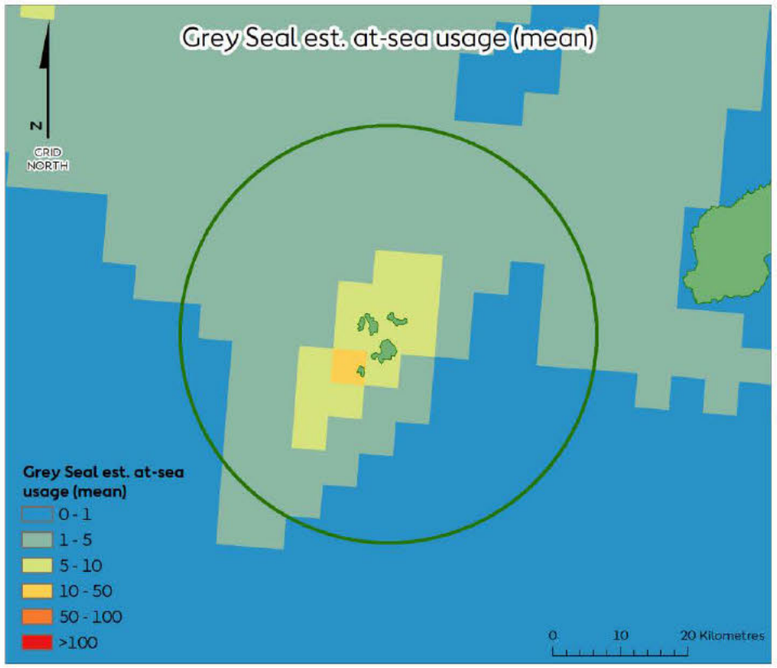
~~**Figure 39: Resilience Measures Areas of Search Seagrass E2: Isles of Scilly Physical Processes.**~~

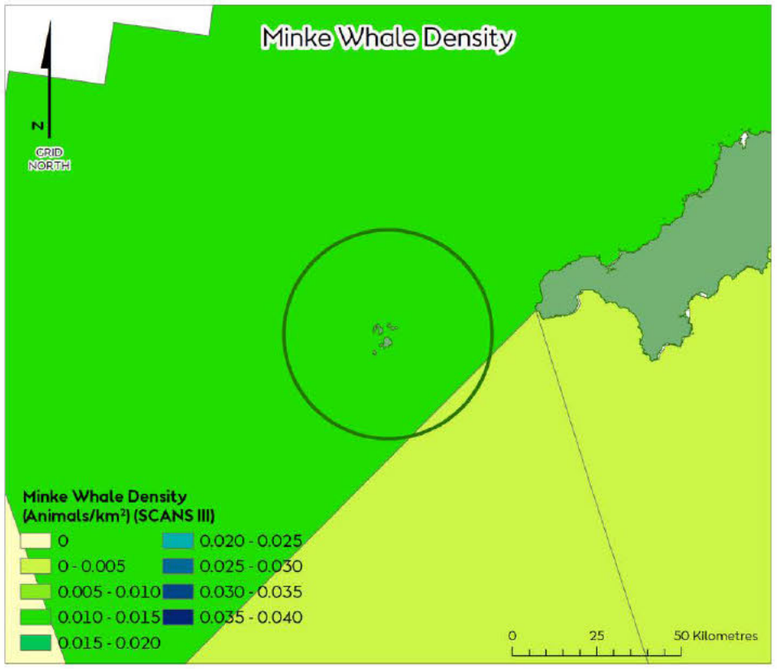


~~Figure 40: Resilience Measures Areas of Search Seagrass E2: Isles of Scilly Benthic.~~



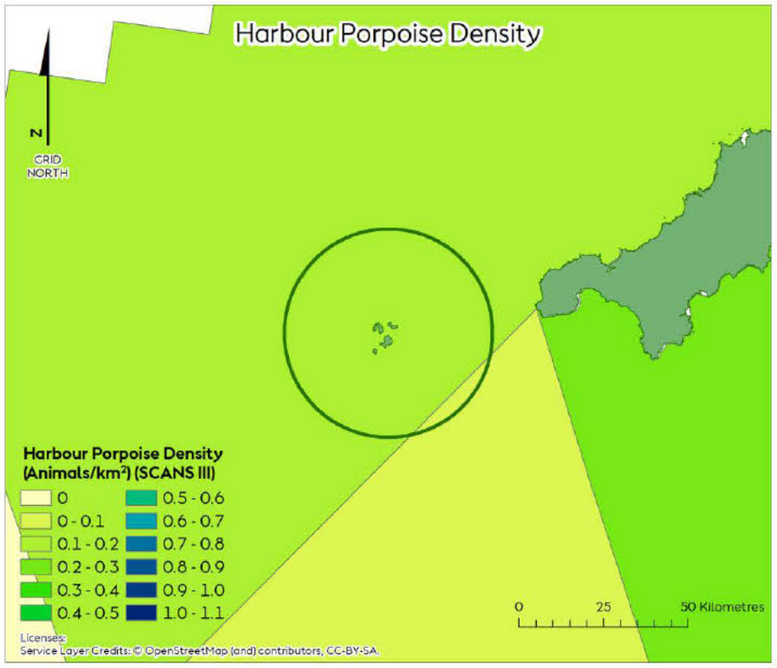
~~Figure 41: Resilience Measures Areas of Search Seagrass E2: Isles of Scilly Fish Ecology.~~

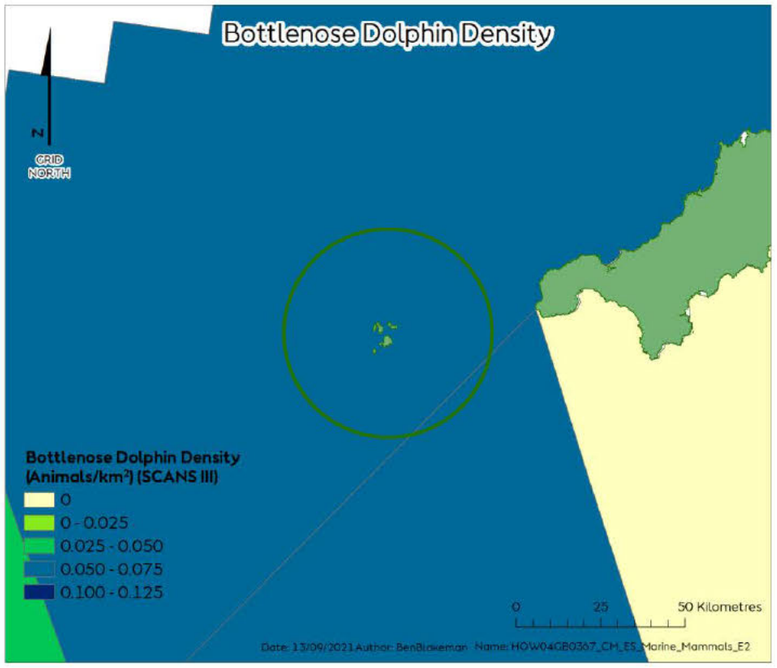




Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E2: Isles of Scilly
Marine Mammals

Compensation Measures Areas of Search
Seagrass





Estimated at-sea Distribution of Grey and Harbour Seals maps data from Sea Mammal Research Unit (SMRU) and Marine Scotland, 2017

Coordinate system: ETRS 1989 UTM Zone 31N

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Compensation Measures
Marine Mammals
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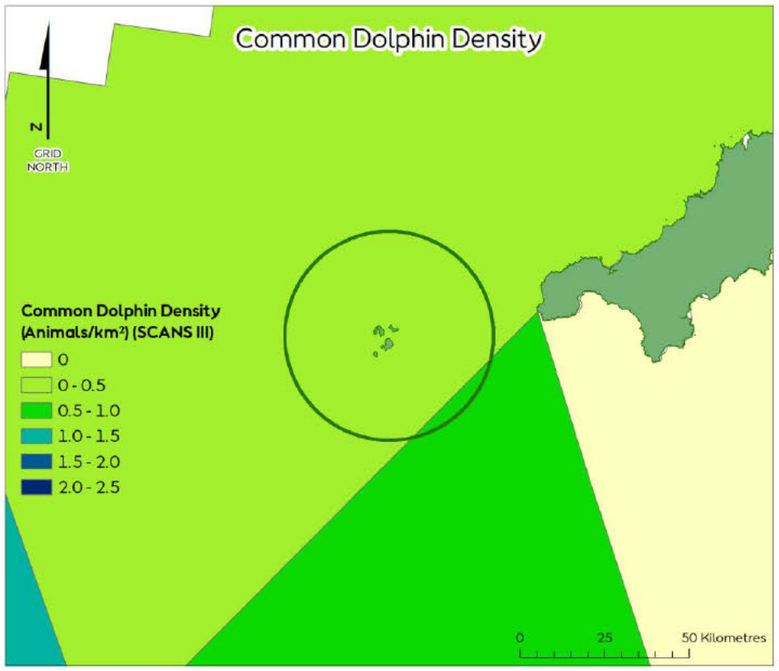
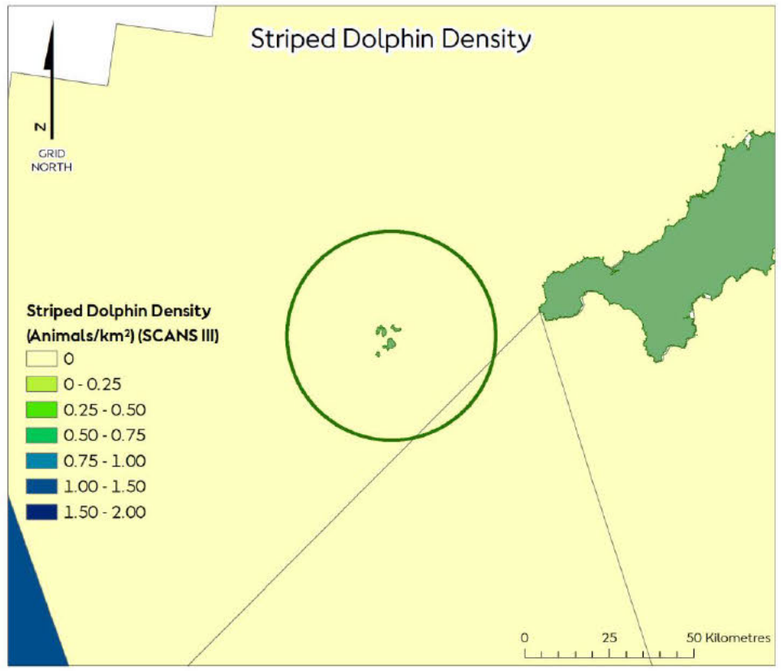
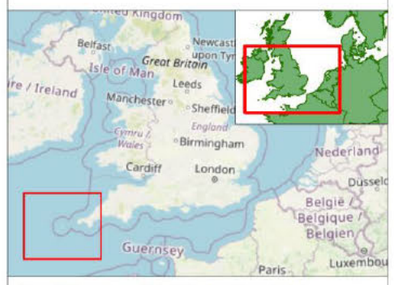
~~Figure 42: Resilience Measures Areas of Search Seagrass E2: Isles of Scilly Marine Mammal 1.~~





Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E2: Isles of Scilly
Marine Mammals

Compensation Measures Areas of Search
Seagrass



Coordinate system: ETRS 1989 UTM Zone 31N

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Compensation Measures
Marine Mammals
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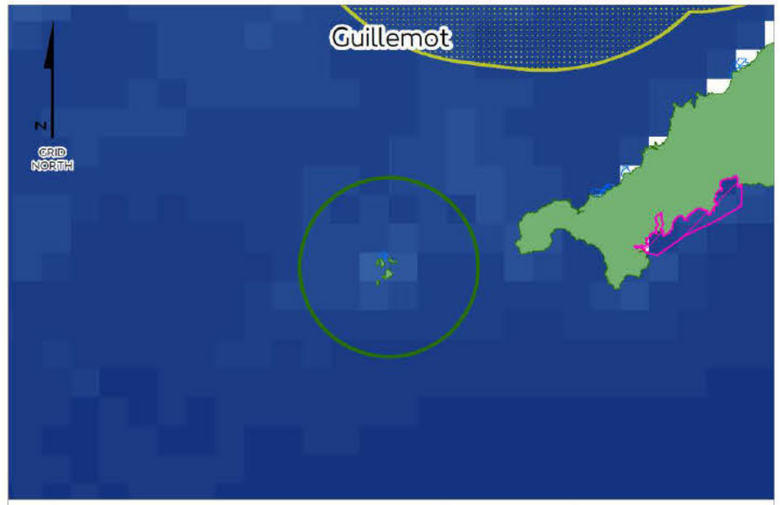
Date: 13/09/2021 Author: BenBlakeman Name: HOW04GB0376_CM_ES_Marine_Mammals_E2_2

~~**Figure 43: Resilience Measures Areas of Search Seagrass E2: Isles of Scilly Marine Mammal 2.**~~

Kittiwake Hotspots (Cleasby et al, 2020)
- Maximum Curvature
- Statistically Significant Getis-Ord hotspot
- Top 5% Getis-Ord hotspot
- Top 1% Getis-Ord hotspot

Kittiwake (Waggit et al., 2019) Density
High : 2.07
Low : 0

Hotspots identified at the UK-scale for Black-legged Kittiwakes using Getis-Ord hotspot analysis with a neighbourhood size of d = 10 km based on FPT analysis or Maximum Curvature. Getis-Ord hotspots defined as all cells with the top 1% of calculated Gi* scores; all cells within the top 5% of Gi* score; all cells in which Gi* scores were deemed statistically significant at the < 0.01 level.



Guillemot Hotspots (Cleasby et al, 2020)
- Maximum Curvature
- Statistically Significant Getis-Ord hotspot - d = 9km
- Top 5% Getis-Ord hotspot - d = 9km
- Top 1% Getis-Ord hotspot - d = 9km

Guillemot (Waggit et al., 2019) Density
High : 6.25
Low : 0

Hotspots identified at the UK-scale for Common Guillemots using Getis-Ord hotspot analysis with a neighbourhood size of d = 9 km based on FPT analysis or Maximum Curvature.

Hornsea Four

Compensation Measures
Areas of Search
Seagrass
E2: Isles of Scilly
Ornithology

- Special Protection Area (SPA) with Marine Components

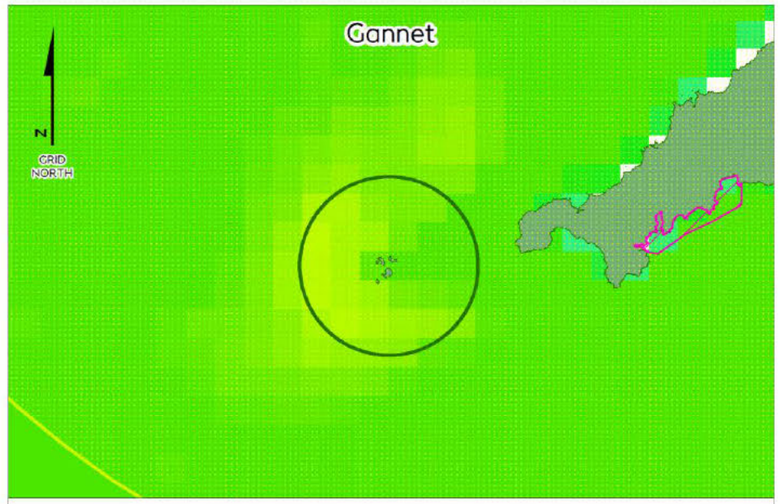
Mean-Max Foraging Range (Woodward 2019)
- Common Guillemot - 73.2km Buffer
- Gannet - 315.2km Buffer
- Kittiwake - 156.1km Buffer
- Razorbill - 88.7km Buffer

Compensation Measures Areas of Search
- Seagrass

Razorbill Hotspots (Cleasby et al, 2020)
- Maximum Curvature
- Statistically Significant Getis-Ord hotspot - d = 7km
- Top 5% Getis-Ord hotspot - d = 7km
- Top 1% Getis-Ord hotspot - d = 7km

Razorbill (Waggit et al., 2019) Density
High : 3
Low : 0

Hotspots identified at the UK-scale for Razorbills using Getis-Ord hotspot analysis with a neighbourhood size of d = 7 km based on FPT analysis or Maximum Curvature.



Gannet (Waggit et al., 2019) Density
High : 1.65
Low : 0

Waggitt et al 2019 densities data. Spatial variation in predicted densities (animals per km) of seabird species in July in the North-East Atlantic. Values are provided at 10km resolution.

Coordinate system: ETRS 1989 UTM Zone 31N

0 25 50 Kilometres
0 10 20 Nautical Miles

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Compensation Measures
Ornithology
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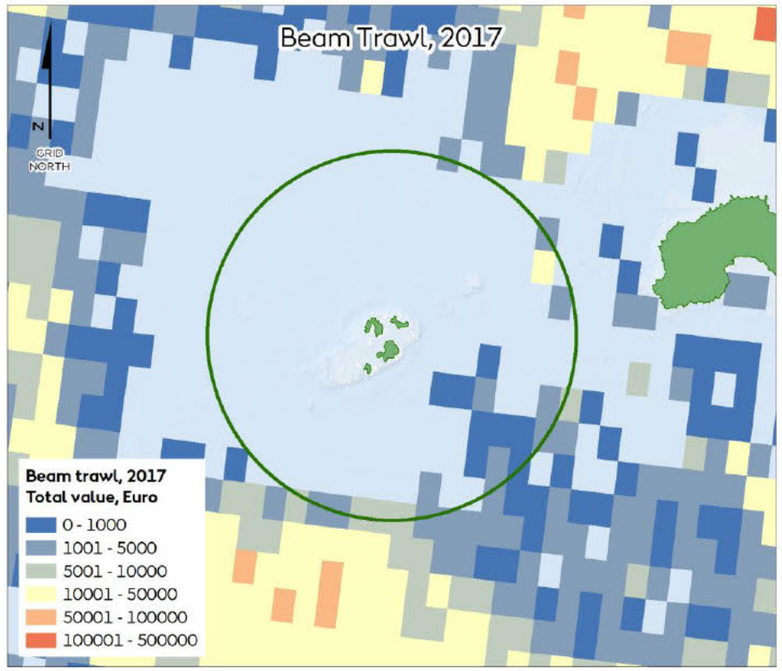
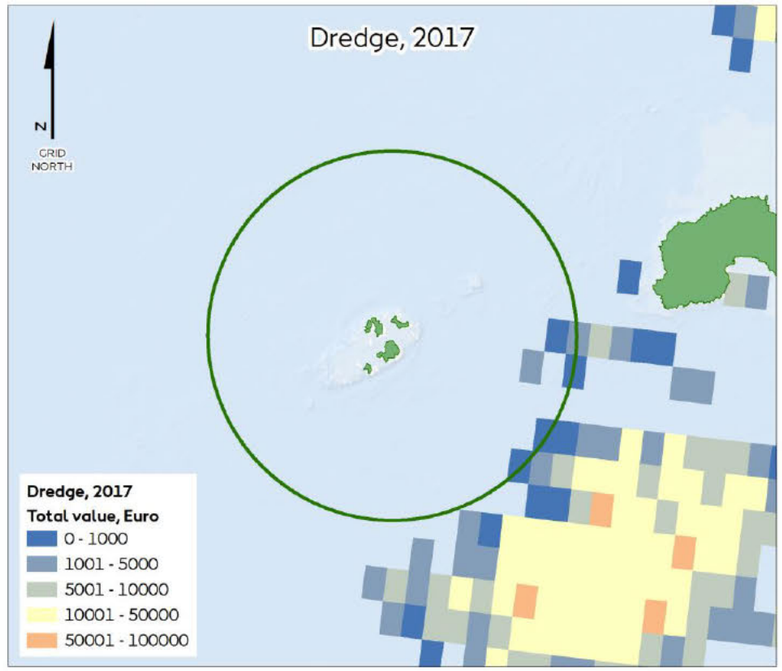
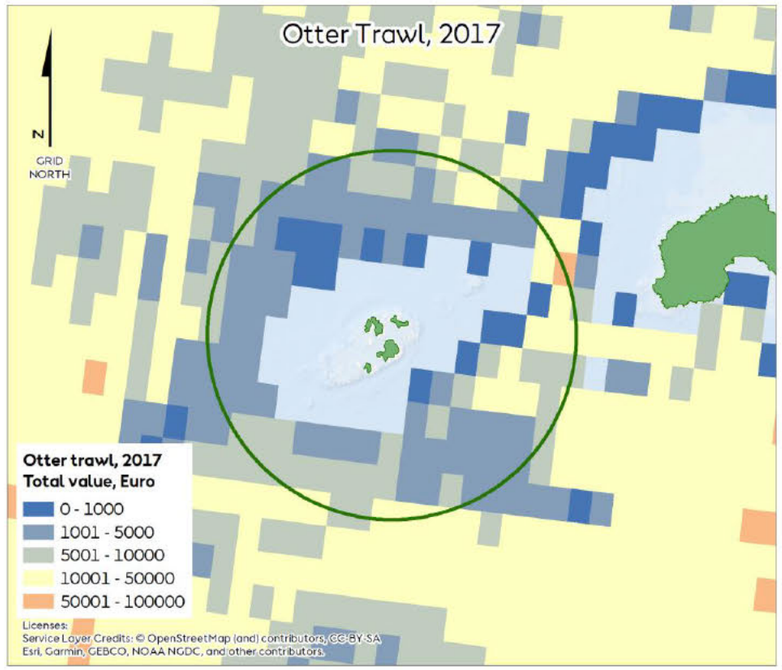
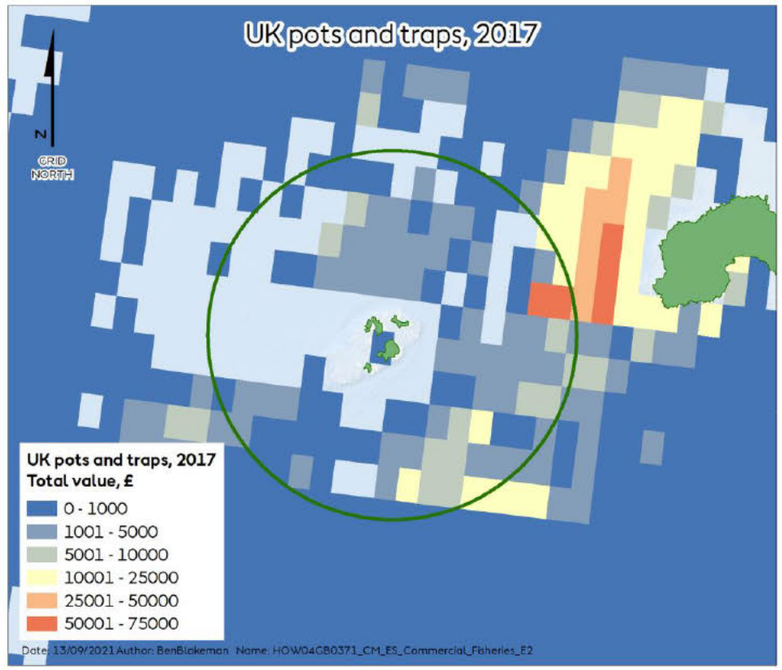
Date: 13/09/2021 Author: BenBlakeman Name: HOW04GB0369_CM_ES_Ornithology_E2

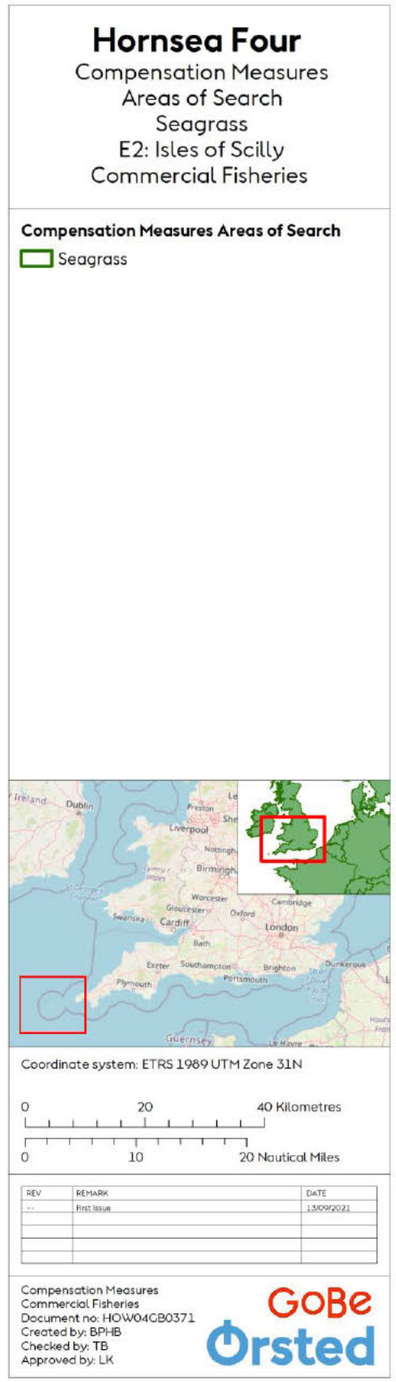
~~Figure 44: Resilience Measures Areas of Search Seagrass E2: Isles of Scilly Ornithology.~~



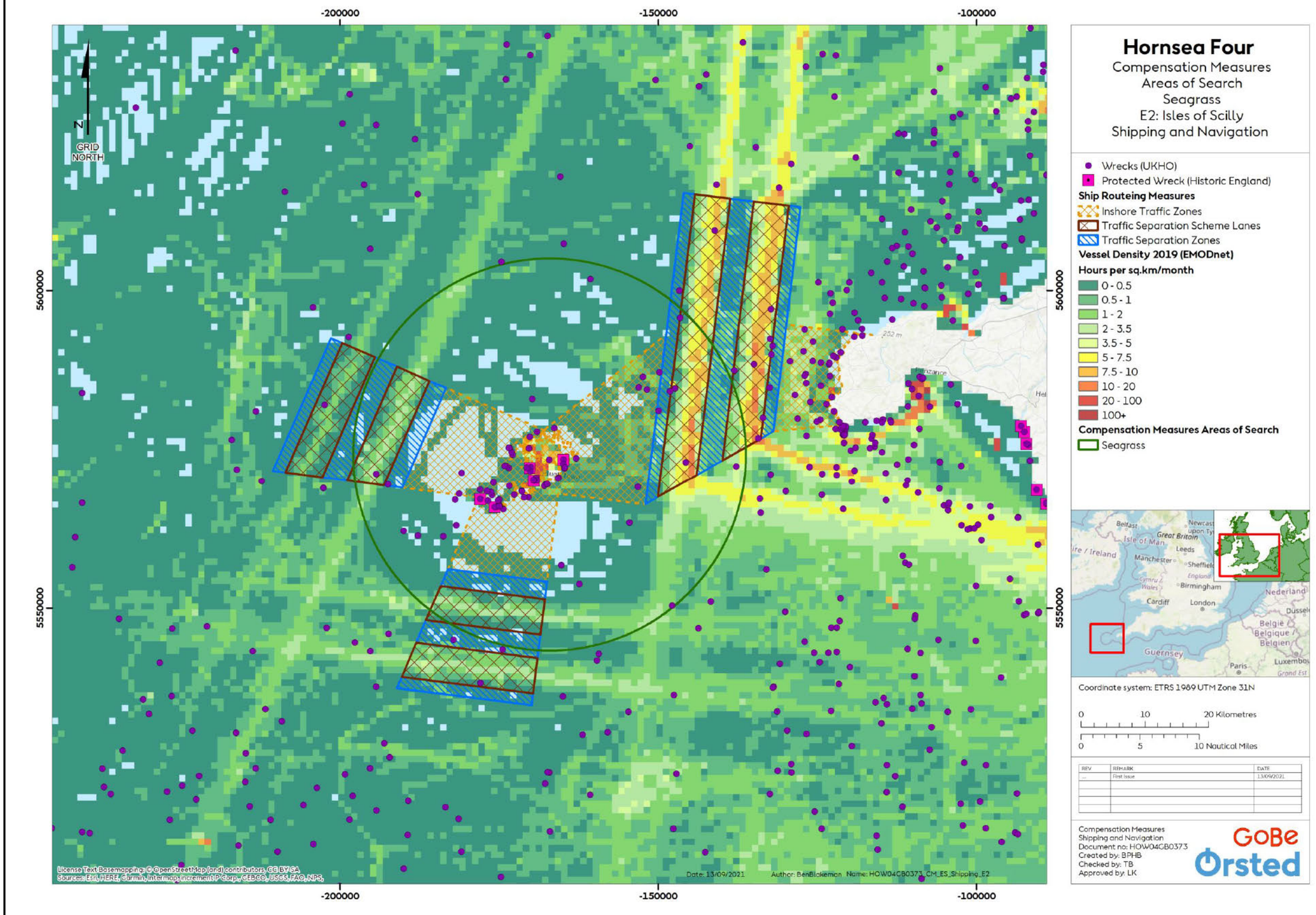








~~Figure 45: Resilience Measures Areas of Search Seagrass E2: Isles of Scilly Commercial Fisheries.~~

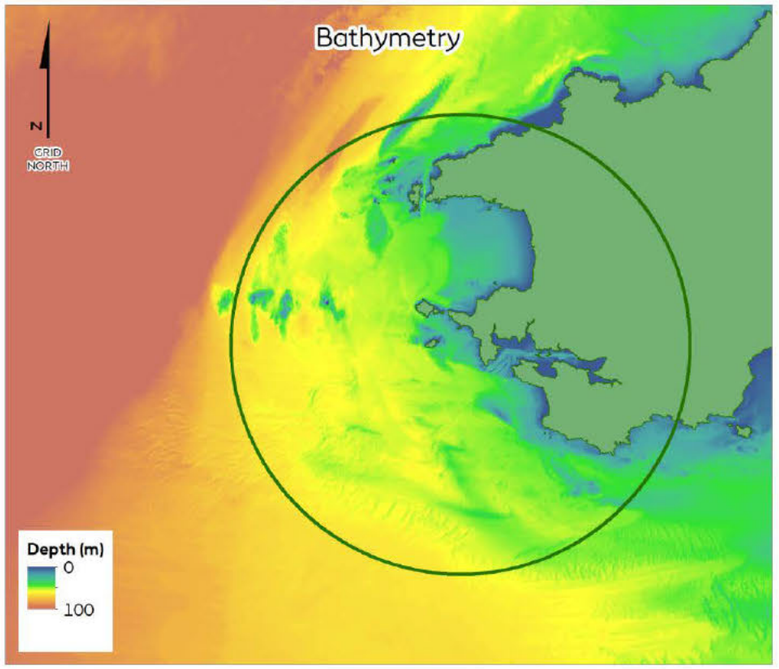


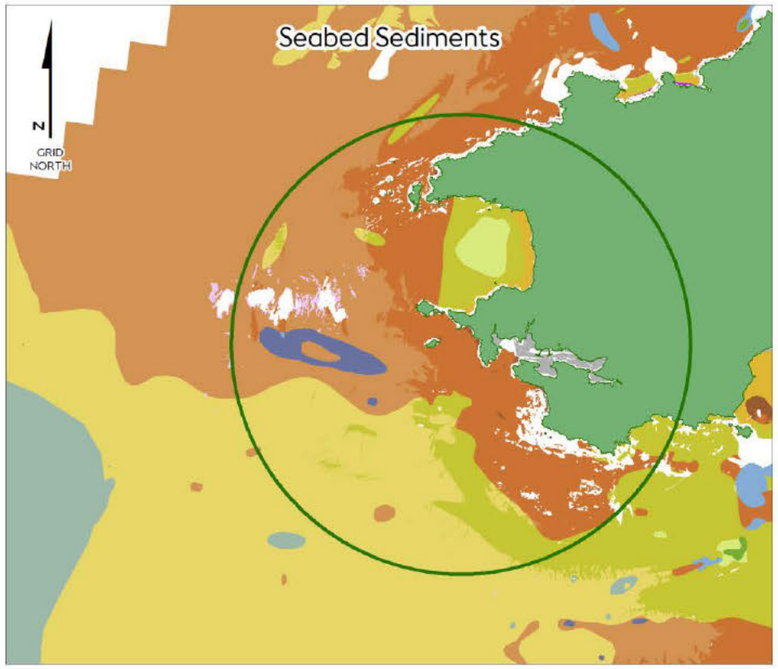
~~Figure 46: Resilience Measures Areas of Search Seagrass E2: Isles of Scilly Shipping.~~

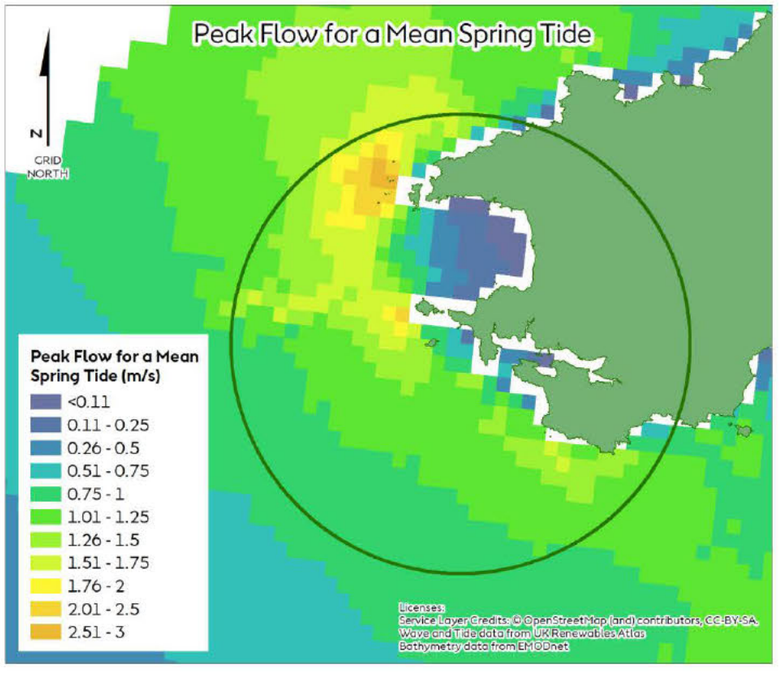
Table 14: Summary of baseline environment in relation to the Area of Search E3 (Celtic Sea) for resilience measure - fish habitat enhancement (seagrass).

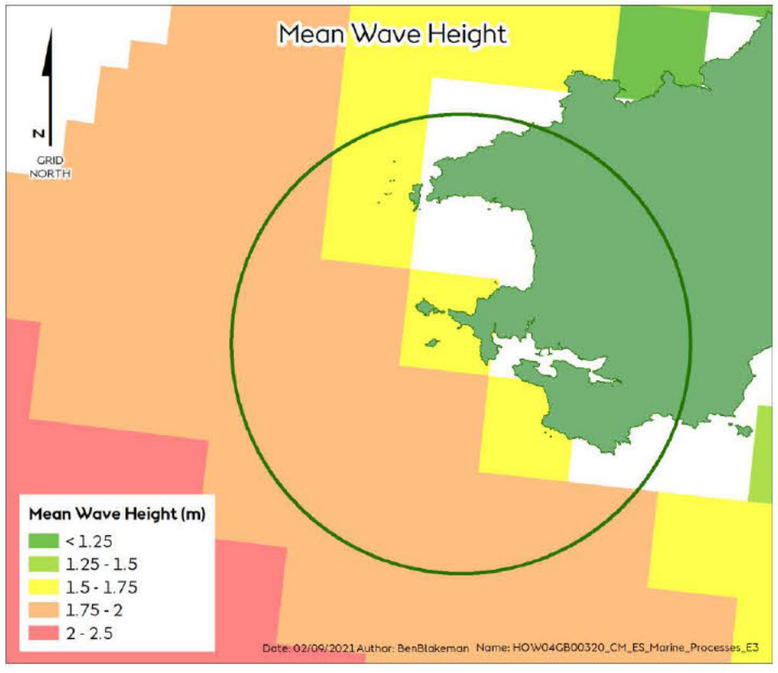
Topic	Summary of Baseline Environment
Marine Geology, Oceanography and Physical Processes	The baseline environment for physical processes is illustrated in Figure 47. • The AoS is shallow towards the coast, but sits of the edge of the continental shelf, which drops away sharply towards the west. • Seabed sediments are comprised of mixed coarse and sandy sediments.
Benthic and Intertidal Ecology	The baseline environment for benthic ecology is illustrated in Figure 48. • Seabed habitats in the AoS are mainly sands and mixed sediments, with some outcrops of rock and biogenic reef. • Numerous designated sites are present within the AoS, including the Pembrokeshire and West Wales Marine SACs, and the Skomer MCZ.
Fish and Shellfish Ecology	The baseline environment for fish and shellfish ecology is illustrated in Figure 49. • The AoS overlaps with spawning and nursery grounds for species including herring, cod, whiting, mackerel, cod, plaice, sole and sandeel (high intensity).
Marine Mammals	The baseline environment for marine mammals is illustrated in Figure 50 and Figure 51. • A range of marine mammals are known to be present in this AoS including: harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), striped dolphin (*Stenella coeruleoalba*), risso's dolphin (*Grampus griseus*) and minke whale (*Balaenoptera acutorostrata*) (Hammond et al. 2017). • There are two large grey seal colonies within the AoS (SCOS, 2020).
Offshore and Intertidal Ornithology	The baseline environment for offshore ornithology is illustrated in Figure 52. • Within the AoS there are two SPAs with offshore ornithology designated features, Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA and the Grassholm SPA. The Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro SPA is designated for European storm petrel (*Hydrobates pelagicus*), red-billed chough (Pyrrhocorax pyrrhocorax), short-eared owl (*Asio flammeus*), manx shearwater (*Puffinus puffinus*), Atlantic puffin (*Fratercula arctica*), and lesser black-backed gull (*Larus fuscus*) (JNCC, 2017b). The Grassolm SPA is designated for gannet (*Morus bassanus*) (JNCC, 2015b). • As shown on Figure 52, there is an area of high gannet density in the west of the AoS.
Commercial Fisheries	The baseline environment for commercial fisheries is illustrated in Figure 53. • The Celtic Sea is a large area that includes ICES Divisions VIIg-h, the western parts of Divisions VIIe-f and the shelf waters in Divisions VIIj. • As shown on Figure 53, fishing effort is highest in the south and west of the AoS.
Shipping and Navigation	The baseline environment for shipping and navigation is illustrated in Figure 54. • The vessel density in the AoS varies from 1 to >222,000 route(s)/0.15 km^2/ year. • The Milford Haven Waterway holds the majority of the vessels, with the primary routes going from the settlements along the river, out through the mouth of the estuary and wither A) in a northwest direction directly across towards Ireland, or B) in a southwest direction to pass the southern tip of Cornwall and out into the English Chanel (Marine Traffic, 2021). • As shown on Figure 54, there is an area of avoidance for shipping in the west of the AoS and a traffic separation scheme immediately to the west of the AoS.

Topic	Summary of Baseline Environment
Marine Archaeology	The baseline environment for marine archaeology is described below. • Within the AoS, there are many different types of archaeological features including both ship and aircraft wrecks.









Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E3: Celtic Sea, Wales
Marine Processes

Compensation Measures Areas of Search
Seagrass

EUNIS Habitats (UKSeaMap 2018)
- A4.27: Faunal communities on deep moderate energy circalittoral rock
- A4.33: Faunal communities on deep low energy circalittoral rock
- A5.13: Infralittoral coarse
- A5.14: Circalittoral coarse
- A5.15: Deep circalittoral coarse sediment
- A5.23 or A5.24: Infralittoral fine sand or infralittoral muddy sand
- A5.25 or A5.26: Circalittoral fine sand or circalittoral muddy sand
- A5.27: Deep circalittoral
- A5.33: Infralittoral sandy
- A5.35: Circalittoral sandy
- A5.36: Circalittoral fine
- A5.37: Deep circalittoral
- A5.43: Infralittoral mixed
- A5.44: Circalittoral mixed
- A5.45: Deep circalittoral mixed sediments
- No EUNIS habitat

Coordinate system: ETRS 1989 UTM Zone 31N

0 10 20 Kilometres
0 5 10 Nautical Miles

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Compensation Measures
Marine Processes
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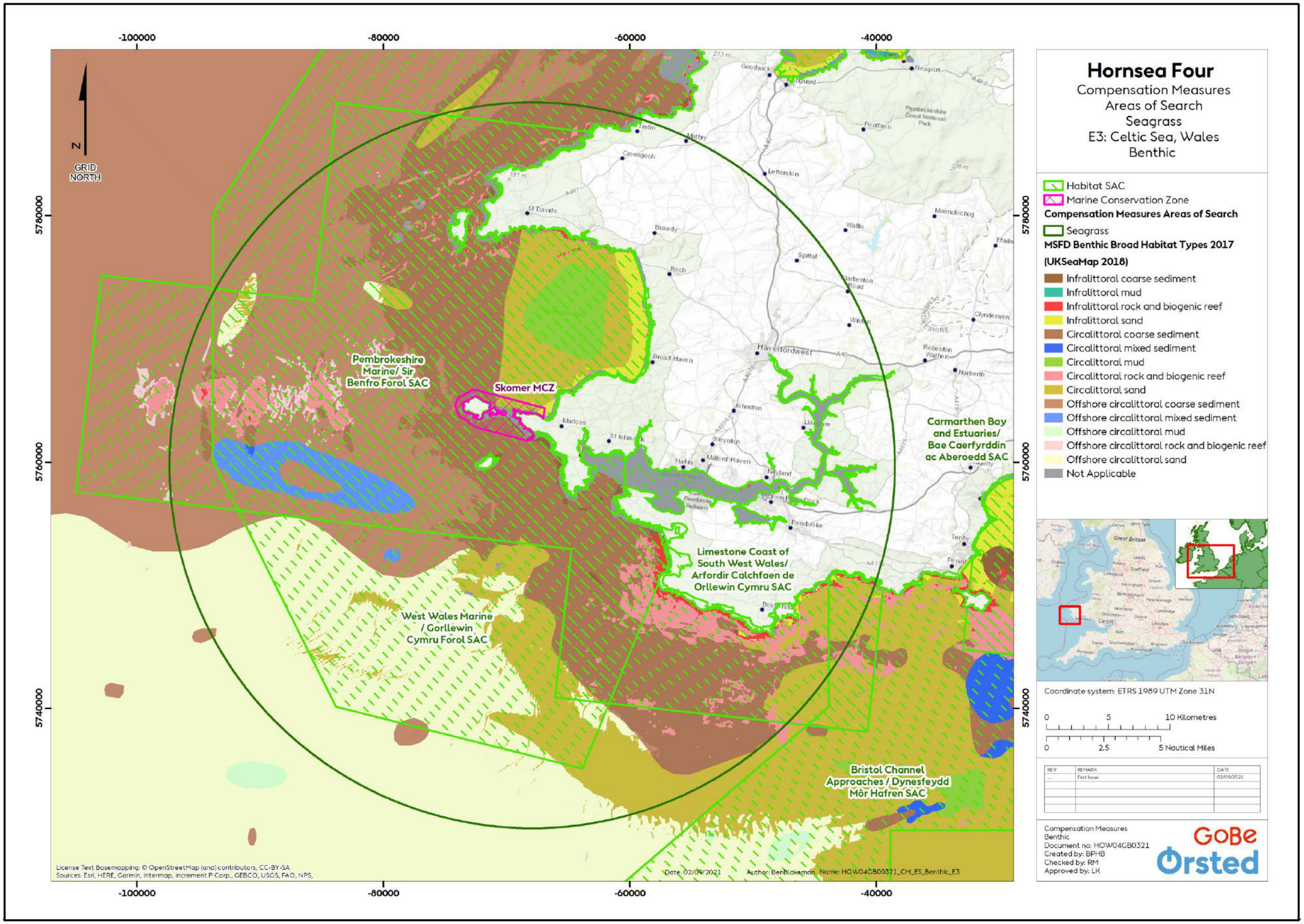
~~**Figure 47: Resilience Measures Areas of Search Seagrass E3: Celtic Sea, Wales Marine Processes.**~~



Hornsea Four

Compensation Measures
Areas of Search
Seagrass
E3: Celtic Sea, Wales
Benthic

- Habitat SAC
- Marine Conservation Zone

Compensation Measures Areas of Search

- Seagrass

MSFD Benthic Broad Habitat Types 2017

(UKSeaMap 2018)

- Infralittoral coarse sediment
- Infralittoral mud
- Infralittoral rock and biogenic reef
- Infralittoral sand
- Circalittoral coarse sediment
- Circalittoral mixed sediment
- Circalittoral mud
- Circalittoral rock and biogenic reef
- Circalittoral sand
- Offshore circalittoral coarse sediment
- Offshore circalittoral mixed sediment
- Offshore circalittoral mud
- Offshore circalittoral rock and biogenic reef
- Offshore circalittoral sand
- Not Applicable

Coordinate system: ETRS 1989 UTM Zone 31N

0 5 10 Kilometres

0 2.5 5 Nautical Miles

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Compensation Measures
Benthic
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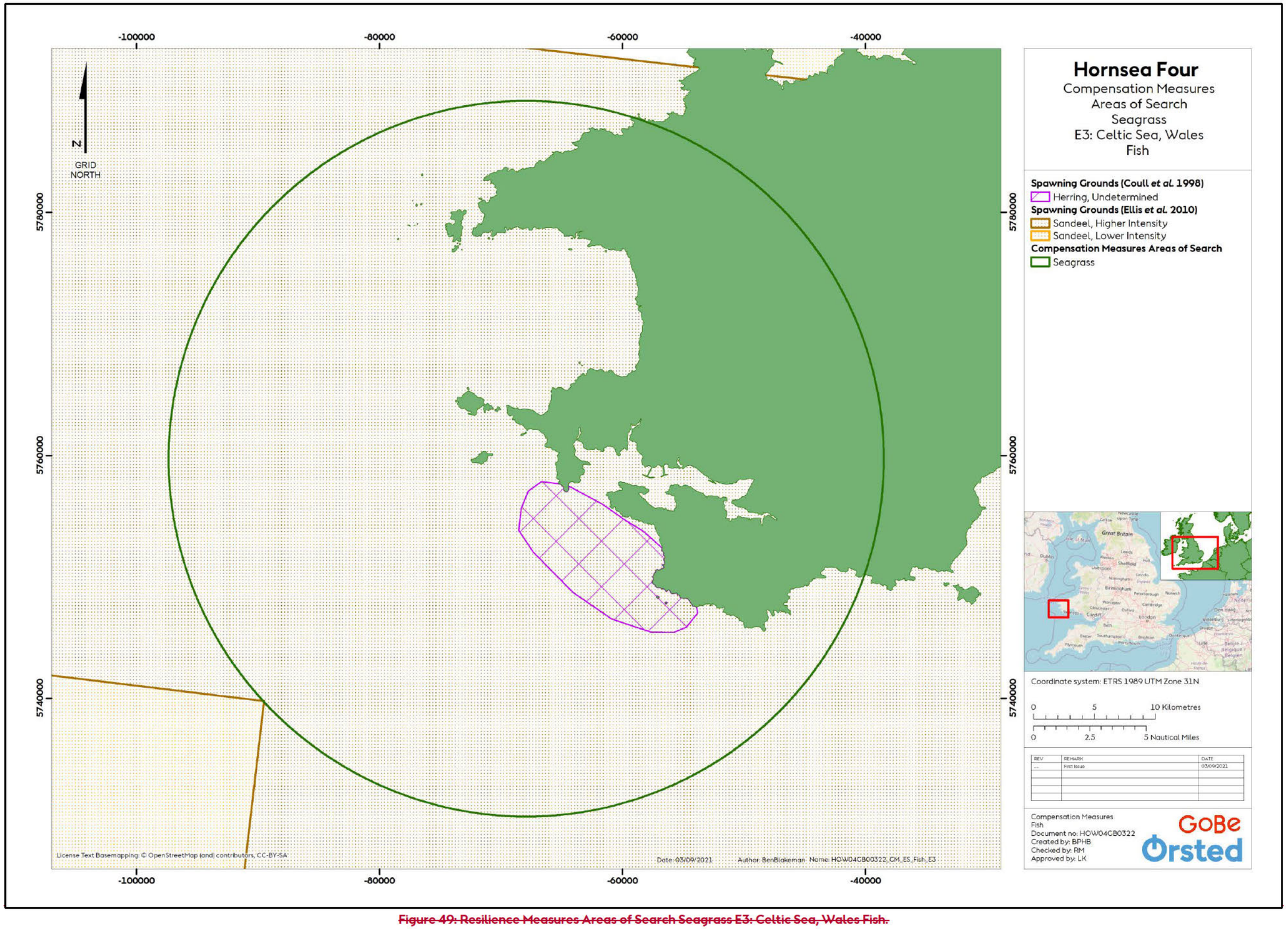
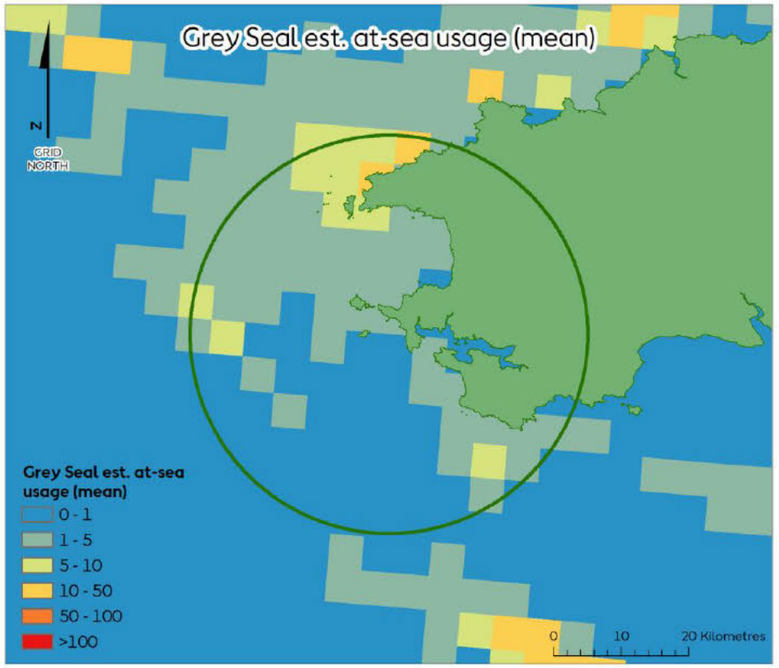
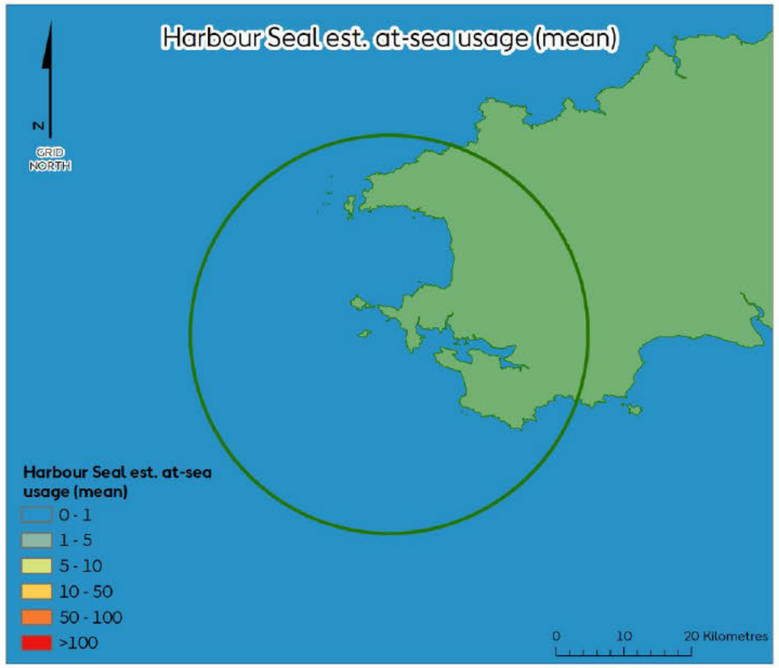
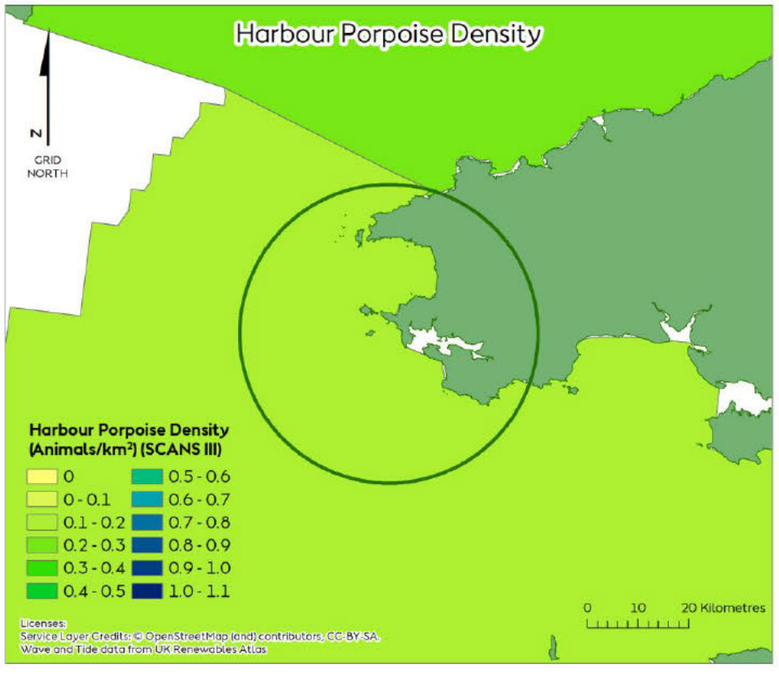
~~**Figure 48: Resilience Measures Areas of Search Seagrass E3: Celtic Sea, Wales Benthic.**~~

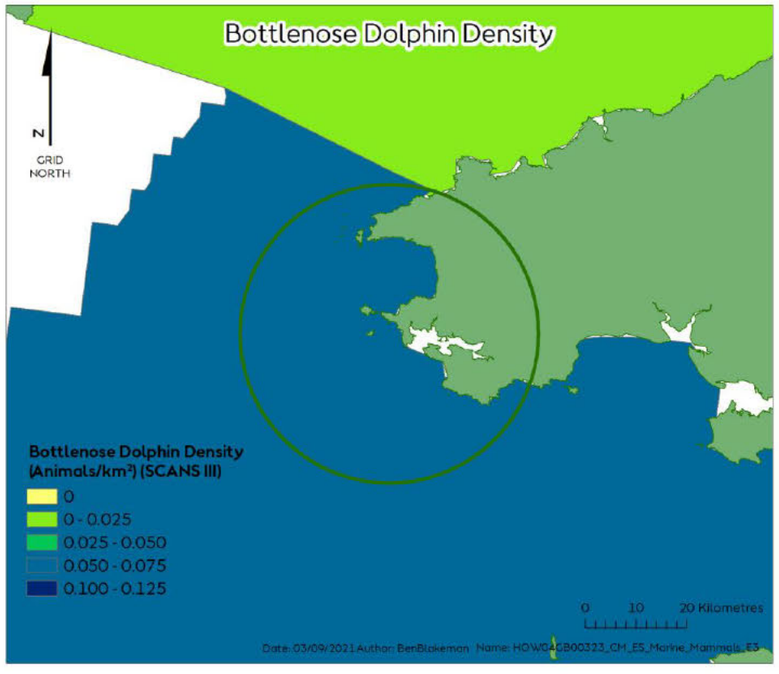


~~Figure 49: Resilience Measures Areas of Search Seagrass E3: Celtic Sea, Wales Fish.~~

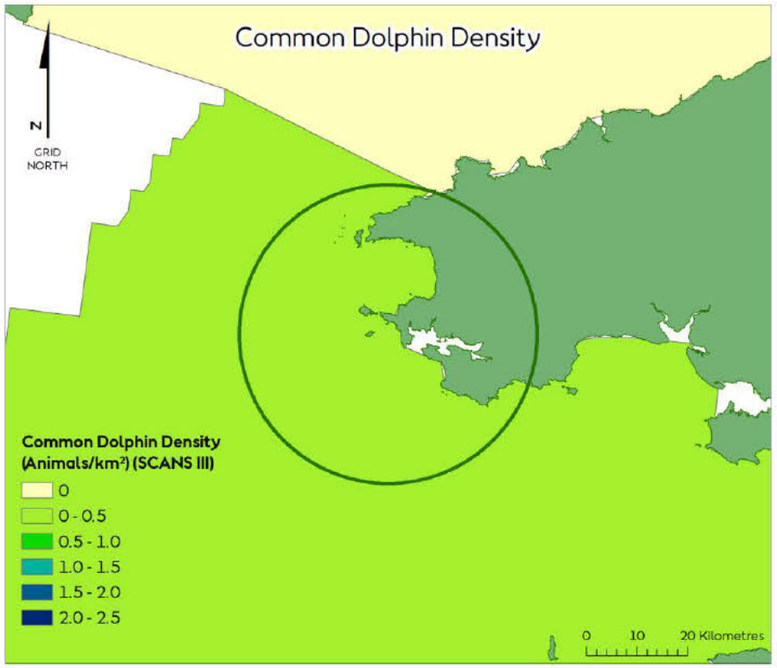


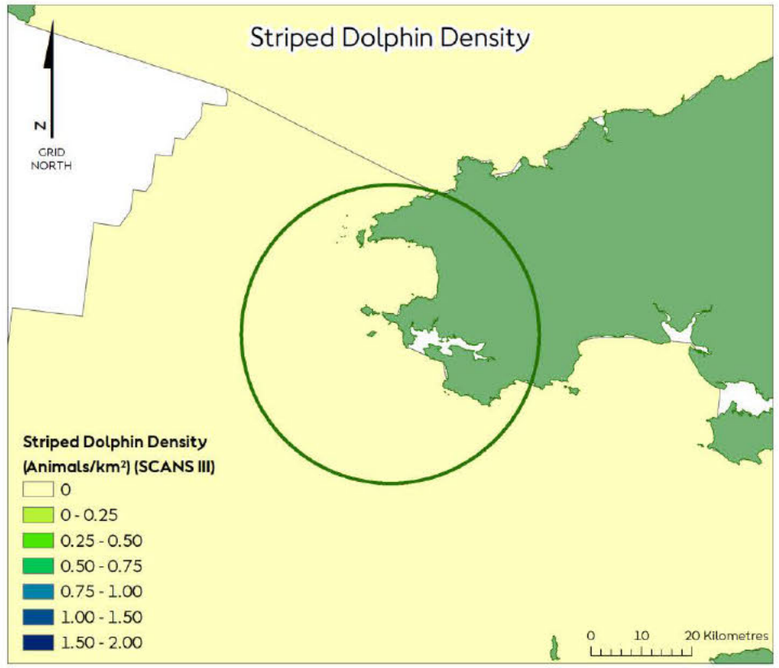


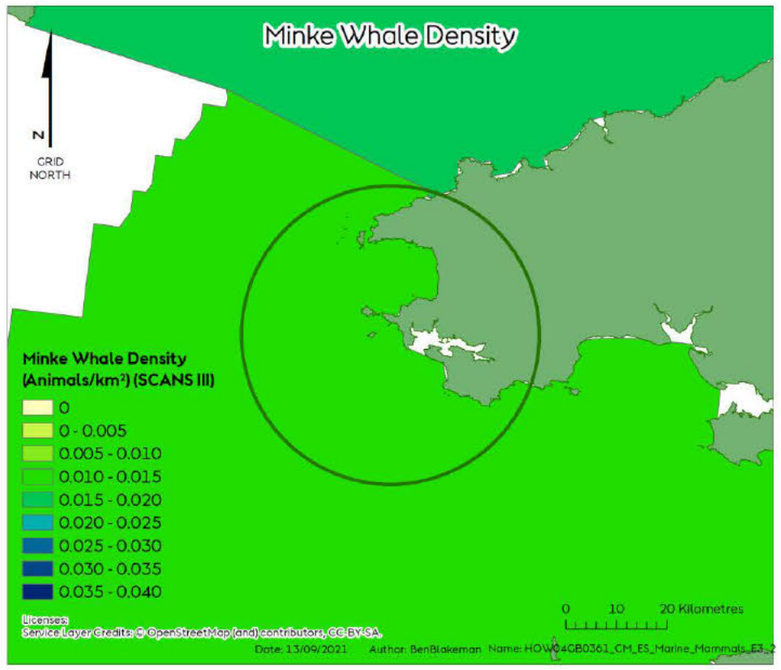




~~Figure 50: Compensation Measures Areas of Search Seagrass E3: Celtic Sea, Wales Marine Mammals 1.~~







Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E3: Celtic Sea, Wales
Marine Mammals

Compensation Measures Areas of Search
Seagrass

No data available for Risso's Dolphin density

Coordinate system: ETRS 1989 UTM Zone 31N

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Compensation Measures
Marine Mammals
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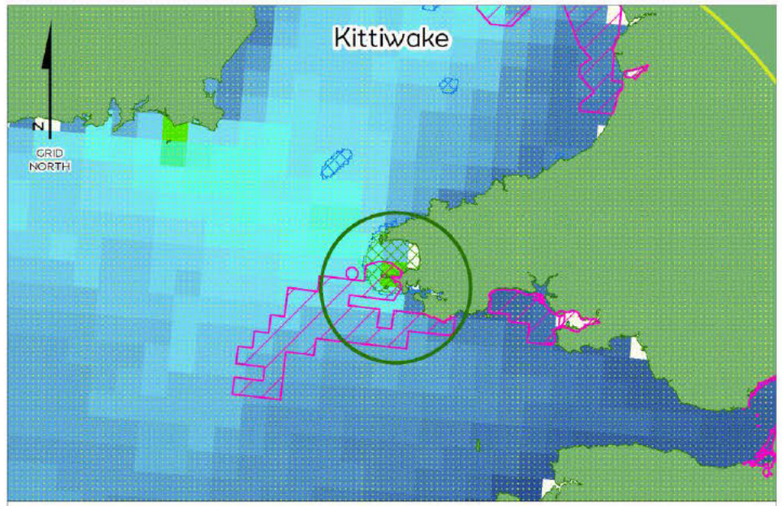
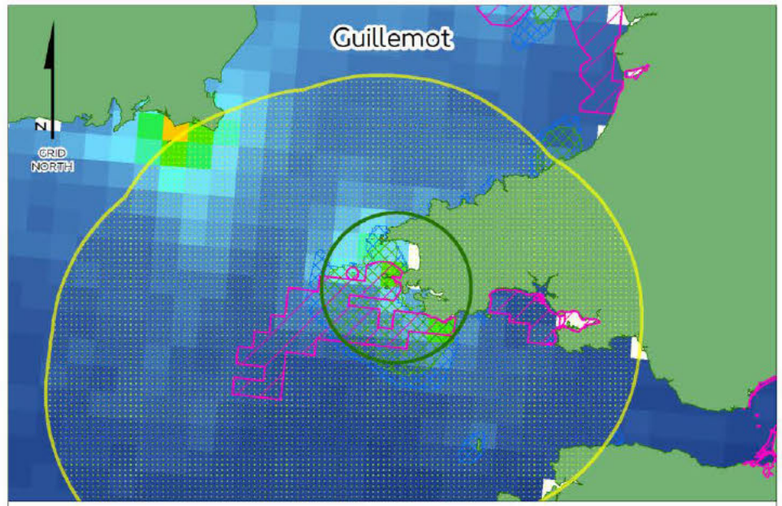
~~**Figure 51: Compensation Measures Areas of Search Seagrass E3: Celtic Sea, Wales Marine Mammals 2.**~~





Hornsea Four

Compensation Measures
Areas of Search
Seagrass
E3: Celtic Sea, Wales
Ornithology

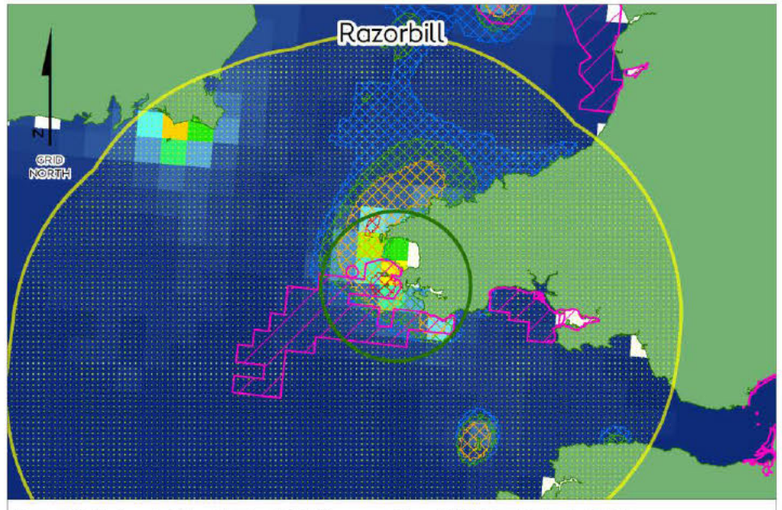
Special Protection Area (SPA) with Marine Components

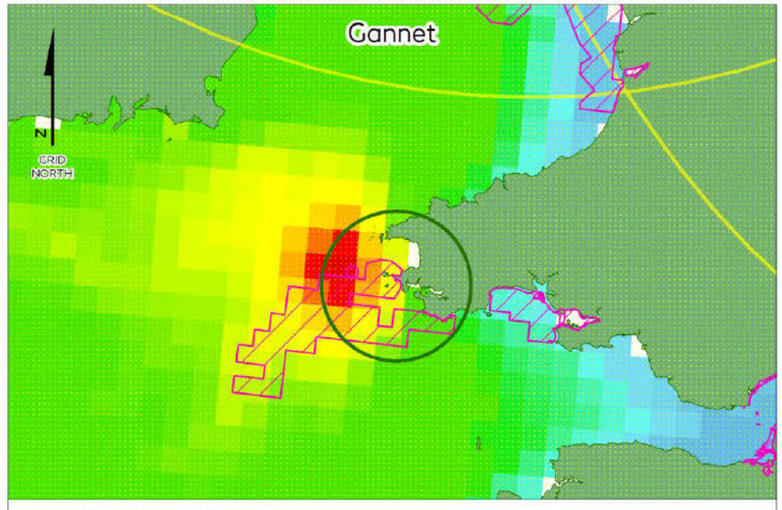
Mean-Max Foraging Range (Woodward 2019)

- Common Guillemot - 73.2km Buffer
- Gannet - 315.2km Buffer
- Kittiwake - 156.1km Buffer
- Razorbill - 88.7km Buffer

Compensation Measures Areas of Search

- Seagrass





Waggitt et al 2019 densities data. Spatial variation in predicted densities (animals per km) of seabird species in July in the North-East Atlantic. Values are provided at 10km resolution.

Coordinate system: ETRS 1989 UTM Zone 31N

0 50 100 Kilometres

0 25 50 Nautical Miles

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Date: 03/09/2021 Author: BenBlakeman Name: HOW04GB00324_CM_ES_Ornithology_E3

Compensation Measures
Ornithology
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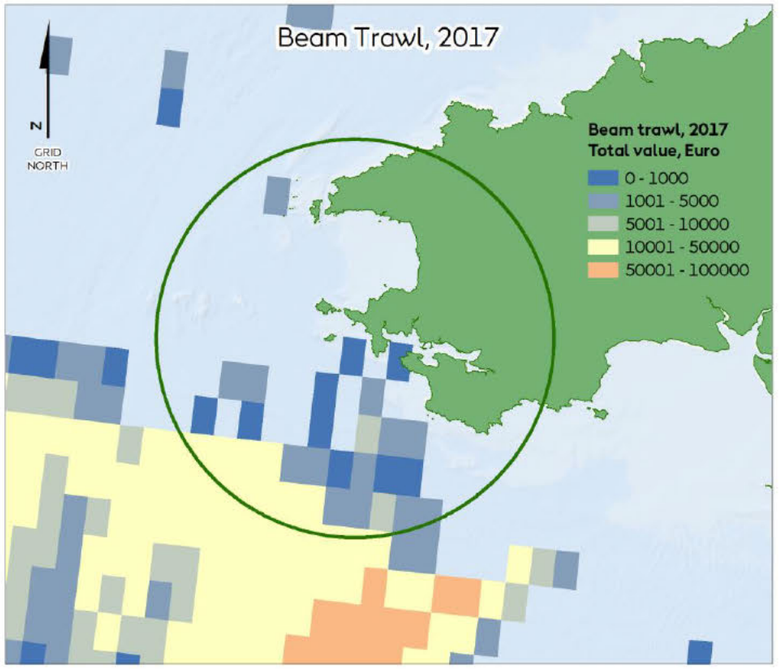
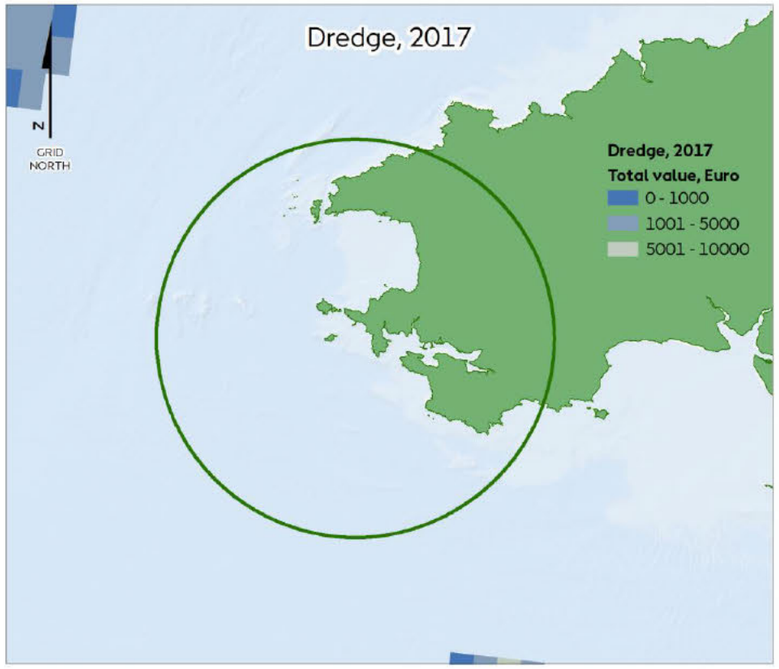
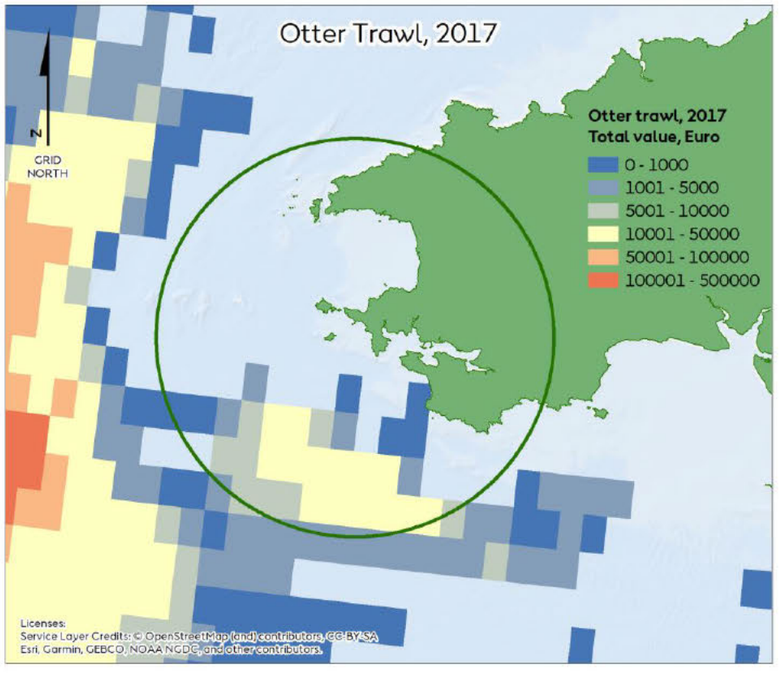
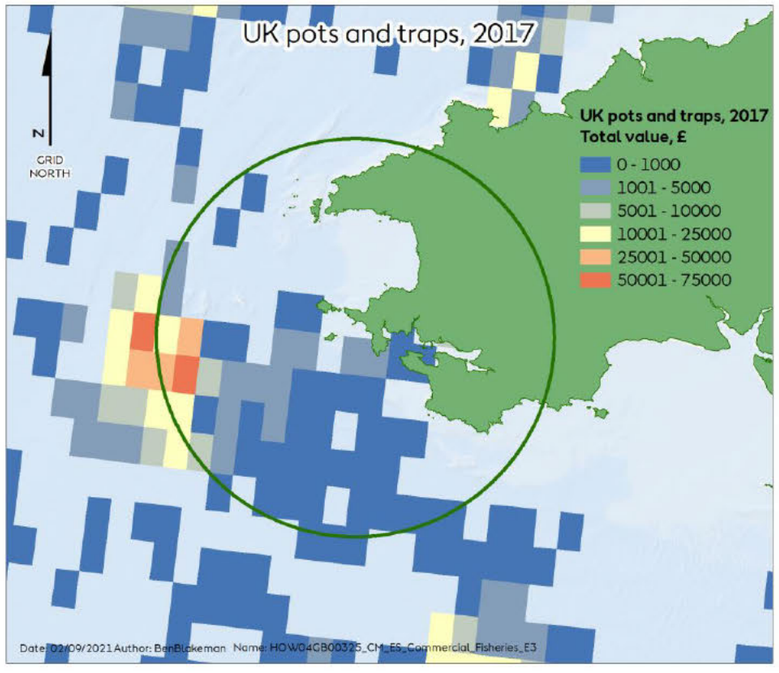
~~**Figure 52: Resilience Measures Areas of Search Seagrass E3: Celtic Sea, Wales Ornithology.**~~









Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E3: Celtic Sea, Wales
Commercial Fisheries

Compensation Measures Areas of Search
Seagrass

Coordinate system: ETRS 1989 UTM Zone 31N

0 20 40 Kilometres
0 10 20 Nautical Miles

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Compensation Measures
Commercial Fisheries
Document no: HOW04GB0325
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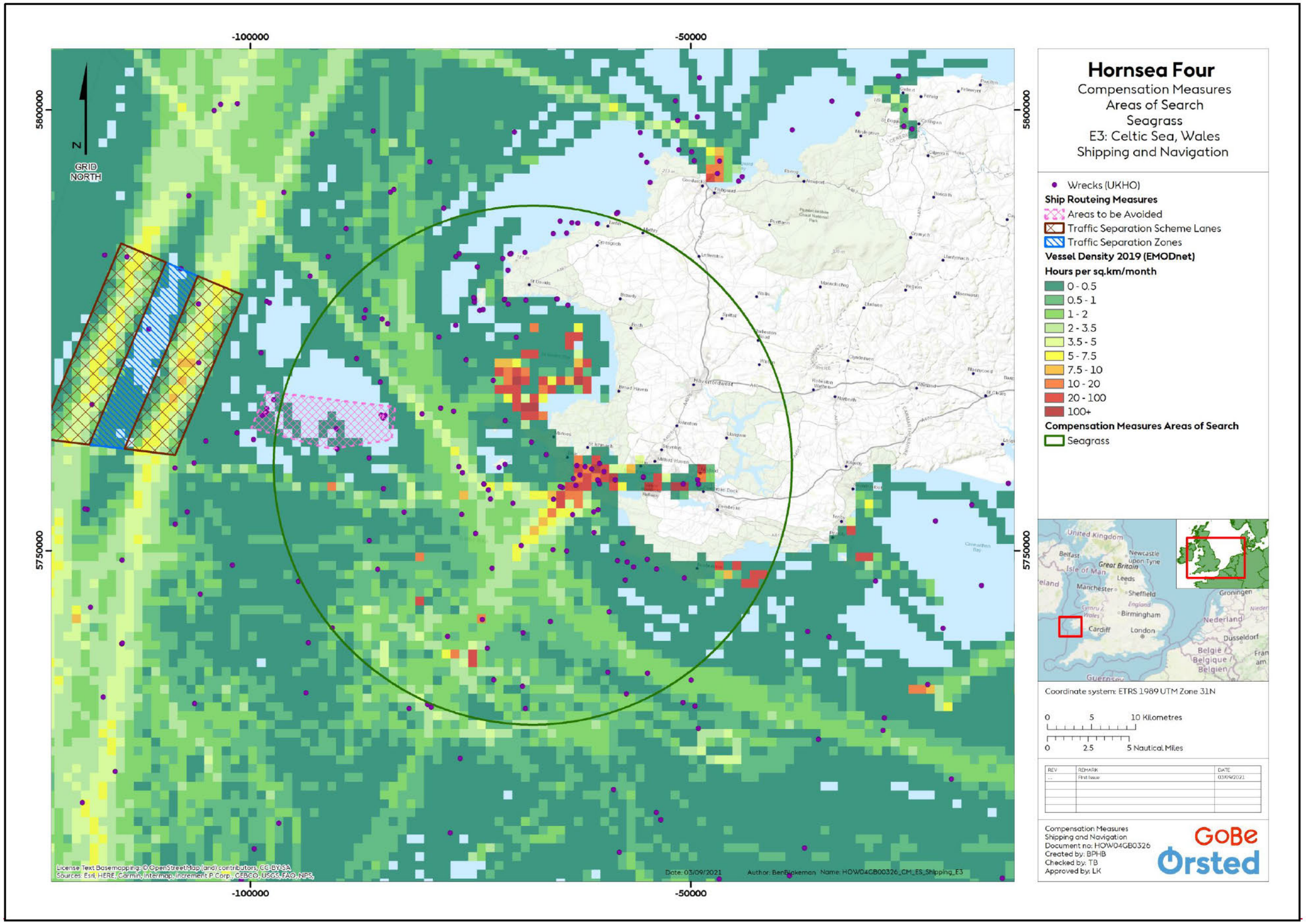
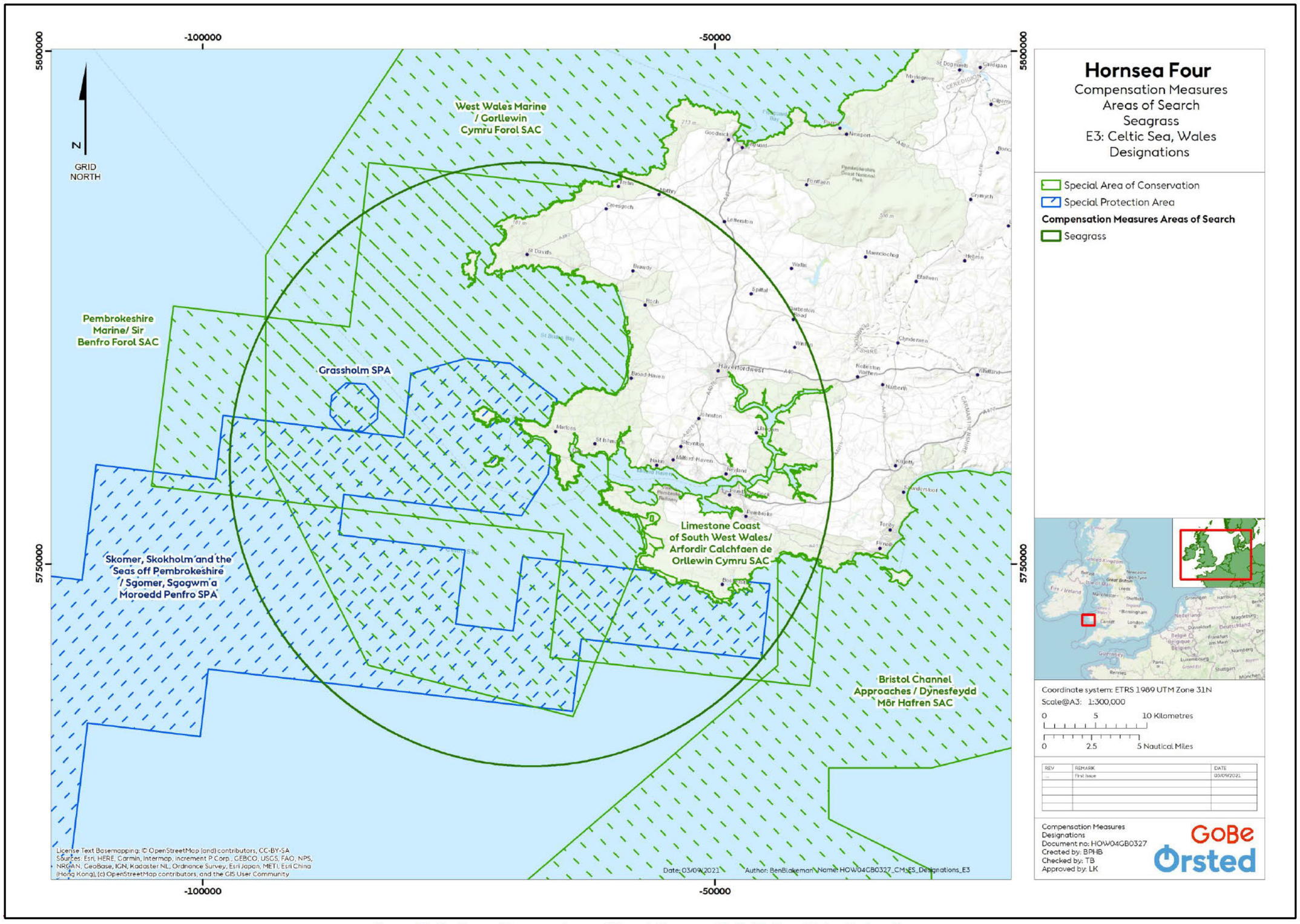
~~**Figure 53: Resilience Measures Areas of Search Seagrass E3: Celtic Sea, Wales Commercial Fisheries.**~~



~~Figure 54: Resilience Measures Areas of Search Seagrass E3: Celtic Sea, Wales Shipping and Navigation.~~

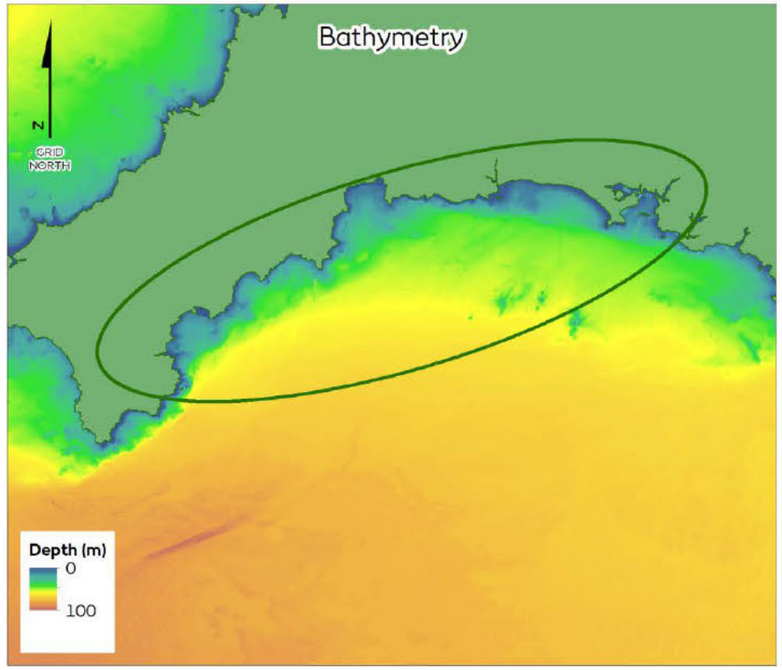


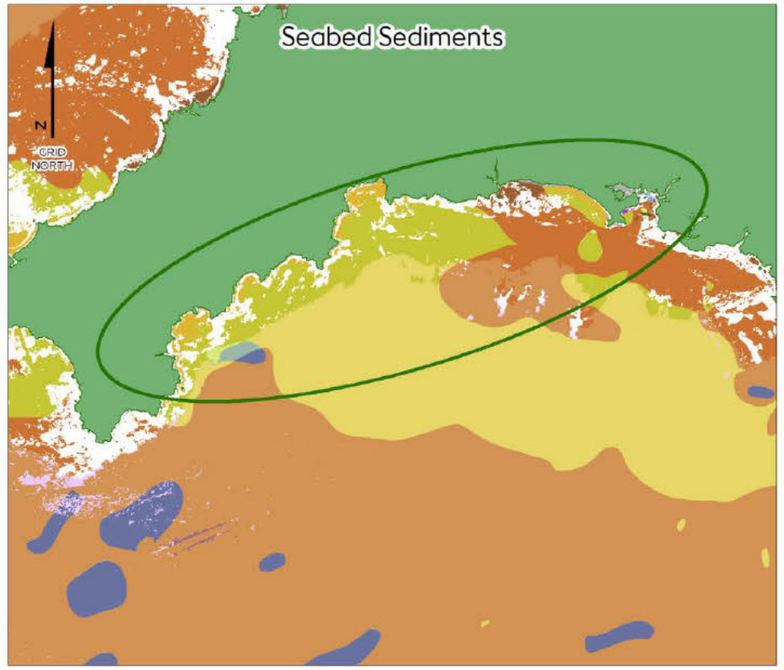
~~Figure 55: Resilience Measures Areas of Search Seagrass E3: Celtic Sea, Wales Designations.~~

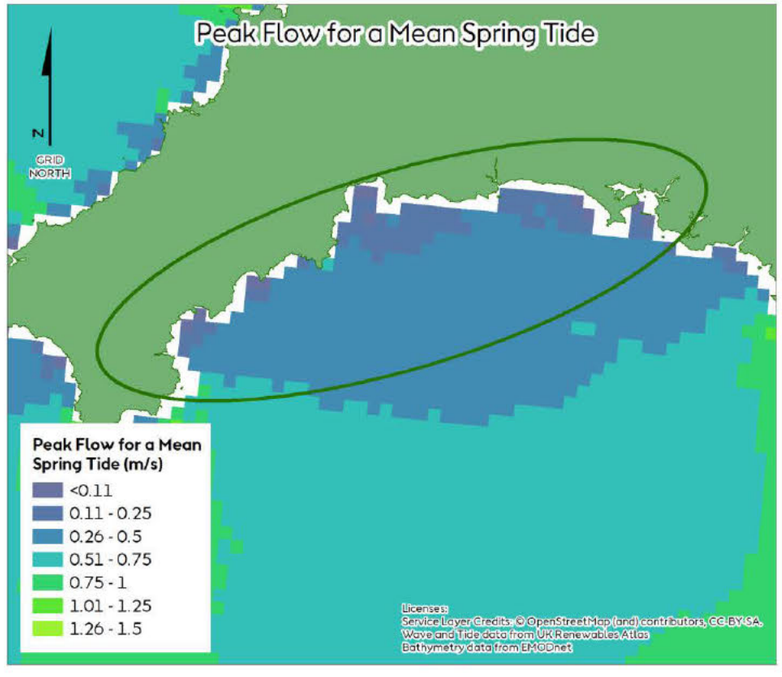
Table 15: Summary of baseline environment in relation to the Area of Search E4 (Plymouth Sound to Helford River) for resilience measure - fish habitat enhancement (seagrass).

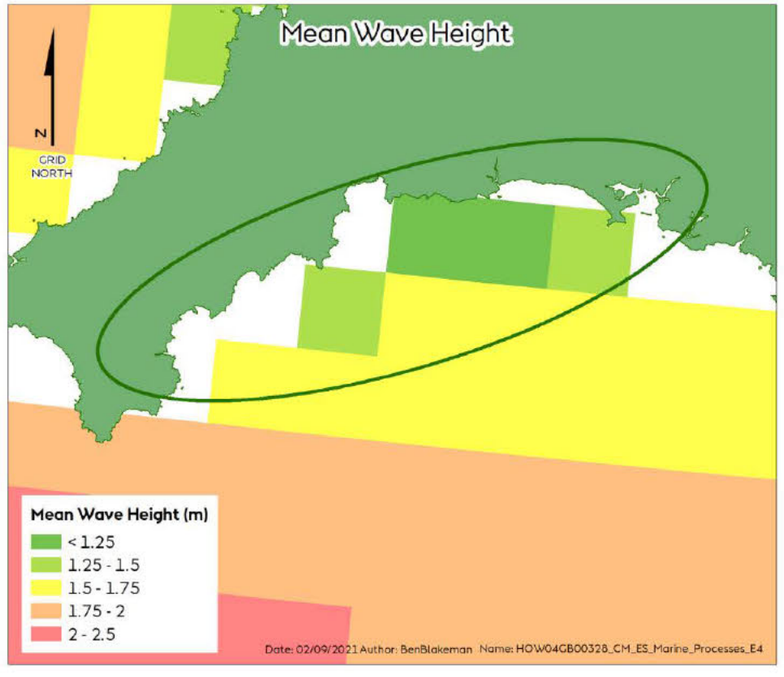
Topic	Summary of Baseline Environment
Marine Geology, Oceanography and Physical Processes	The baseline environment for physical processes is illustrated in Figure 56. • The AoS coastline is characterised by erosion resistant rock, absent of glacial deposits, with intermittent raised beaches and head deposits (Futurecoast, 2002). Seabed sediments are typically composed of sands and gravels, with localised areas of bedrock (Futurecoast, 2002). • The AoS is shallow towards the coast, becoming deeper in the south. • Seabed sediments are comprised of mixed coarse and sandy sediments. • Peak spring tidal currents are of the order of 0.26 to 0.5 m/s, with flows exceeding 1.0 m/s in localised areas, for example around headlands (Royal Haskoning, 2011; ABPmer et al., 2011). The mean spring tidal range for the AoS is between 4.01 and 5.00 m (ABPmer et al., 2011). Exposed to waves originating from the North Atlantic and English Channel, the wave regime is dominated by swell waves with a contribution also made by wind waves (DECC, 2016b; Halcrow, 2010; Royal Haskoning, 2011.
Benthic and Intertidal Ecology	The baseline environment for benthic ecology is illustrated in Figure 57. • Given the size of the AoS, a large species diversity is present and the abundances vary. Within the Helford Estuary, the lower shores show a high abundance of crustaceans, molluscs, sponges and sea squirts while the upper shores are dominated by limpets, barnacles and many common rockpool species. • The benthic environment in this region is characterised by a wide range of habitat types with deep circalittoral sand, circalittoral fine sand or circalittoral muddy sand, circalittoral coarse sediment, and deep circalittoral coarse sediment being the most common throughout the AoS (EMODnet, 2021). • Seabed habitats in the AoS are mainly sands and mixed sediments, with some outcrops of rock and biogenic reef. • Numerous designated sites are present within the AoS, including the Plymouth Sound and Estuaries SAC.
Fish and Shellfish Ecology	The baseline environment for fish and shellfish ecology is illustrated in Figure 58. • The AoS overlaps with spawning and nursery grounds for species including cod, whiting, mackerel, cod, plaice, sole and sandeel (high intensity). • The AoS also includes a herring spawning ground.
Marine Mammals	The baseline environment for marine mammals is illustrated in Figure 59 (for the species where data are available). • The two identified cetacean species known to regularly occur in this AoS are harbour porpoise (*Phocoena phocoena*) and minke whale (*Balaenoptera acutorostrata*). Additionally there are many sightings of unidentified cetacean species which could potentially be common dolphin (*Delphinus delphis*) or striped dolphin (*Stenella coeruleoalba*) (Hammond et al. 2017). • There is one noted grey seal haul out within the Southern England area, on the Eastern side of Start Bay/ the South Hams (SCOS, 2020).
Offshore and Intertidal Ornithology	The baseline environment for offshore ornithology is illustrated in Figure 60. • Within the AoS there are two SPAs with offshore ornithology designated features, the Tamar Estuaries Complex SPA and the Falmouth Bay to St Austell Bay SPA. The Tamar Estuaries Complex SPA is designated for little egret (*Egretta garzetta*) and avocet (*Recurvirostra avosetta*) (JNCC, 2015e). The Falmouth Bay to St Austell Bay SPA is designated for black-throated loon (*Gavia arctica*), common loon (*Gavia immer*), and the horned grebe (*Podiceps auratus*) (JNCC, 2017a).

Topic	Summary of Baseline Environment
Commercial Fisheries	The baseline environment for commercial fisheries is illustrated in Figure 61. • Across the South Coast of England (region including the AoS), the Apparent Fishing Effort ranges from 0 to >1,000 hours/ 120 km^2 (Global Fishing Watch, 2021). This area contains spawning and nursery grounds for the following commercial species: Cod (*Gadus*), Whiting (*Merlangius merlangus*), Plaice (*Pleuronectes platessa*), Lemon Sole (*Microstomus kitt*), Sole (*Solea solea*) and Sandeel (*Ammodytes tobianus*). • This region also contains spawning grounds for Herring (*Clupea harengus*) and nursery areas for Mackerel (*Scomber*) (Cefas, 2021). • Fishing activity is focused on dradging and otter trawling. Potting ind trapping also occurs coastally.
Shipping and Navigation	The baseline environment for shipping and navigation is illustrated in Figure 62. • The vessel density in the AoS varies from 1 to >222,000 route(s)/0.15 km^2/ year. • The majority of vessels occur within Plymouth Sound and the Fal Estuary. Additionally there are a comparatively high number of vessels within the Fowey Estuary. Between the two ends of the AoS there are several small lanes for vessel traffic, ranging at around 5 routes/ 0.15 km^2/ year (Marine Traffic, 2021).
Marine Archaeology	The baseline environment for marine archaeology is illustrated in Figure 62. • Within the AoS, there are many different types of archaeological features including both ship and aircraft wrecks.









Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E4: Plymouth Sound to
Helford River, Cornwall
Marine Processes

Compensation Measures Areas of Search
Seagrass

EUNIS Habitats (UKSeaMap 2018)
- A4.12: Sponge communities on deep circalittoral rock
- A4.27: Faunal communities on deep moderate energy circalittoral rock
- A4.33: Faunal communities on deep low energy circalittoral rock
- A5.13: Infralittoral coarse sediment
- A5.14: Circalittoral coarse sediment
- A5.15: Deep circalittoral coarse sediment
- A5.23 or A5.24: Infralittoral fine sand or infralittoral muddy sand
- A5.25 or A5.26: Circalittoral fine sand or circalittoral muddy sand
- A5.27: Deep circalittoral sand
- A5.33: Infralittoral sandy mud
- A5.35: Circalittoral sandy mud
- A5.37: Deep circalittoral mud
- A5.43: Infralittoral mixed sediments
- A5.44: Circalittoral mixed sediments
- A5.45: Deep circalittoral mixed sediments
- No EUNIS habitat assigned

Coordinate system: ETRS 1989 UTM Zone 31N

0 20 40 Kilometres
0 10 20 Nautical Miles

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Compensation Measures
Marine Processes
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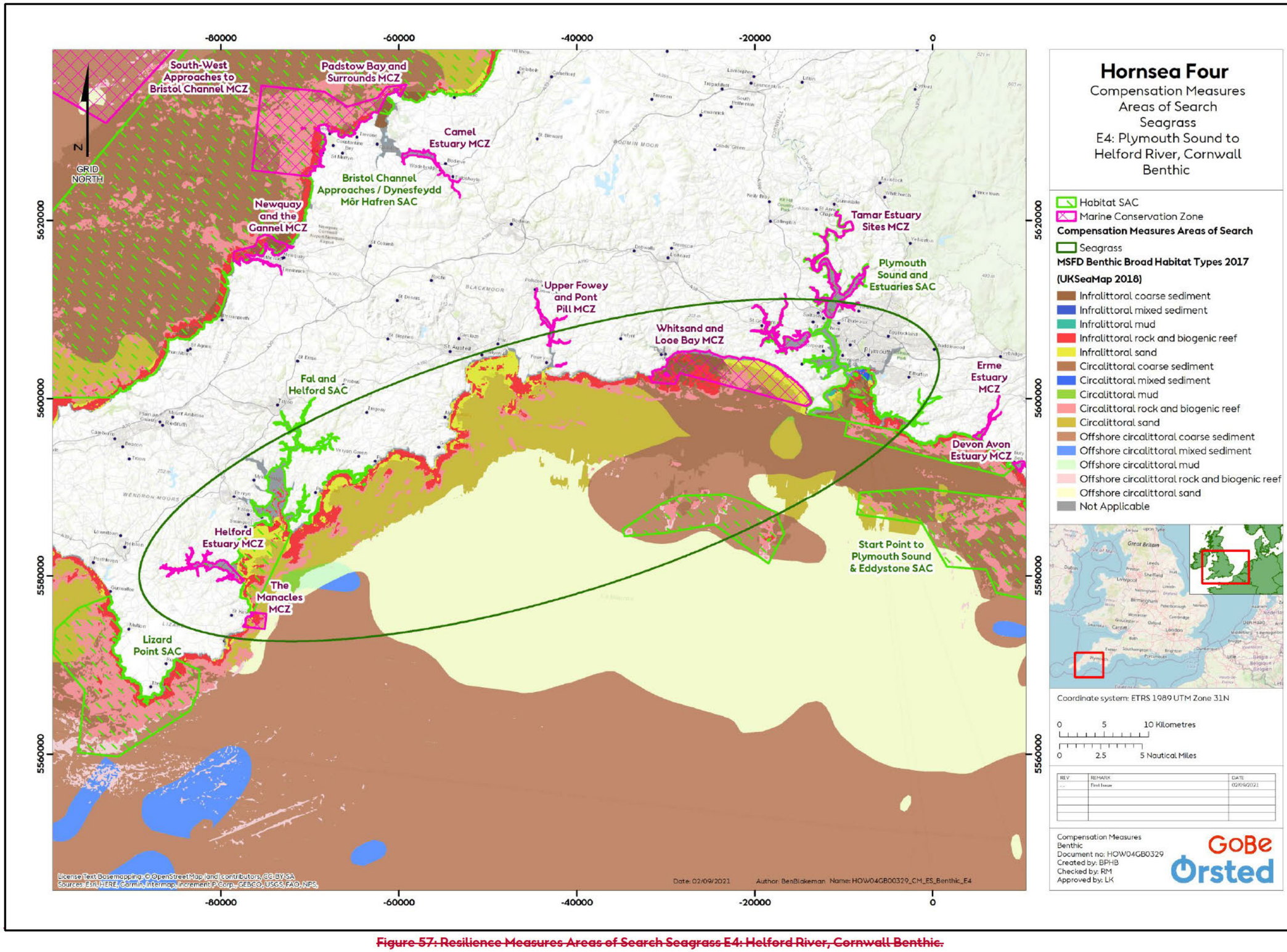
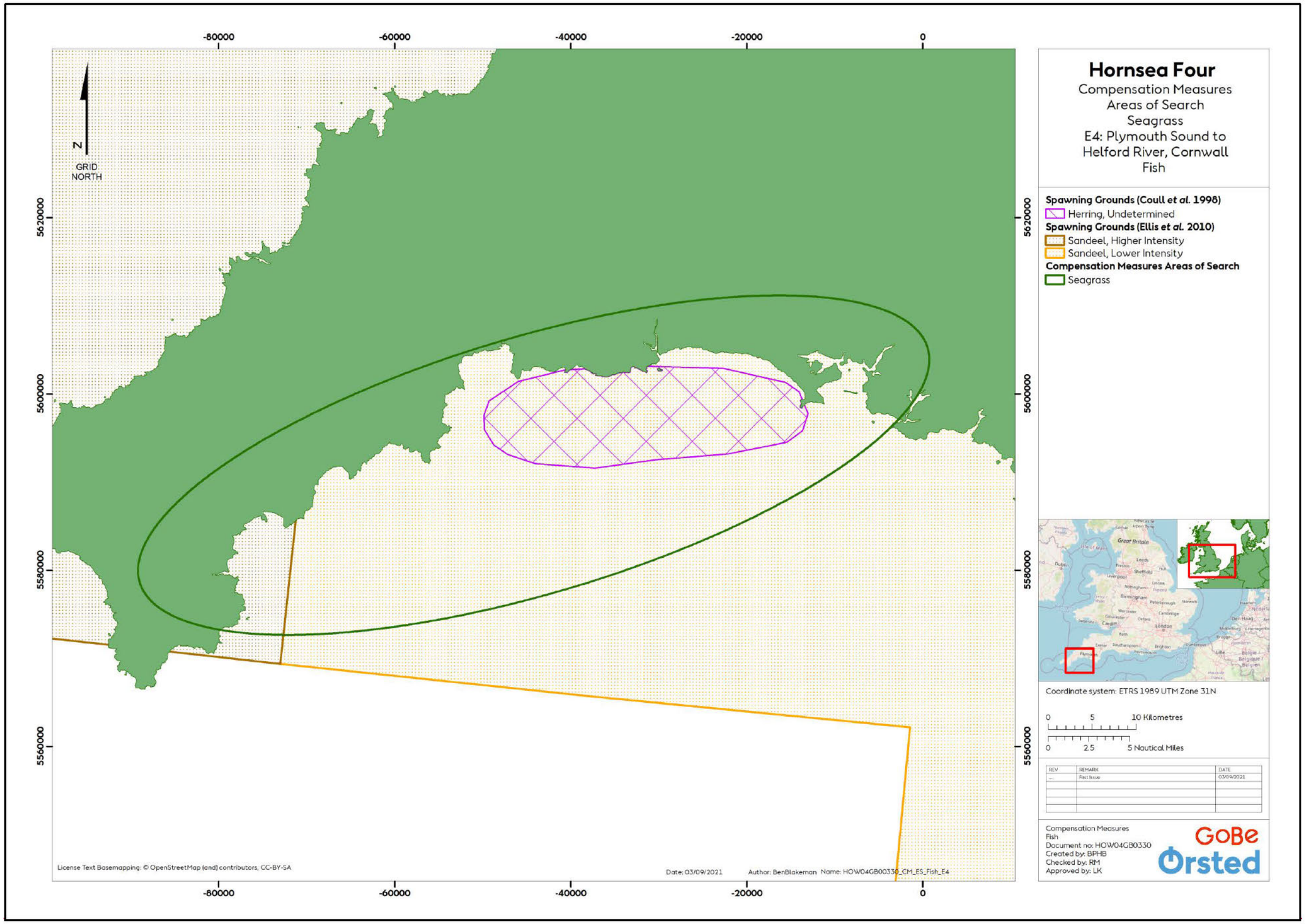
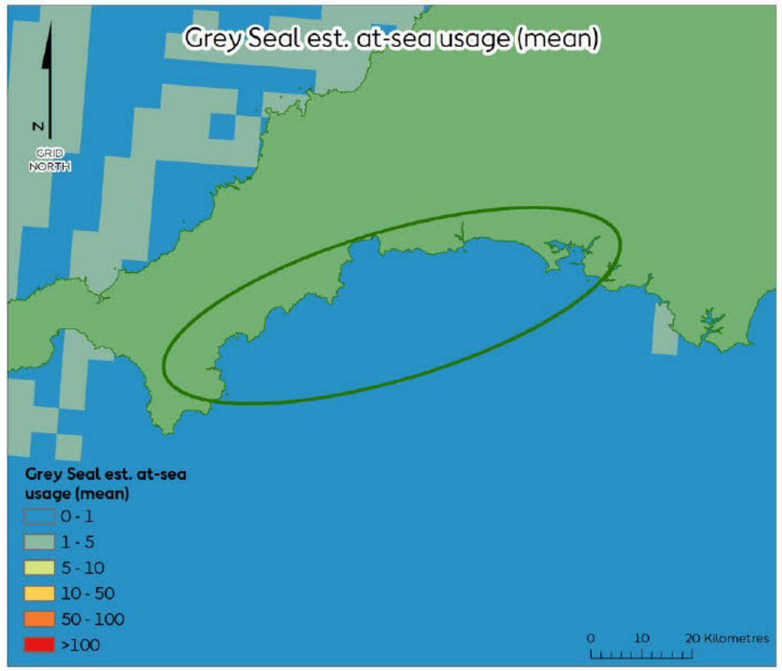
~~**Figure 56: Resilience Measures Areas of Search Seagrass E4: Helford River, Cornwall Marine Processes.**~~

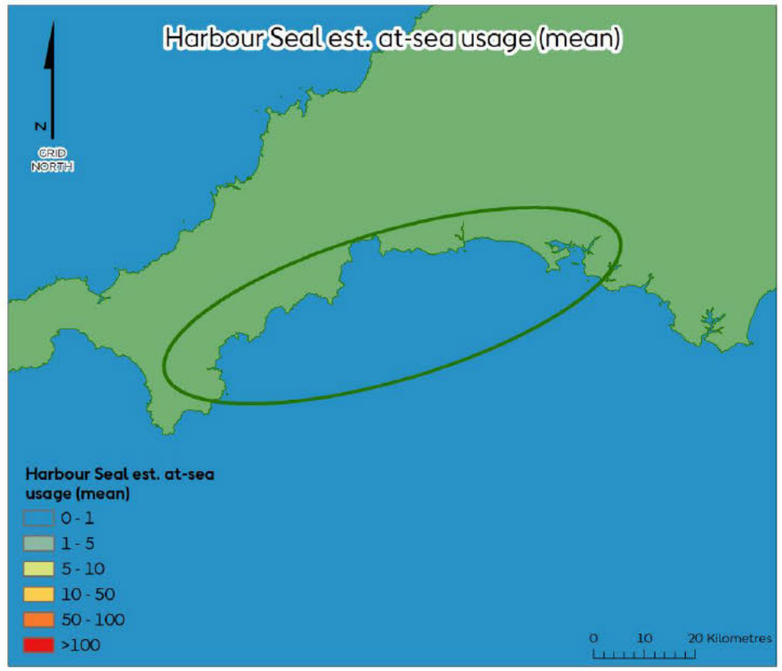


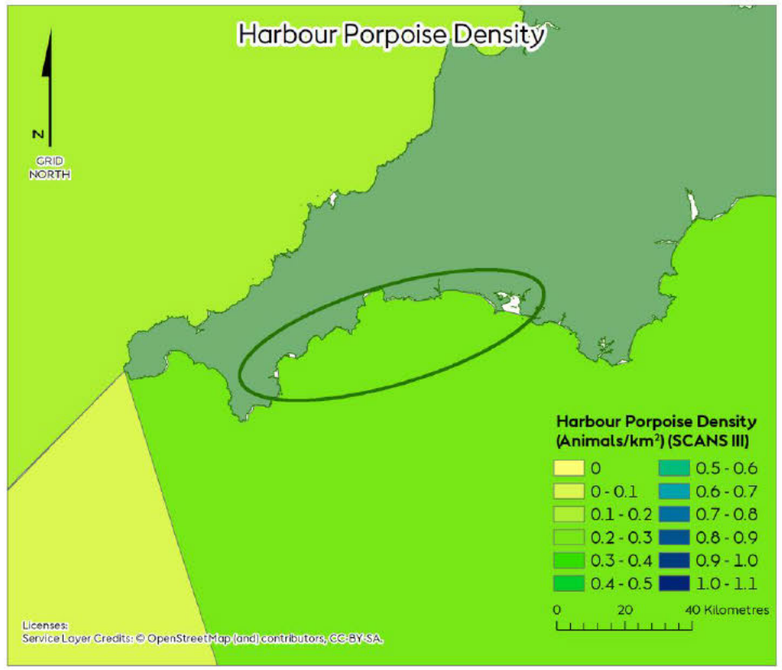
~~Figure 57: Resilience Measures Areas of Search Seagrass E4: Helford River, Cornwall Benthic.~~

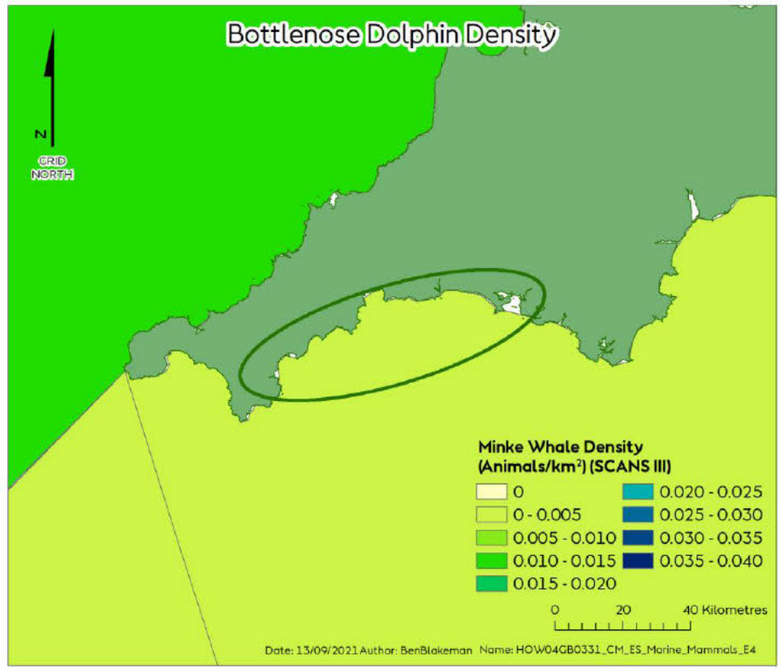


~~Figure 58: Resilience Measures Areas of Search Seagrass E4: Helford River, Cornwall Fish.~~









Hornsea Four

Compensation Measures
Areas of Search
Seagrass
E4: Plymouth Sound to Helford River, Cornwall
Marine Mammals

Compensation Measures Areas of Search

Seagrass

Estimated at-sea Distribution of Grey and Harbour Seals maps data from Sea Mammal Research Unit (SMRU) and Marine Scotland, 2017

Coordinate system: ETRS 1989 UTM Zone 31N

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--	First issue	13/09/2021

Compensation Measures
Marine Mammals
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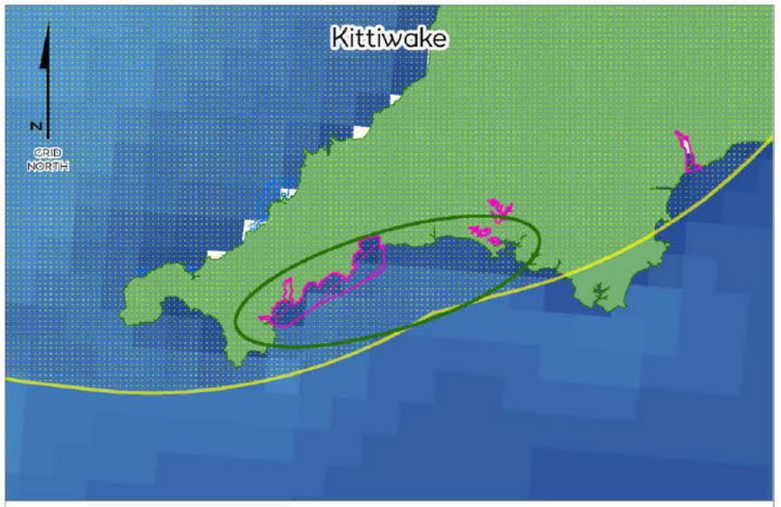
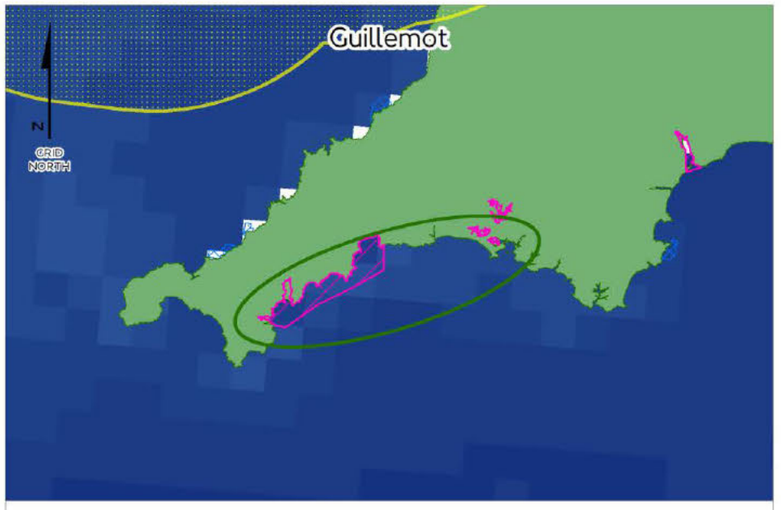
~~Figure 59: Resilience Measures Areas of Search Seagrass E4: Helford River, Cornwall Marine Mammals.~~



Kittiwake Hotspots (Cleasby et al, 2020)
- Maximum Curvature
- Statistically Significant Getis-Ord hotspot
- Top 5% Getis-Ord hotspot
- Top 1% Getis-Ord hotspot

Hotspots identified at the UK-scale for Black-legged Kittiwakes using Getis-Ord hotspot analysis with a neighbourhood size of d = 10 km based on FPT analysis or Maximum Curvature. Getis-Ord hotspots defined as all cells with the top 1% of calculated Gi* scores; all cells within the top 5% of Gi* score; all cells in which Gi* scores were deemed statistically significant at the <0.01 level.

Kittiwake (Waggit et al., 2019)
Density
High : 2.07
Low : 0



Guillemot Hotspots (Cleasby et al, 2020)
- Maximum Curvature
- Statistically Significant Getis-Ord hotspot - d = 9km
- Top 5% Getis-Ord hotspot - d = 9km
- Top 1% Getis-Ord hotspot - d = 9km

Guillemot (Waggit et al., 2019)
Density
High : 6.25
Low : 0

Hotspots identified at the UK-scale for Common Guillemots using Getis-Ord hotspot analysis with a neighbourhood size of d = 9 km based on FPT analysis or Maximum Curvature.

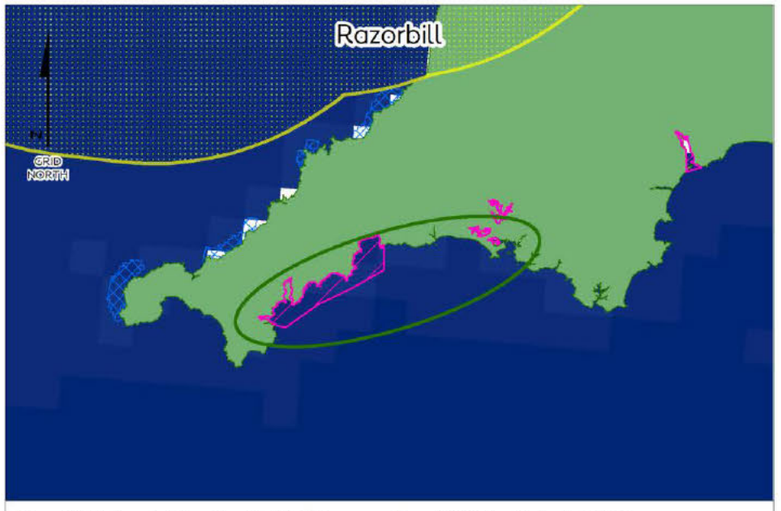
Hornsea Four

Compensation Measures
Areas of Search
Seagrass
E4: Plymouth Sound to Helford River, Cornwall
Ornithology

- Special Protection Area (SPA) with Marine Components

Mean-Max Foraging Range (Woodward 2019)
- Common Guillemot - 73.2km Buffer
- Gannet - 315.2km Buffer
- Kittiwake - 156.1km Buffer
- Razorbill - 88.7km Buffer

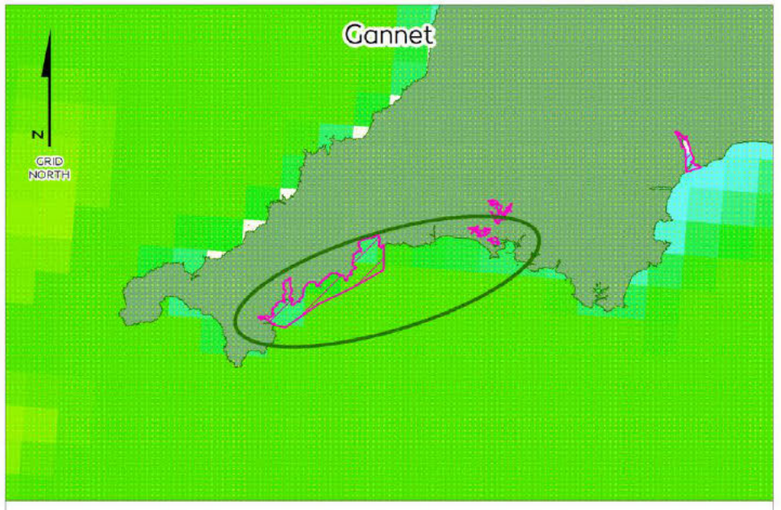
Compensation Measures Areas of Search
- Seagrass



Razorbill Hotspots (Cleasby et al, 2020)
- Maximum Curvature Statistically Significant Getis-Ord hotspot - d = 7km
- Top 5% Getis-Ord hotspot - d = 7km
- Top 1% Getis-Ord hotspot - d = 7km

Razorbill (Waggit et al., 2019)
Density
High : 3
Low : 0

Hotspots identified at the UK-scale for Razorbills using Getis-Ord hotspot analysis with a neighbourhood size of d = 7 km based on FPT analysis or Maximum Curvature.



Gannet (Waggit et al., 2019)
Density
High : 1.65
Low : 0

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Date: 03/09/2021 Author: BenBlakeman Name: HOW04GB00332_CM_ES_Ornithology_E4

Waggitt et al 2019 densities data. Spatial variation in predicted densities (animals per km) of seabird species in July in the North-East Atlantic. Values are provided at 10km resolution.

Coordinate system: ETRS 1989 UTM Zone 31N

0 25 50 Kilometres
0 10 20 Nautical Miles

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Compensation Measures
Ornithology
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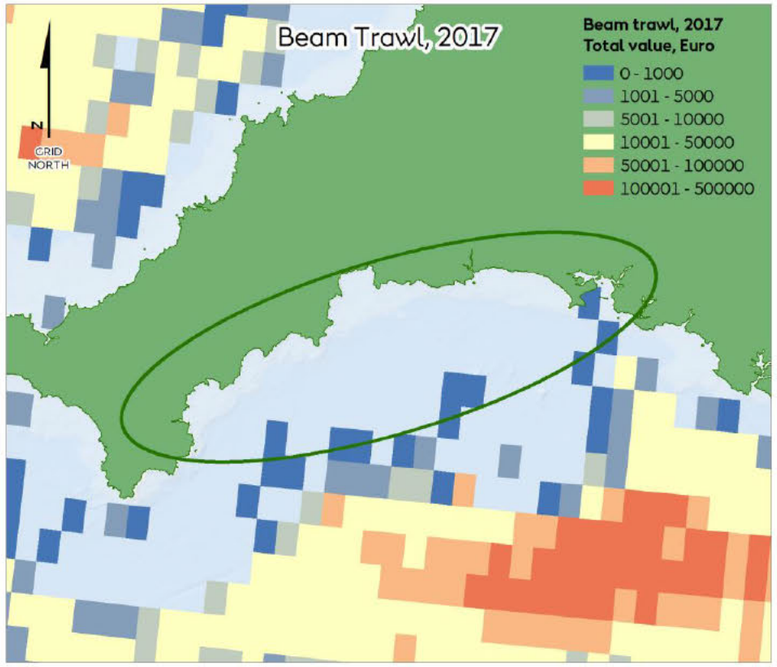
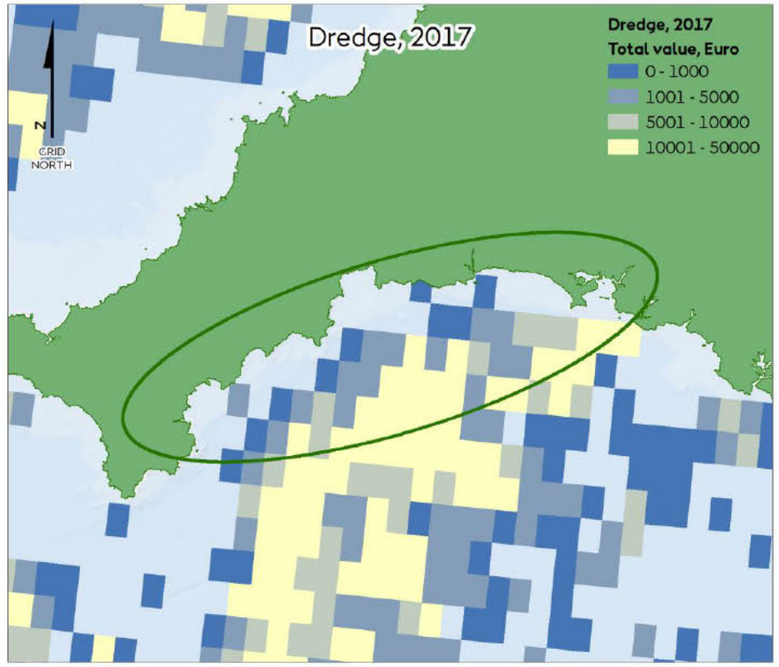
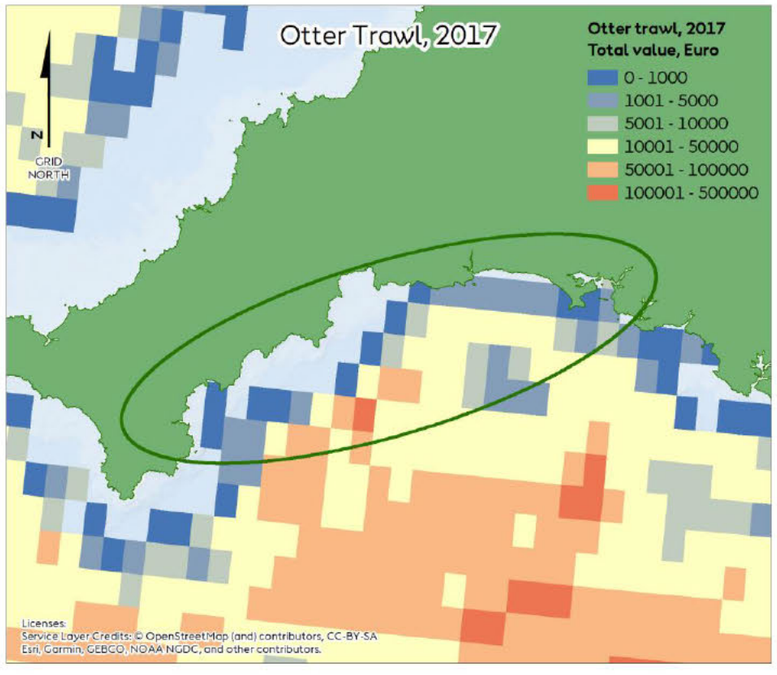
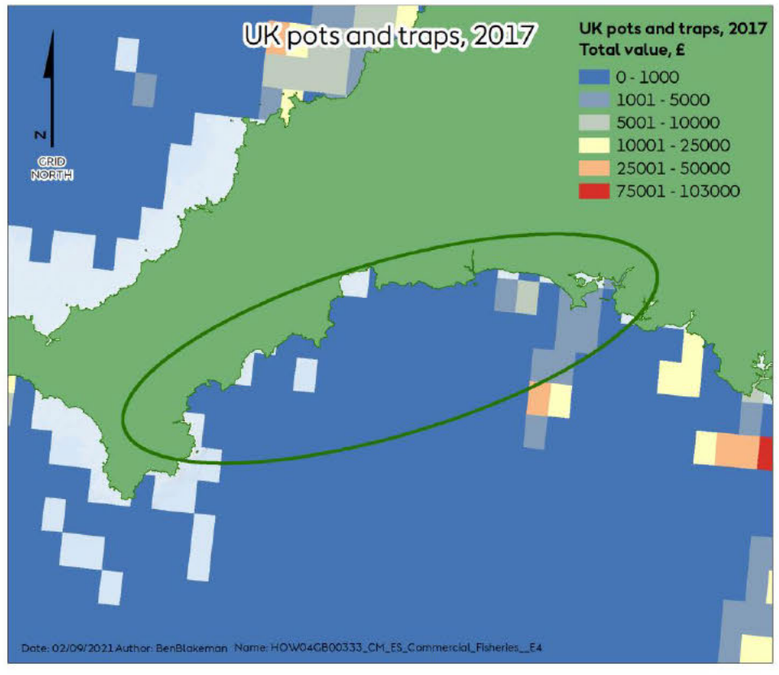
~~**Figure 60: Resilience Measures Areas of Search Seagrass E4: Helford River, Cornwall Ornithology.**~~



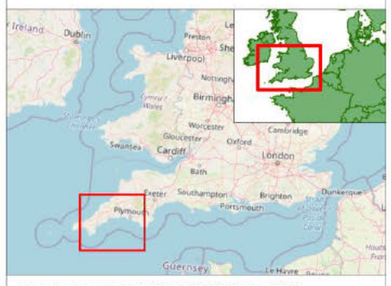






Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E4: Plymouth Sound to
Helford River, Cornwall
Commercial Fisheries

Compensation Measures Areas of Search
Seagrass



Coordinate system: ETRS 1989 UTM Zone 31N

0 20 40 Kilometres
0 10 20 Nautical Miles

REV	REMARK	DATE
--	First Issue	02/09/2021

Compensation Measures
Commercial Fisheries
Document no: HOW04GB0333
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Checked by: TB
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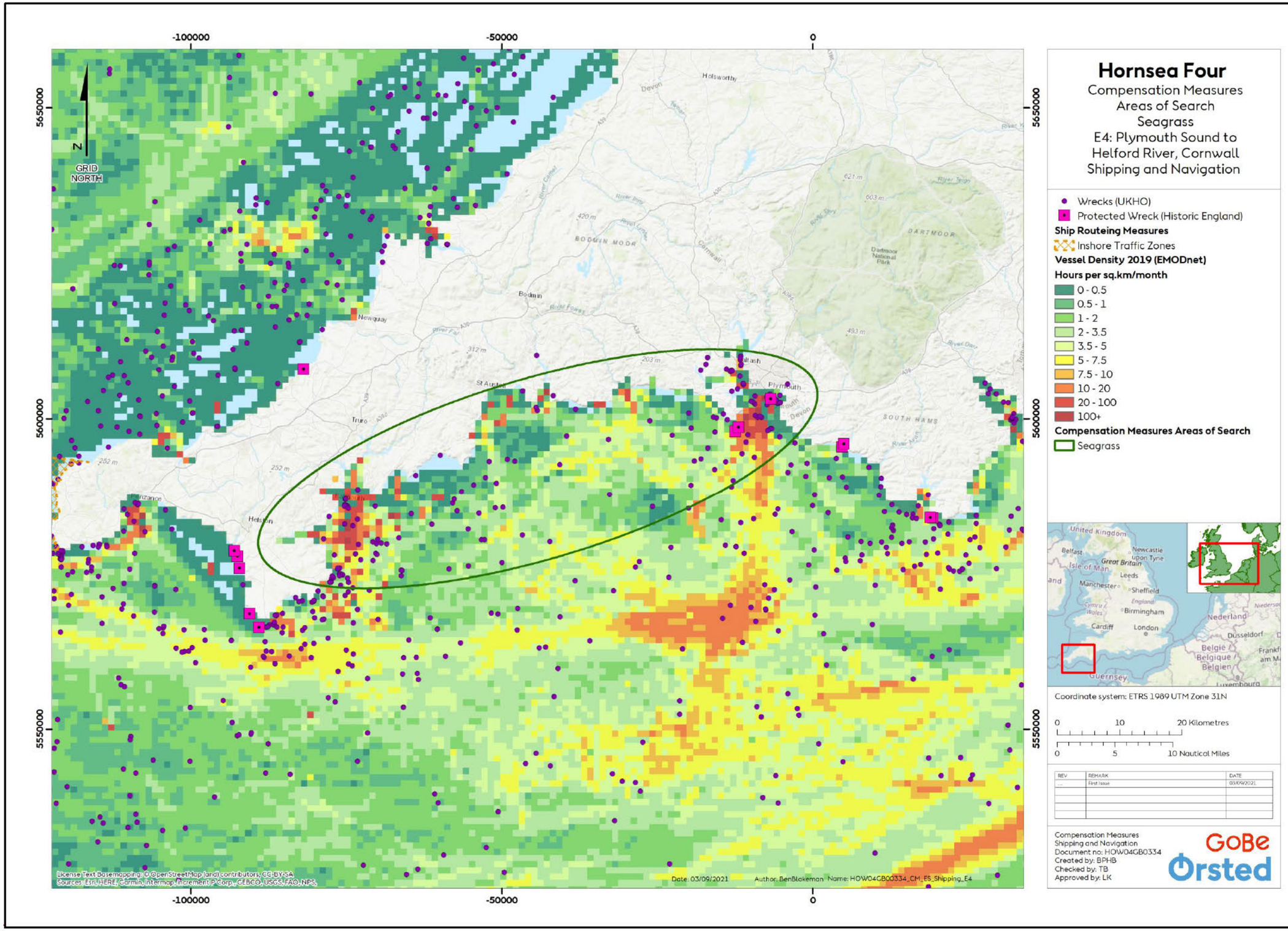
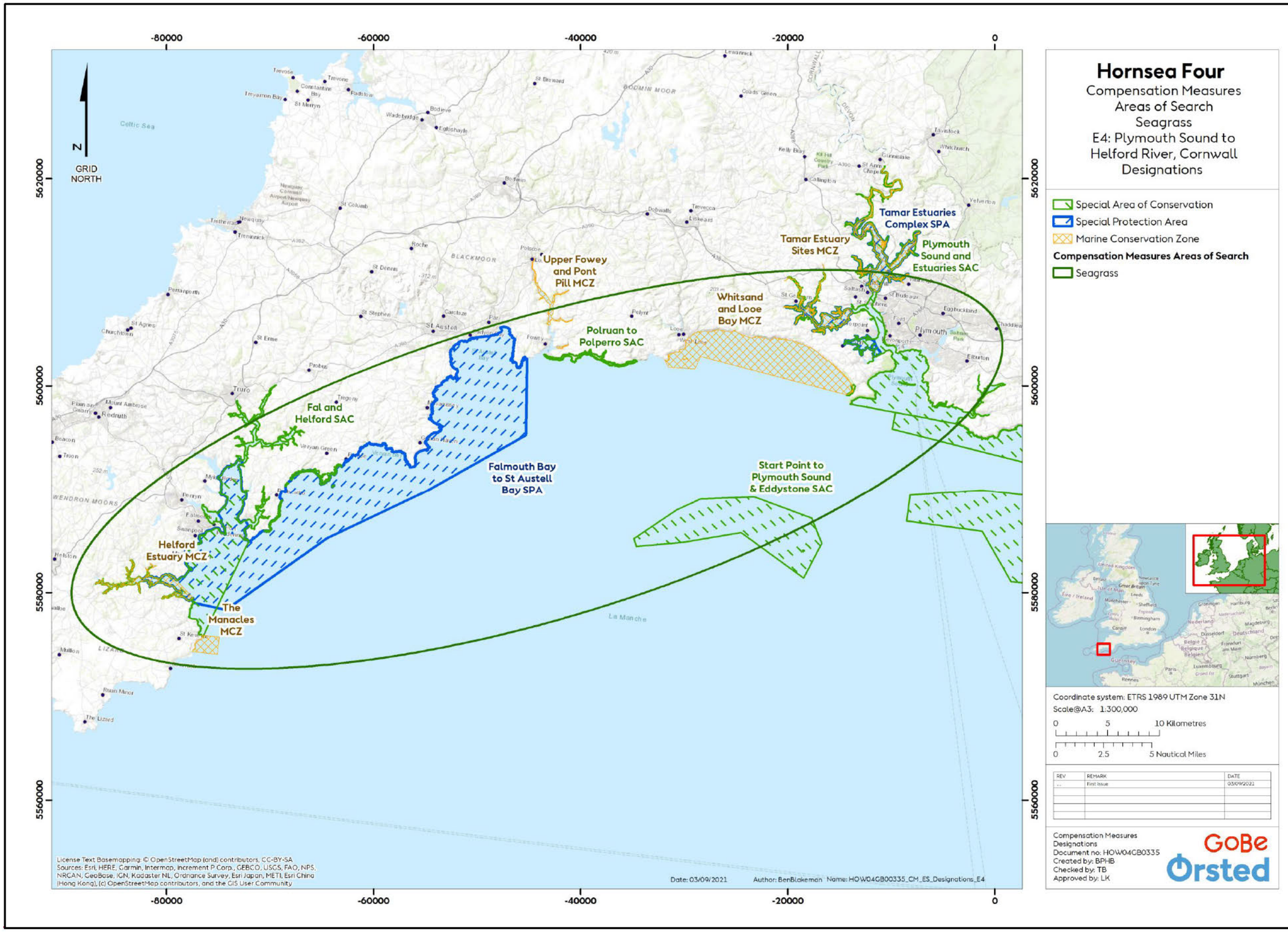
~~**Figure 61: Resilience Measures Areas of Search Seagrass E4: Helford River, Cornwall Commercial Fisheries.**~~



~~Figure 62: Resilience Measures Areas of Search Seagrass E4: Helford River, Cornwall Shipping and Navigation.~~

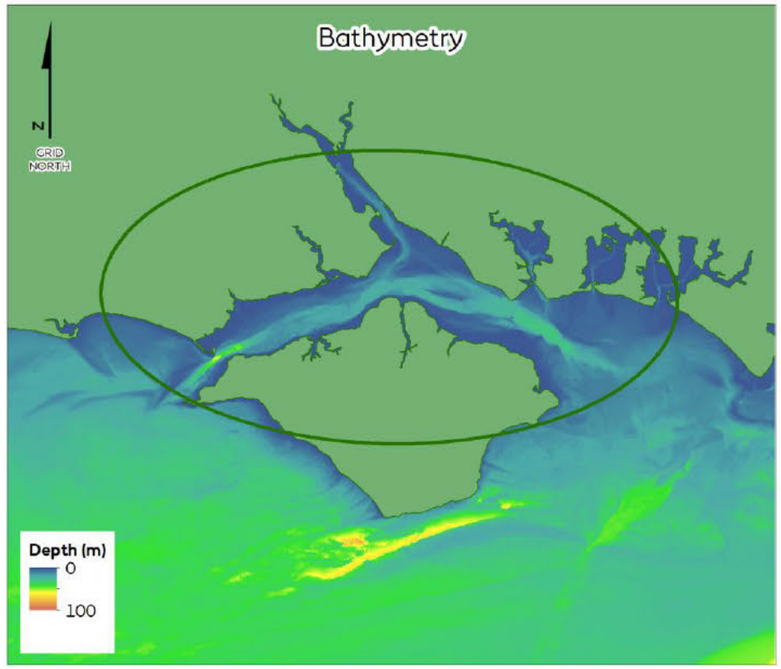


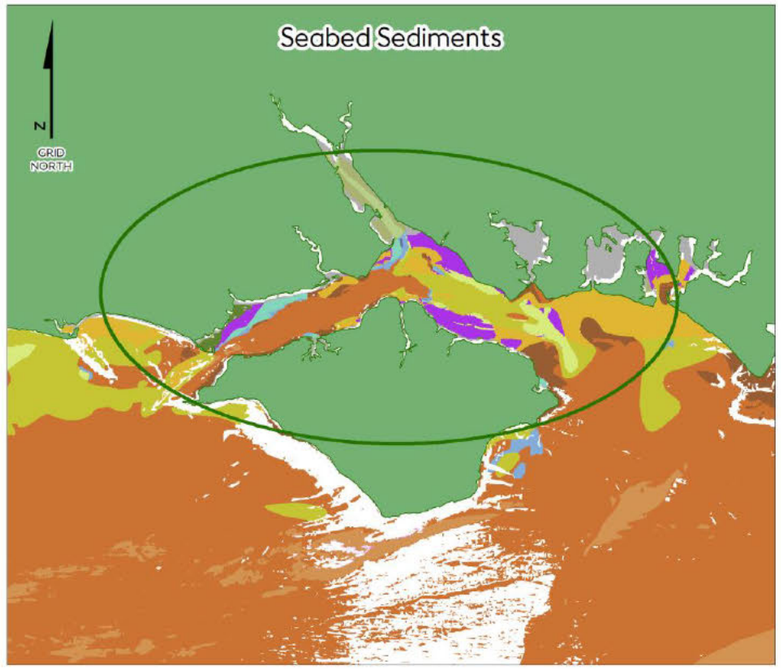
~~Figure 63: Resilience Measures Areas of Search Seagrass E4: Helford River, Cornwall Designations.~~

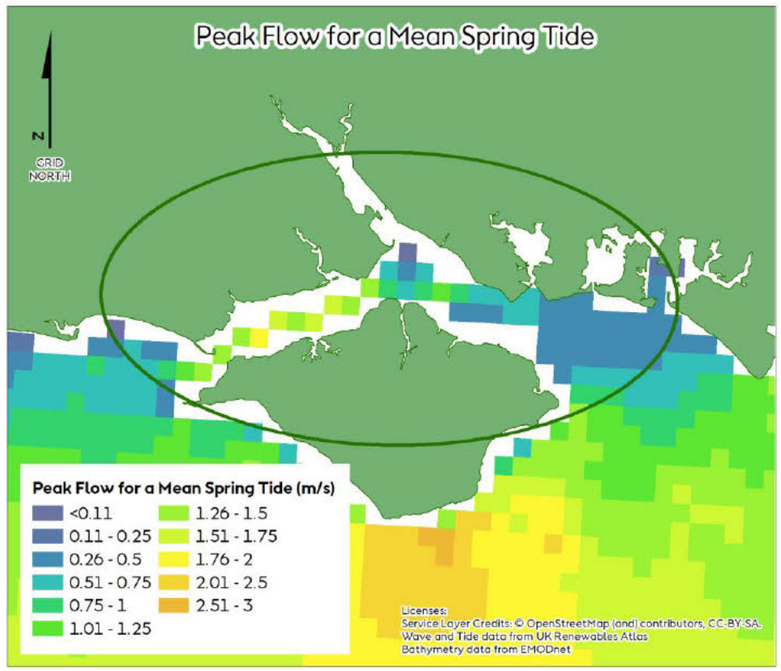
Table 16: Summary of baseline environment in relation to the Area of Search E5 (The Solent) for resilience measure - fish habitat enhancement (seagrass).

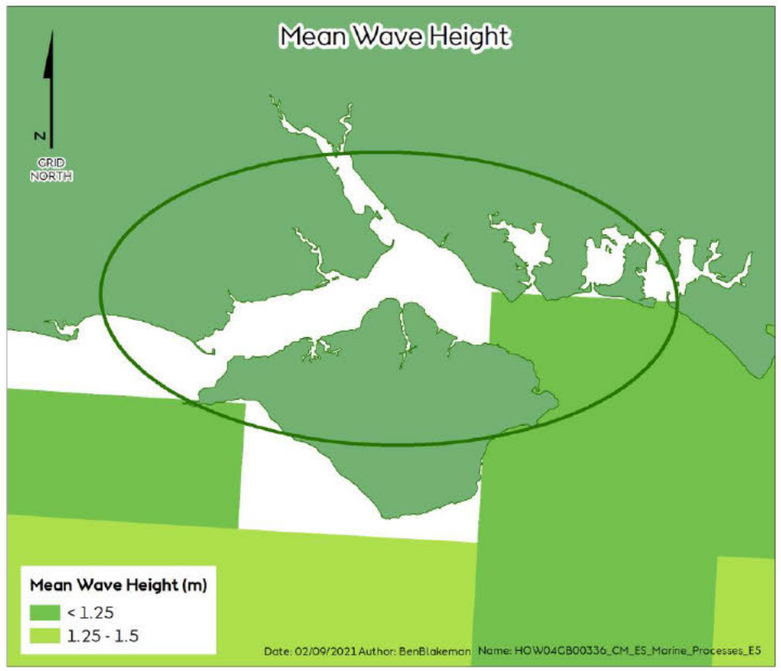
Topic	Summary of Baseline Environment
Marine Geology, Oceanography and Physical Processes	The baseline environment for physical processes is illustrated in Figure 64. • Seabed sediments vary within the AoS between coarse, mixed and sandy sediments with patches of mud and muddy sand. • The flood tide within Southampton Water can last for up to 7.5 hours on a spring tide. High water then lasts for about 2 hours, followed by the ebb, which can be as short as 2.5 hours. Within Southampton Water the tidal excursion is strongly ebb dominant but reduces in magnitude towards the head of the estuary.
Benthic and Intertidal Ecology	The baseline environment for benthic ecology is illustrated in Figure 65. • The subtidal habitat of the Solent is mainly composed of sands and gravels, which is a UK BAP priority habitat. The diversity of flora and fauna living in this habitat varies according to the level of environmental stress to which they are exposed. Sandier sediments are mainly found in the central Solent, which are typically colonised by burrowing worms, crustaceans, bivalve molluscs and echinoderms. • Beds consisting of Zostera marina have been found in patches on the western Solent shore at Calshot Spit and Stanswood Bay (Hampshire Biodiversity Partnership, 2003), as well as in the entrance to the Medina and to the east, along the north coast of the Isle of Wight (ABPmer, 2015). The benthic environment in this region is characterised by a wide range of habitat types with deep circalittoral sand, circalittoral fine sand or circalittoral muddy sand, circalittoral coarse sediment, and deep circalittoral coarse sediment being the most common throughout the AoS (EMODnet, 2021). • The invertebrate diversity is believed to be low across Southampton Water and the Solent. The Thorn Channel area is the most diverse, with a mean Shannon Weiner Diversity Index of 2.7. The invertebrate abundance and diversity in the main channel and its margins were very low as would be expected. • Numerous designated sites are present within the AoS, including the Solent Maritime SAC and the Bembridge MCZ.
Fish and Shellfish Ecology	The baseline environment for fish and shellfish ecology is illustrated in Figure 66. • A species composition survey was undertaken in September 2000 and approximately 36 species were recorded, with the most abundant being sea bass (*Dicentrarchus labrax*, 53.62%), bib (*Trisopterus luscus*, 13.34%), and black sea bream (*Spondyliosoma cantharu*, 6.20%) (Pickett, et al., 2002). The AoS overlaps with spawning and nursery grounds for species including cod, whiting, mackerel, cod, plaice, sole and sandeel.
Marine Mammals	The baseline environment for marine mammals is illustrated in Figure 67 (where data are available) • The two identified cetacean species known to regularly occur in this AoS are harbour porpoise (*Phocoena phocoena*) and minke whale (*Balaenoptera acutorostrata*). Additionally there are many sightings of unidentified cetacean species which could potentially be common dolphin (*Delphinus delphis*) or striped dolphin (*Stenella coeruleoalba*) (Hammond et al. 2017). • Harbour seals have been observed within this AoS, however these numbers are extremely limited, with the highest abundance estimates suggesting <50 individuals within the AoS (SCOS, 2020).
Offshore and Intertidal Ornithology	The baseline environment for offshore ornithology is illustrated in Figure 68. • Within the AoS there are four SPAs with offshore ornithology designated features, Chichester and Langstone Harbours SPA, Portsmouth Harbour SPA, Solent and Southampton Water SPA and the Solent and Dorset Coast SPA.

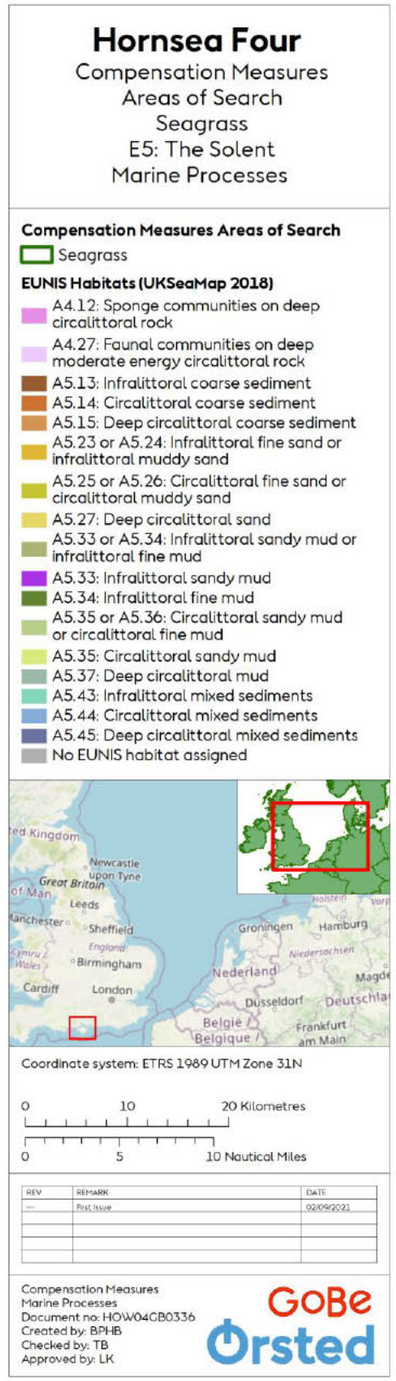
Topic	Summary of Baseline Environment
	• Several species associated with these SPAs are widespread in the area, appearing at three of the four sites, and include: sandwich tern (*Sterna sandvicensis*), brent goose (*Branta bernicla bernicla*), common tern (*Sterna hirundo*), and little tern (*Sterna albifrons*) (JNCC, 2015a, 2015c, 2015d, 2017b, 2020b).
Commercial Fisheries	The baseline environment for commercial fisheries is illustrated in Figure 69. • The Solent is a mixed sea fishery, and the fishing effort varies between several different commercial species throughout the year. The inshore waters of have an important role as a nursery area for bass, with specific areas identified for protection, and for a range of other fin fish and shellfish. Shellfishing is one of the main types of fisheries in the Solent. • Commercial shellfish beds of the native oyster, *Ostrea edulis*, lie around the entrance to Southampton Water, around the approach channel in the Central Solent, and along the shallow subtidal shores of the East and West Solent (ABPmer, 2015).
Shipping and Navigation	The baseline environment for shipping and navigation is illustrated in Figure 70. • The vessel density in the AoS varies from 1 to >222,000 route(s)/0.15 km2/ year. • The majority of vessels occur to the North of the Isle of Wight (IOW), heading up into Southampton. High vessel densities extend to the West of the IOW with some distinct lanes heading to Bournemouth and continuing along to coast towards Weymouth. To the East of the IOW the routes disperse more, with one main route heading out into the English Channel (Marine Traffic, 2021).
Marine Archaeology	The baseline environment for marine archaeology is illustrated in Figure 70. • Within the AoS, there are many different types of archaeological features including both ship and aircraft wrecks.



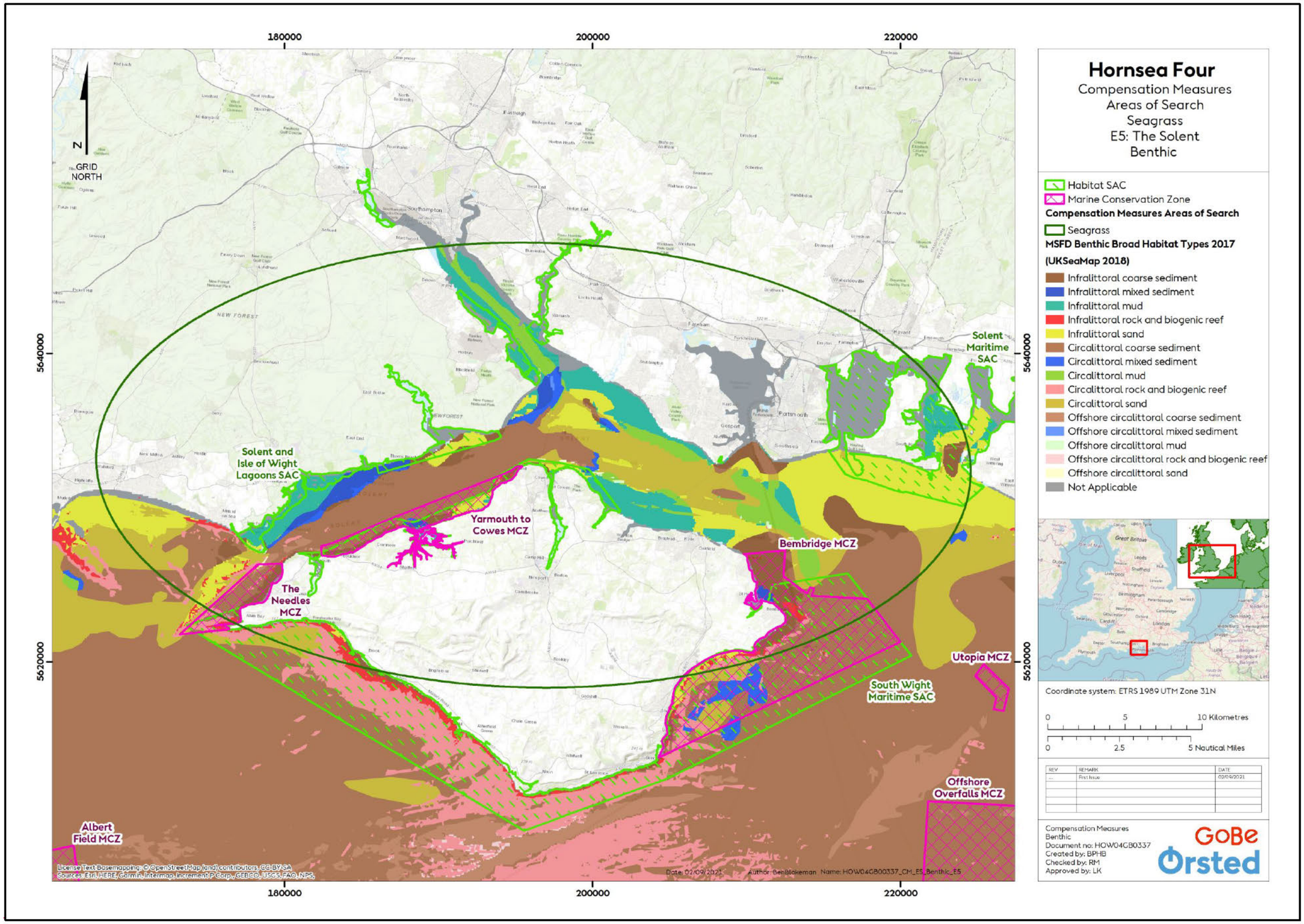




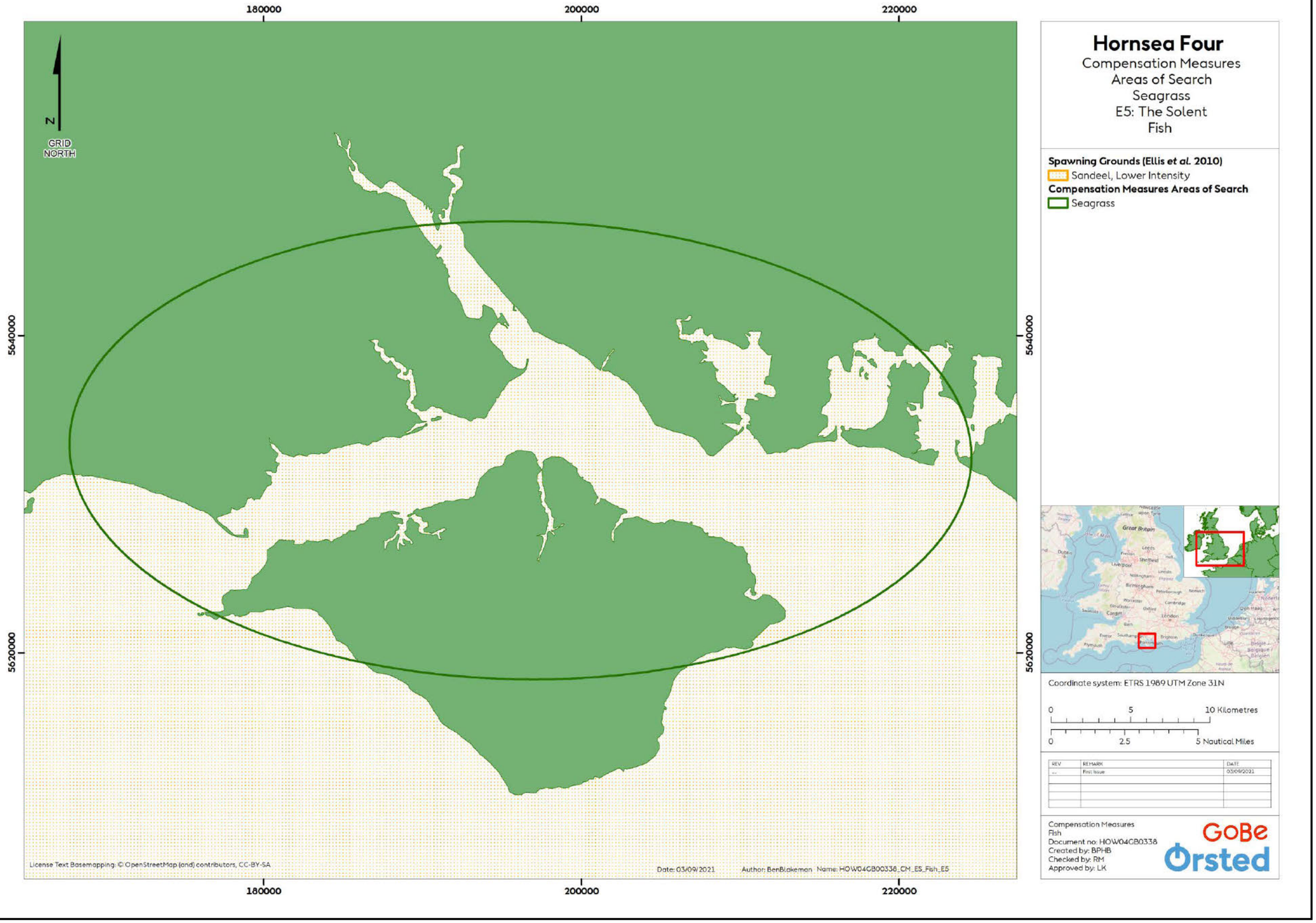




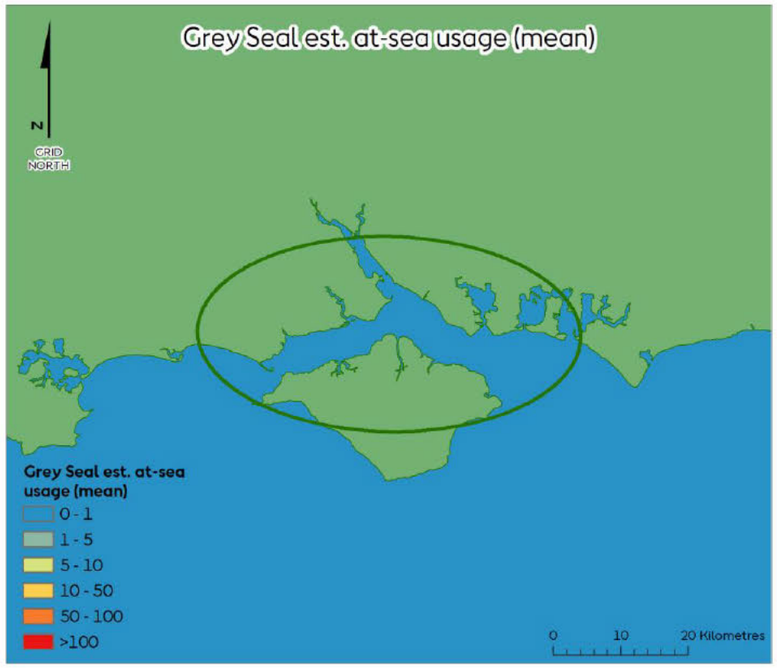
~~Figure 64: Resilience Measures Areas of Search Seagrass E5: The Solent Marine Processes.~~

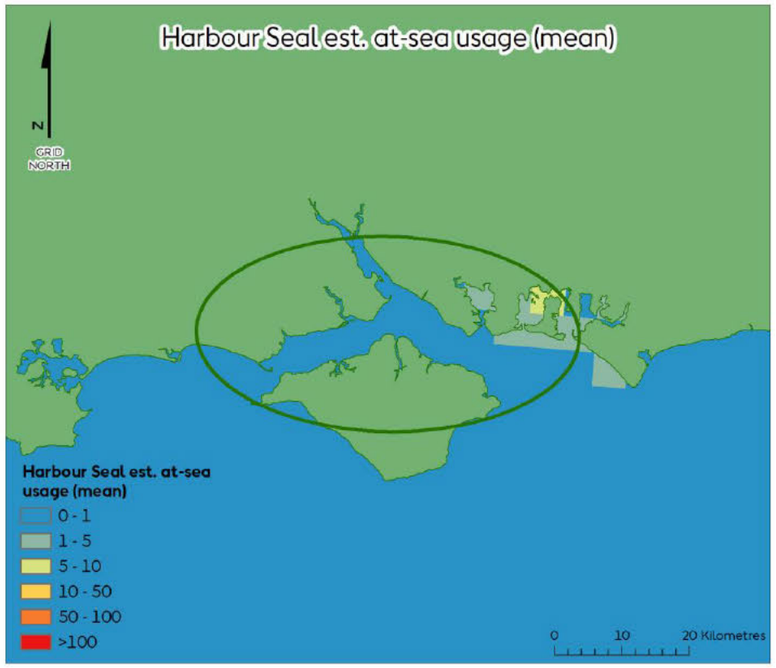


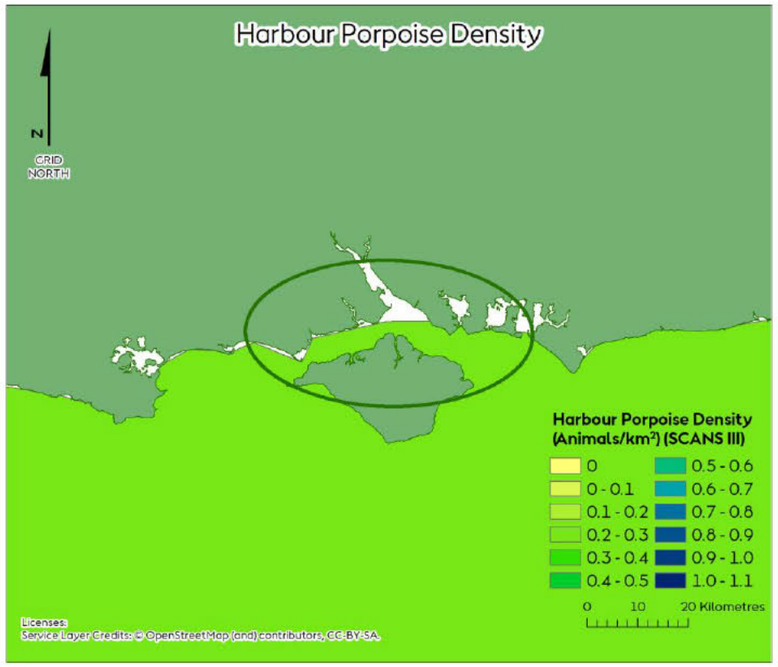
~~Figure 65: Resilience Measures Areas of Search Seagrass E5: The Solent Benthic.~~

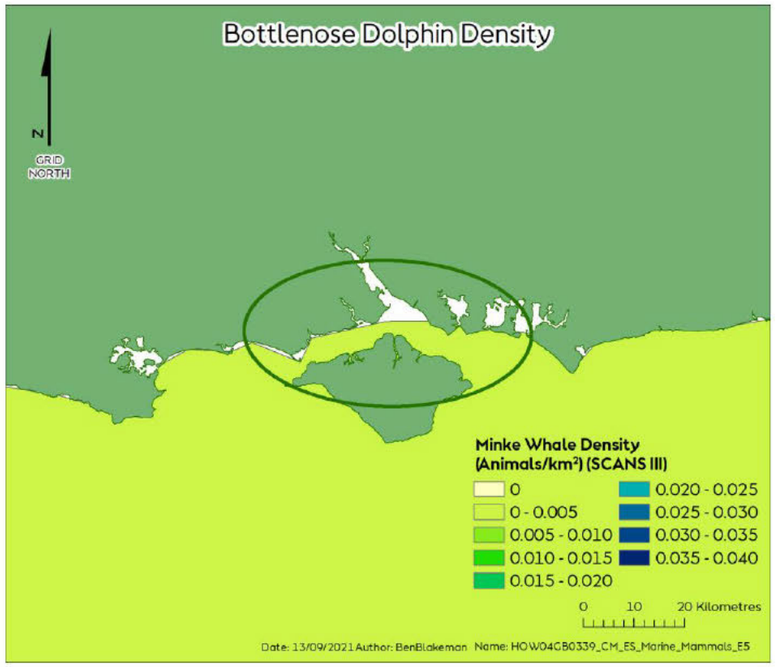


~~Figure 66: Resilience Measures Areas of Search Seagrass E5: The Solent Fish.~~









Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E5: The Solent
Marine Mammals

Compensation Measures Areas of Search
Seagrass

Estimated at-sea Distribution of Grey and Harbour Seals maps data from Sea Mammal Research Unit (SMRU) and Marine Scotland, 2017

Coordinate system: ETRS 1989 UTM Zone 31N

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Compensation Measures
Marine Mammals
Document no: HOW04GB0339
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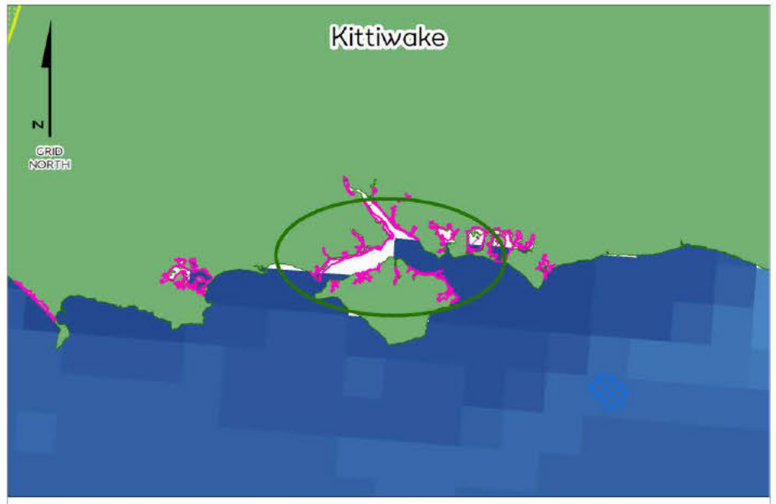
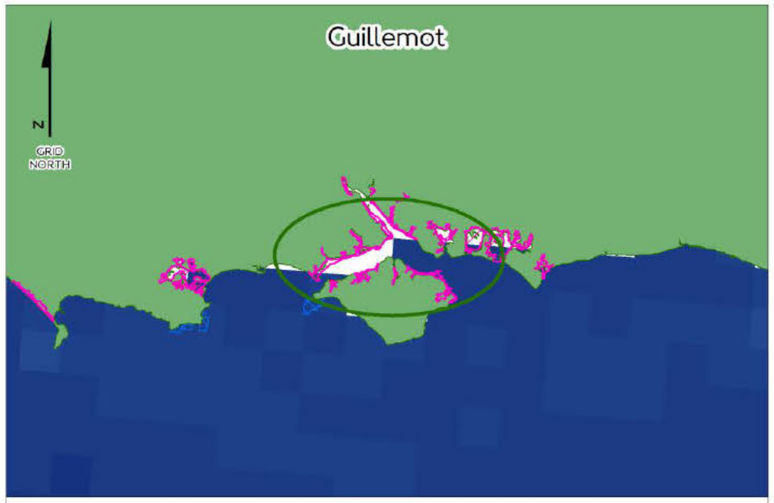
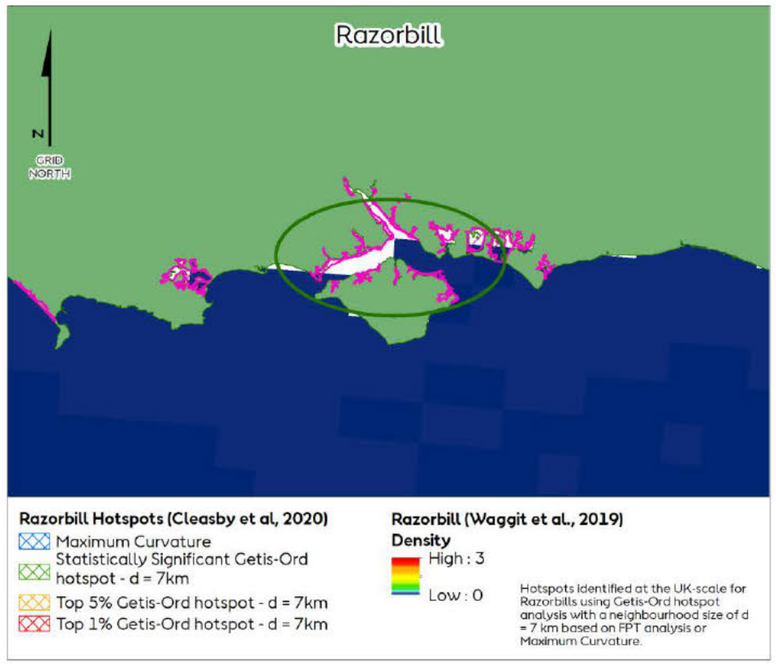
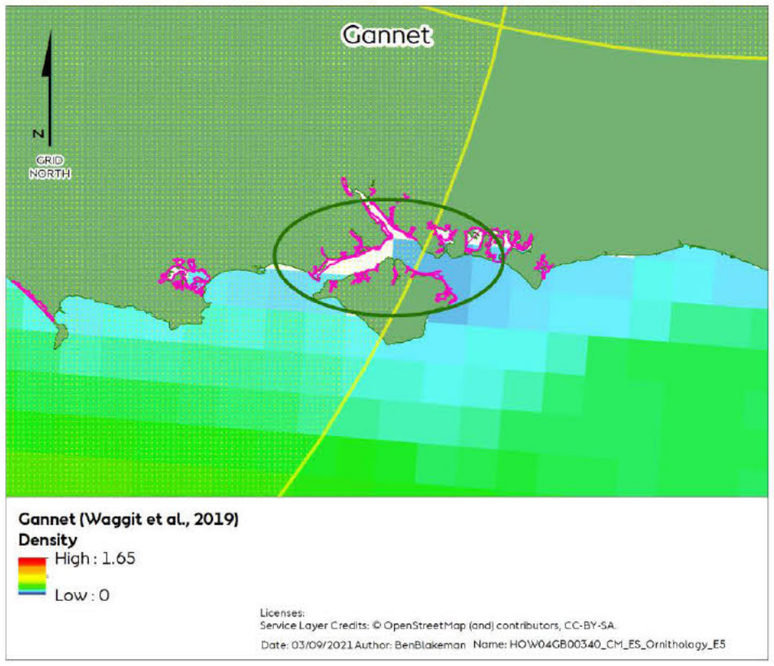
~~**Figure 67: Resilience Measures Areas of Search Seagrass E5: The Solent Marine Mammals.**~~









Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E5: The Solent
Ornithology

Special Protection Area (SPA) with Marine Components

Mean-Max Foraging Range (Woodward 2019)

- Common Guillemot - 73.2km Buffer
- Gannet - 315.2km Buffer
- Kittiwake - 156.1km Buffer
- Razorbill - 88.7km Buffer

Compensation Measures Areas of Search

- Seagrass

Waggitt et al 2019 densities data. Spatial variation in predicted densities (animals per km) of seabird species in July in the North-East Atlantic. Values are provided at 10km resolution.

Coordinate system: ETRS 1989 UTM Zone 31N

0 25 50 Kilometres
0 10 20 Nautical Miles

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—	First Issue	03/09/2021

Compensation Measures
Ornithology
Document no: HOW04GB0340
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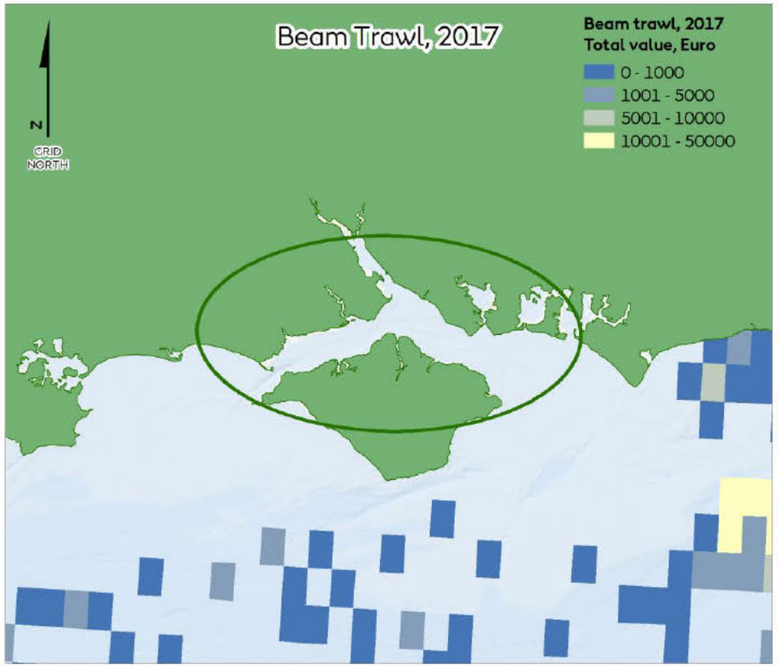
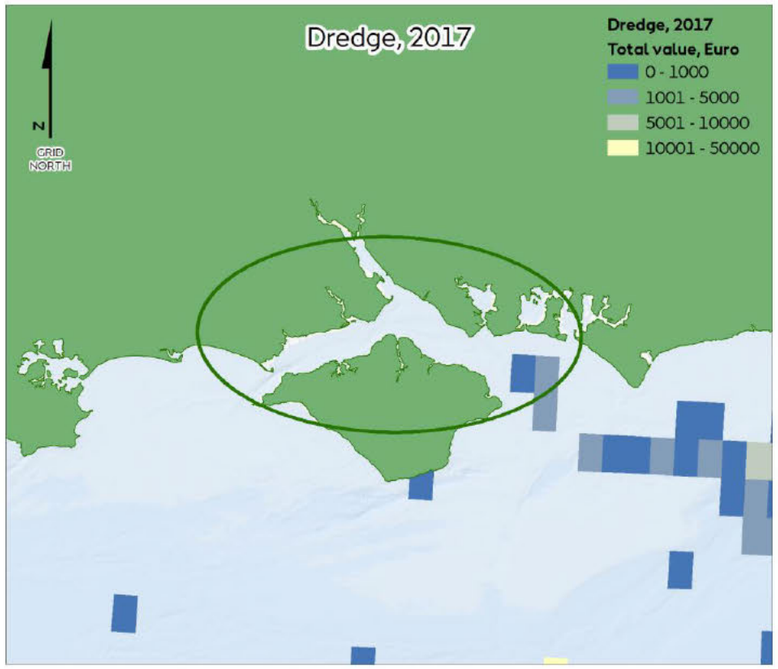
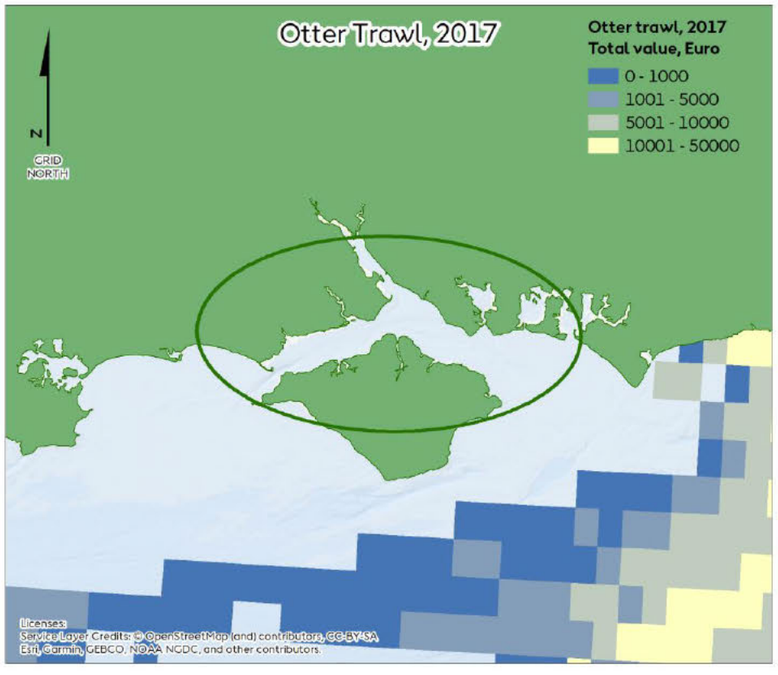
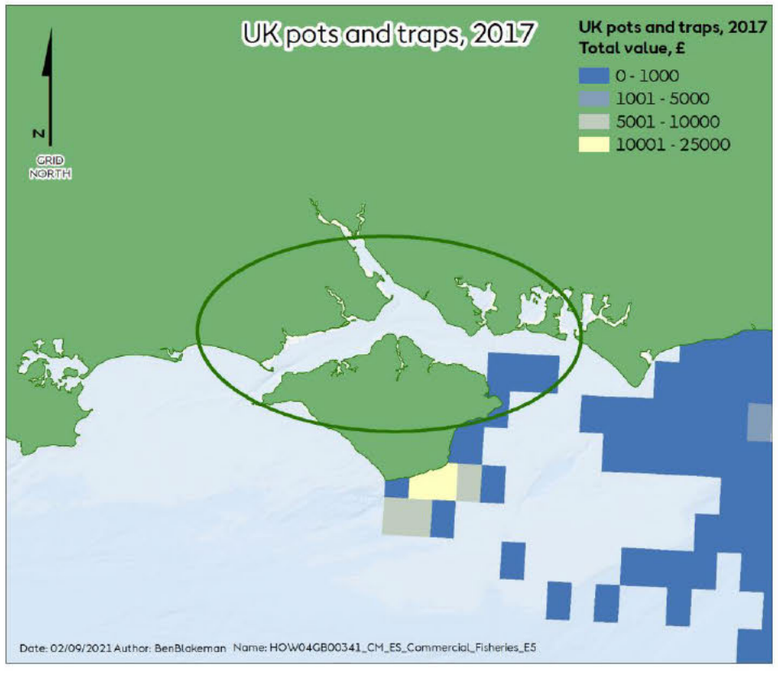
~~**Figure 68: Resilience Measures Areas of Search Seagrass E5: The Solent Ornithology.**~~









Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E5: The Solent
Commercial Fisheries

Compensation Measures Areas of Search
Seagrass

Coordinate system: ETRS 1989 UTM Zone 31N

0 20 40 Kilometres
0 10 20 Nautical Miles

REV	REMARK	DATE
---	First Issue	02/09/2021

Compensation Measures
Commercial Fisheries
Document no: HOW04GB0341
Created by: BPHB
Checked by: TB
Approved by: LK

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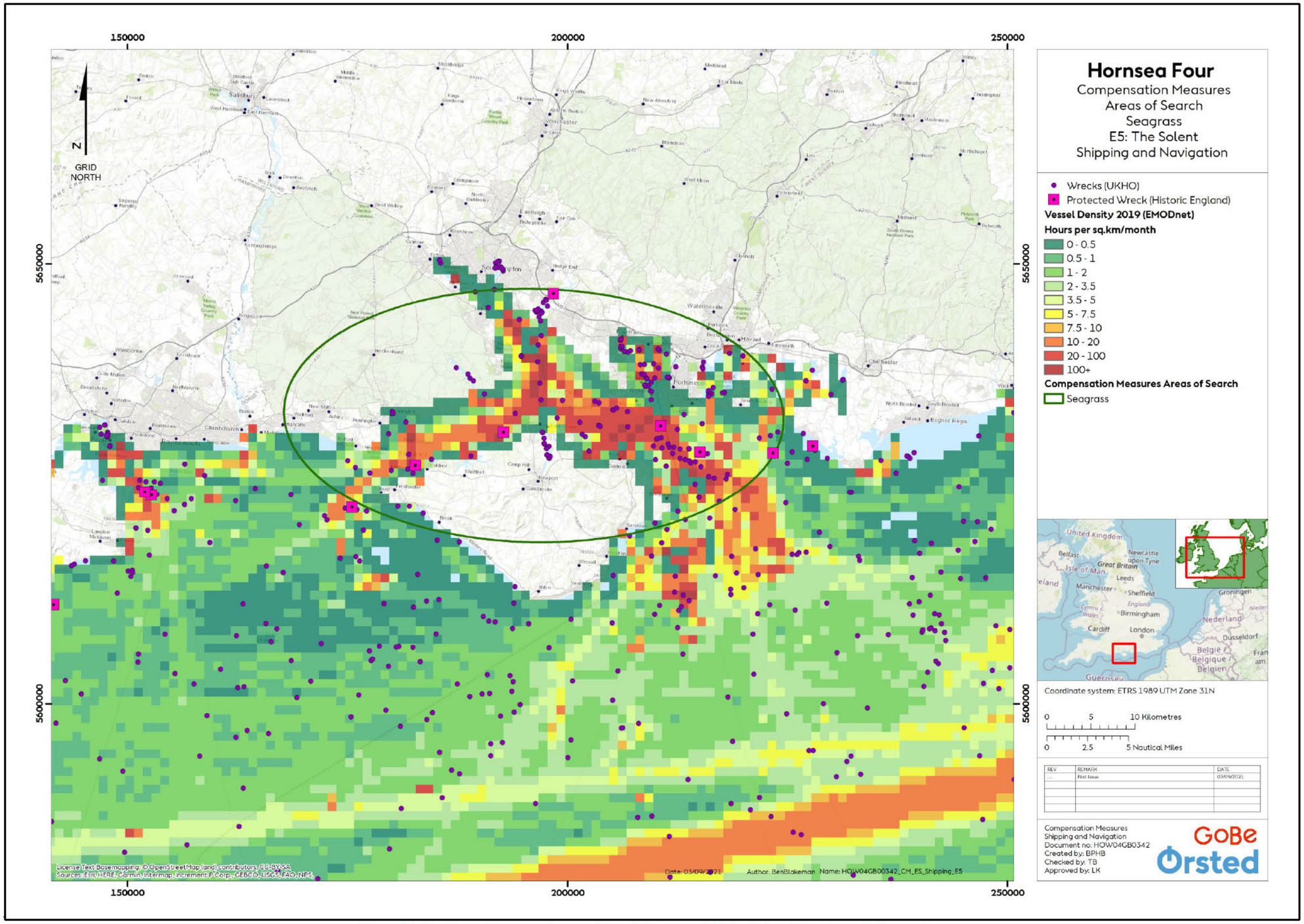
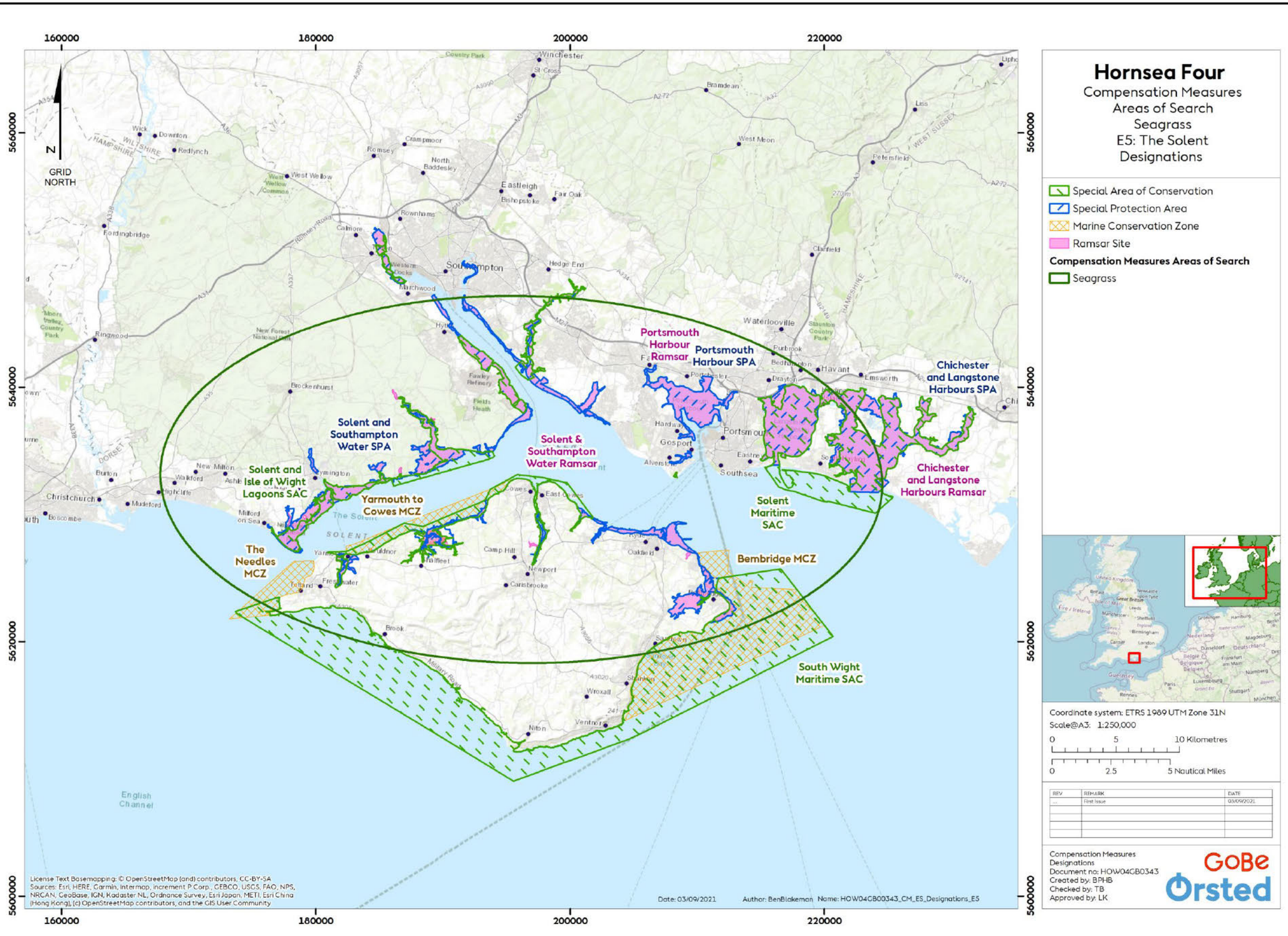
~~**Figure 69: Resilience Measures Areas of Search Seagrass E5: The Solent Commercial Fisheries.**~~



~~Figure 70: Resilience Measures Areas of Search Seagrass E5: The Solent Shipping and Navigation.~~

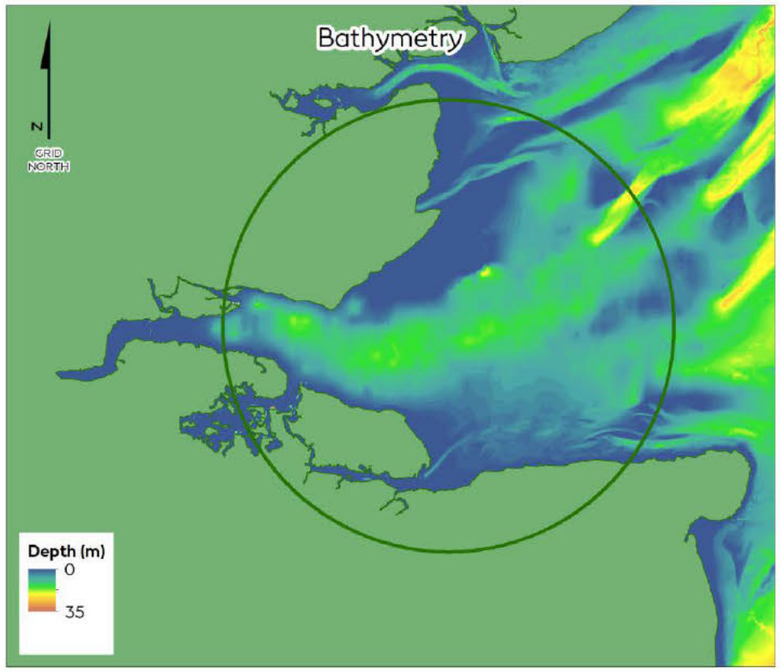


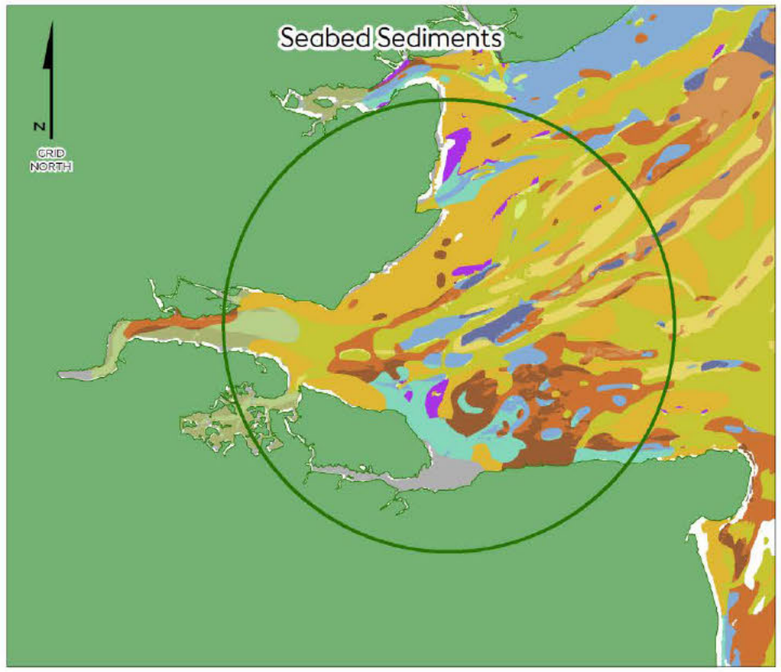
~~Figure 71: Resilience Measures Areas of Search Seagrass E5: The Solent Designations.~~

Table 17: Summary of baseline environment in relation to the Area of Search E6 (Essex Estuaries) for resilience measure - fish habitat enhancement (seagrass).

Topic	Summary of Baseline Environment
Marine Geology, Oceanography and Physical Processes	The baseline environment for physical processes is illustrated in Figure 72. The Thames can be broadly defined into the Inner and Outer Estuary, with the Inner Estuary extending upstream from the point of widening at Shoebury Ness (Southend) to the tidal limit at Teddington Weir (ABP Marine, 2014). Seabed sediments vary within the AoS between coarse, mixed and sandy sediments with patches of mud and muddy sand.
Benthic and Intertidal Ecology	The baseline environment for benthic ecology is illustrated in Figure 73. A variety of sediment types are present in this area, ranging from fine muds and sands, mixed and coarse sediments. Patches of deeper coarse sediment and rock extend further away from the coast. Species of interest include St John's jellyfish, lagoon sand shrimp, starlet sea anemone, lagoon sea slug, tentacled lagoon worm, ocean quahog and native oyster. Habitats of interest include blue mussel beds, estuarine rocky habitats, intertidal boulder communities, littoral chalk communities, ross worm reefs, seagrass beds, sheltered muddy gravel, tide swept channels, subtidal sand and gravels, subtidal chalk, and includes intertidal mudflats covering much of the Thames Estuary. Numerous SACs and MCZs designated for benthic habitats and features are present within the Thames Estuary.
Fish and Shellfish Ecology	The baseline environment for fish and shellfish ecology is illustrated in Figure 74. The AoS is an ecologically diverse and important habitat and nurseries for marine fish (McGoran, 2018). The AoS supports several spawning and nursery areas for species including herring, sole, sandeel, cod, mackerel, plaice and dab.
Marine Mammals	The baseline environment for marine mammals is illustrated in Figure 75. The most common marine mammals within the AoS include harbour porpoise (Phocoena phocoena), bottlenose dolphin (Tursiops truncatus), harbour seal (Phoca vitulina), and grey seal (Halichoerus grypus). The Harbour porpoise is the most numerous marine mammal within the area (Marine Aggregate Levy Sustainability Fund (MALSF), 2009). It is reported that the largest group of harbour seals in the study area can be found on the haul out site located on Foulness Sands and Buxey Sands at the mouth of the River Crouch (Duck, 1998). Although grey seals do not regularly breed or haul out in the region, very small numbers are occasionally seen, with the closest regular haul out sites located at Horsey, Norfolk, Scroby Sands, Norfolk and St. Margaret's at Cliffe, Kent (Duck, 1998; SCOS, 2007).
Offshore and Intertidal Ornithology	The baseline environment for offshore ornithology is illustrated in Figure 76. Within the AoS there are several SPAs with offshore ornithology designated features including the Outer Thames Estuary SPA. Within the AoS there are ten SPAs with offshore ornithology designated features. The brent goose (branta bernicla bernicla) was the most widespread species, known to be at eight of the ten sites. Common ringer plover (Charadrius hiaticula), grey plover (Pluvialis squatarola), and little tern (Sterna albifrons) are also widespread in the AoS, being present at six of the eight sites each.
Commercial Fisheries	The baseline environment for commercial fisheries is illustrated in Figure 77. The AoS supports an important commercial fishing industry providing high quality fresh products to both local and European markets.

Topic	Summary of Baseline Environment
	The estuary now provides over 50% of all UK cockle landings and significant catches of sole as well as herring, sprat, thornback ray, bass, grey mullet and cod. The large populations of cockles are maintained at a sustainable level by the Kent and Essex Sea Fisheries Committee under a Regulating Order and other fisheries are controlled under EU and national legislation (Richardson and Soloviev, 2021). As shown on Figure 77, the key methods of fishing in the AoS are dredging, potting and trapping.
Shipping and Navigation	The baseline environment for shipping and navigation is illustrated in Figure 78. London has served as a major port since Roman times and currently handles over 30,000 commercial vessel movements per year. The estuary connects the London conurbation to the North Sea. The vessel density in the southern North Sea varies from 1 to >250,000 route(s)/ 0.31 km2/ year. There are several high density shipping lanes in the region, with the primary route goes from the city of London out into the open estuary, with several routes heading Northeast along the coast and several heading east, joining the other major shipping lanes in the southern North Sea.
Marine Archaeology	The baseline environment for marine archaeology is illustrated in Figure 78. Within the AoS, there are many different types of archaeological features including both ship and aircraft wrecks.

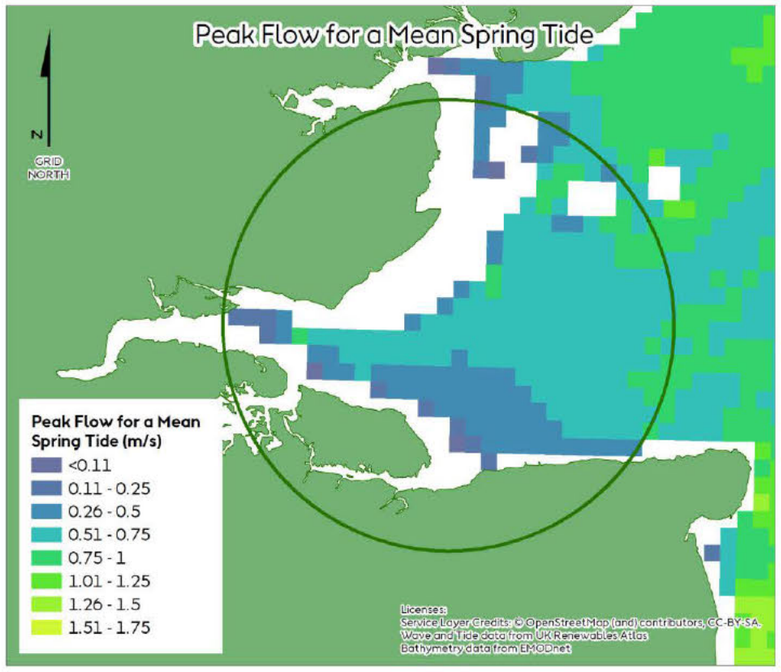


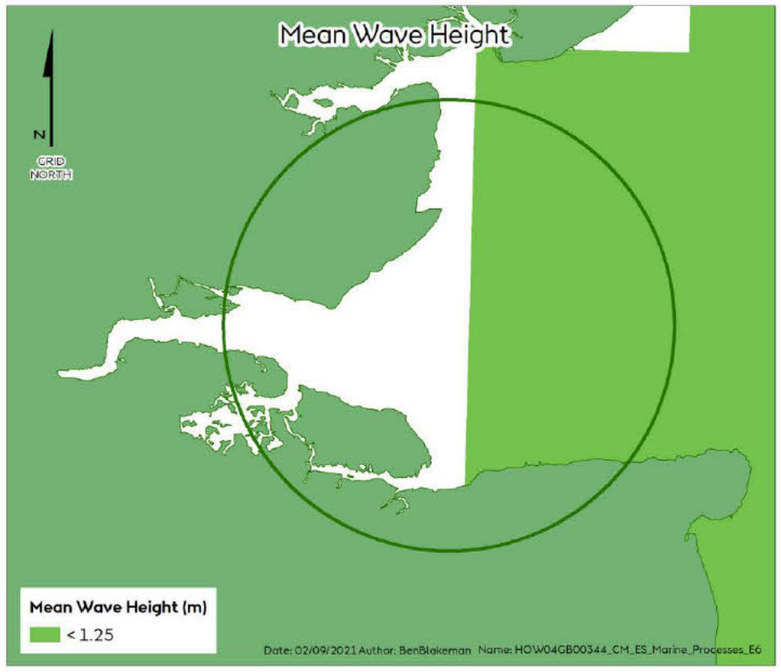


Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E6: Essex Estuaries
Marine Processes

Compensation Measures Areas of Search
Seagrass

EUNIS Habitats (UKSeaMap 2018)
- A5.13: Infralittoral coarse sediment
- A5.14: Circalittoral coarse sediment
- A5.15: Deep circalittoral coarse sediment
- A5.23 or A5.24: Infralittoral fine sand or infralittoral muddy sand
- A5.25 or A5.26: Circalittoral fine sand or circalittoral muddy sand
- A5.27: Deep circalittoral sand
- A5.33 or A5.34: Infralittoral sandy mud or infralittoral fine mud
- A5.33: Infralittoral sandy mud
- A5.35 or A5.36: Circalittoral sandy mud or circalittoral fine mud
- A5.35: Circalittoral sandy mud
- A5.36: Circalittoral fine mud
- A5.37: Deep circalittoral mud
- A5.43: Infralittoral mixed sediments
- A5.44: Circalittoral mixed sediments
- A5.45: Deep circalittoral mixed sediments
- No EUNIS habitat assigned





Coordinate system: ETRS 1989 UTM Zone 31N

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0 5 10 Nautical Miles

REV	REMARK	DATE
--	First Issue	02/09/2021

Compensation Measures
Marine Processes
Document no: HOW04GB0344
Created by: BPHB
Checked by: TB
Approved by: LK

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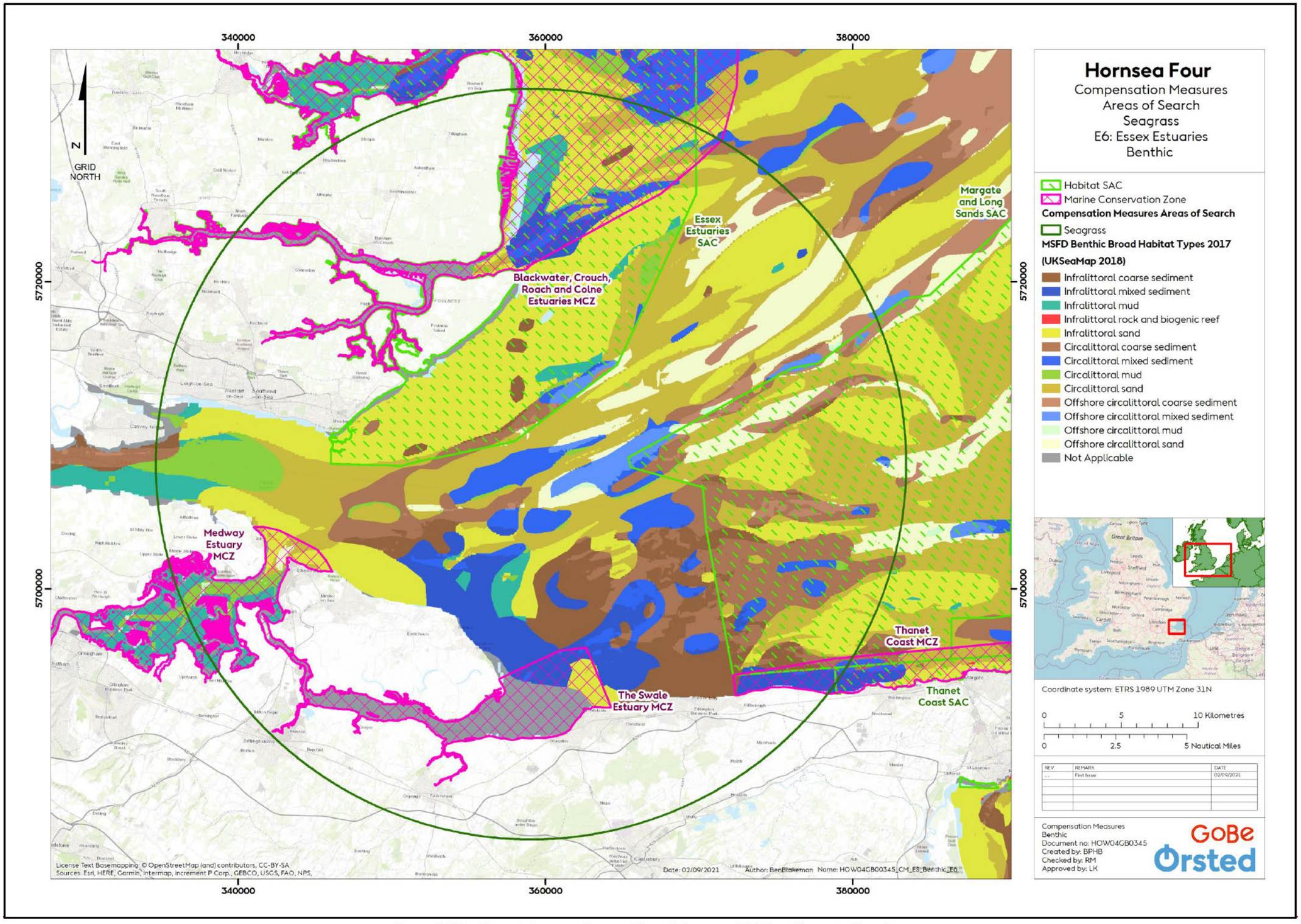
~~**Figure 72: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Marine Processes.**~~



Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E6: Essex Estuaries
Benthic

Habitat SAC
Marine Conservation Zone
Compensation Measures Areas of Search
Seagrass
MSFD Benthic Broad Habitat Types 2017
(UKSeaMap 2018)
- Infralittoral coarse sediment
- Infralittoral mixed sediment
- Infralittoral mud
- Infralittoral rock and biogenic reef
- Infralittoral sand
- Circalittoral coarse sediment
- Circalittoral mixed sediment
- Circalittoral mud
- Circalittoral sand
- Offshore circalittoral coarse sediment
- Offshore circalittoral mixed sediment
- Offshore circalittoral mud
- Offshore circalittoral sand
- Not Applicable

Coordinate system: ETRS 1989 UTM Zone 31N

0 5 10 Kilometres
0 2.5 5 Nautical Miles

REV	REMARK	DATE
-	First Issue	02/09/2021

Compensation Measures
Benthic
Document no: HOW04GB0345
Created by: BPHB
Checked by: RM
Approved by: LK

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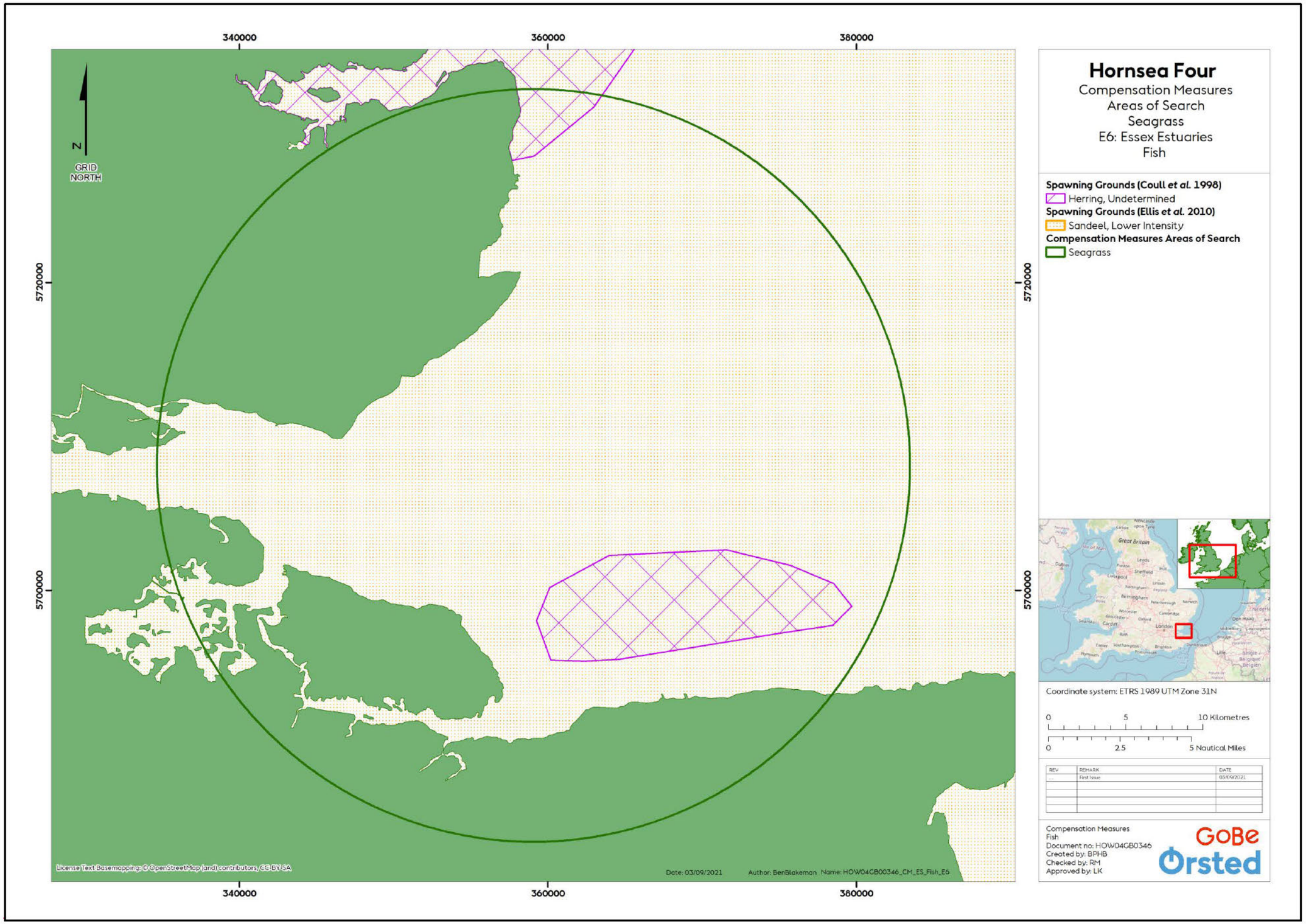
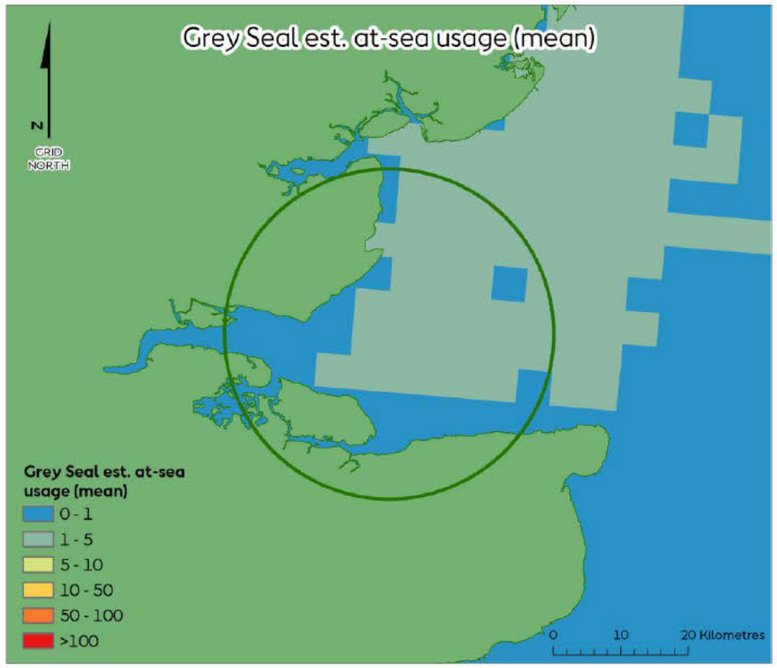
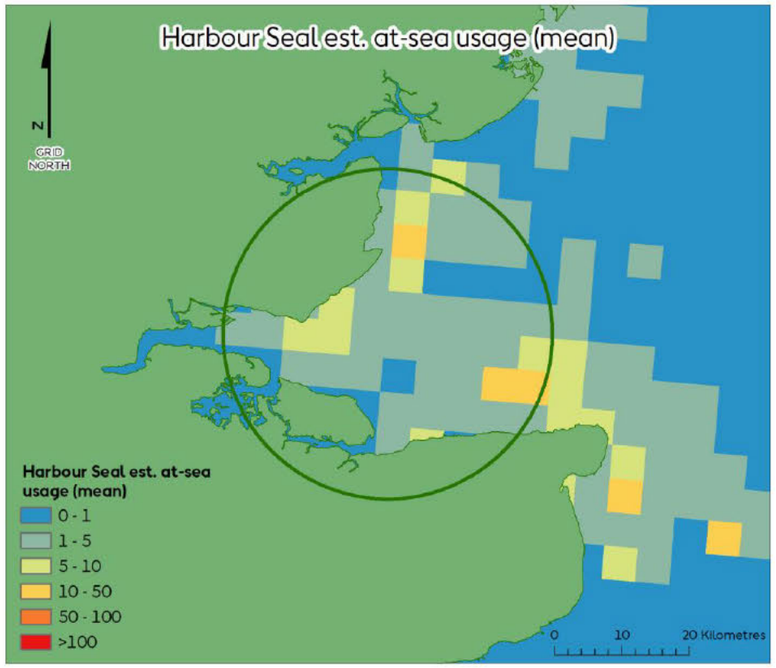
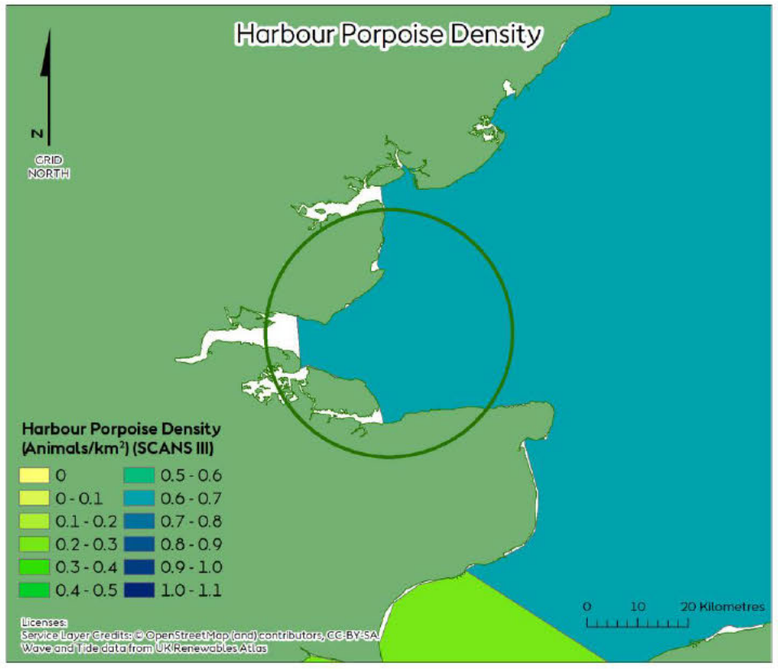
~~**Figure 73: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Benthic.**~~

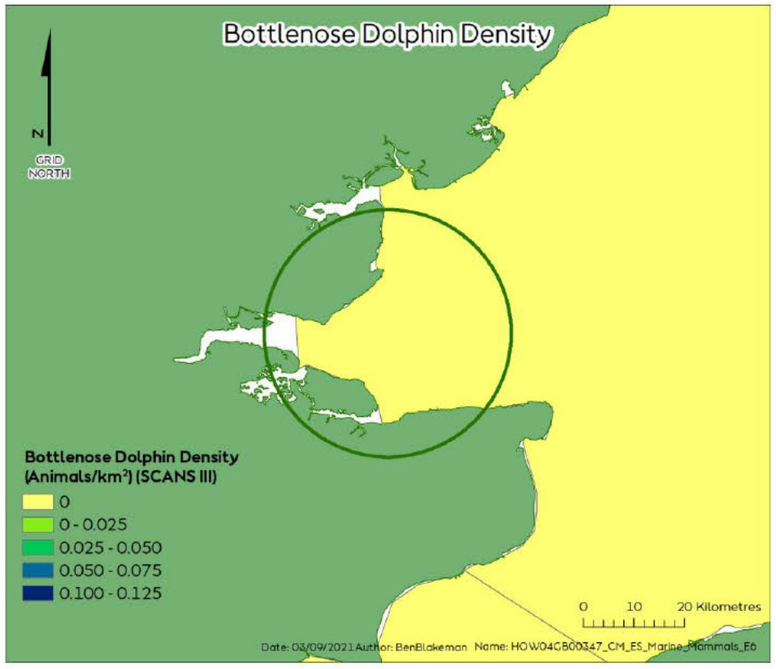


~~Figure 74: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Fish.~~









Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E6: Essex Estuaries
Marine Mammals

Compensation Measures Areas of Search
Seagrass

Estimated at-sea Distribution of Grey and Harbour Seals maps data from Sea Mammal Research Unit (SMRU) and Marine Scotland, 2017

Coordinate system: ETRS 1989 UTM Zone 31N

REV	REMARK	DATE
---	First Issue	03/09/2021

Compensation Measures
Marine Mammals
Document no: HOW04GB0347
Created by: BPHB
Checked by: TB
Approved by: LK

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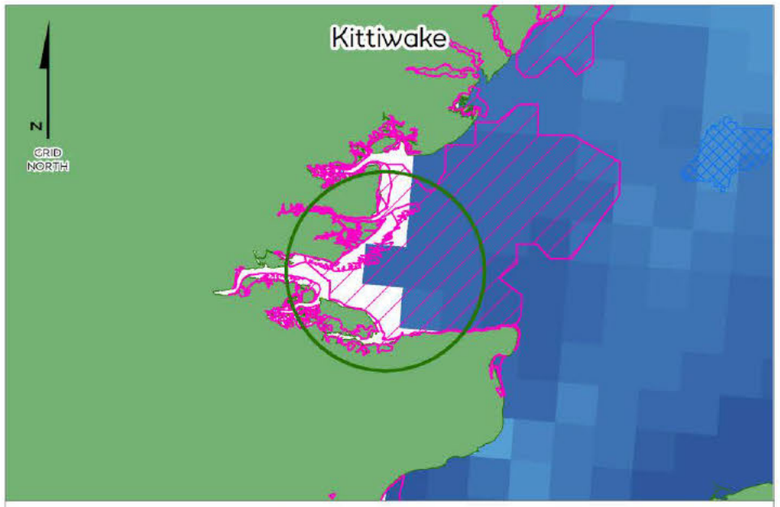
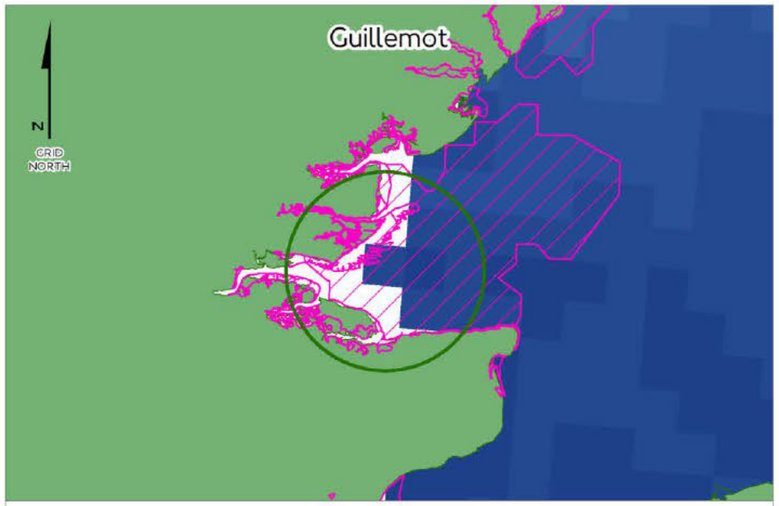
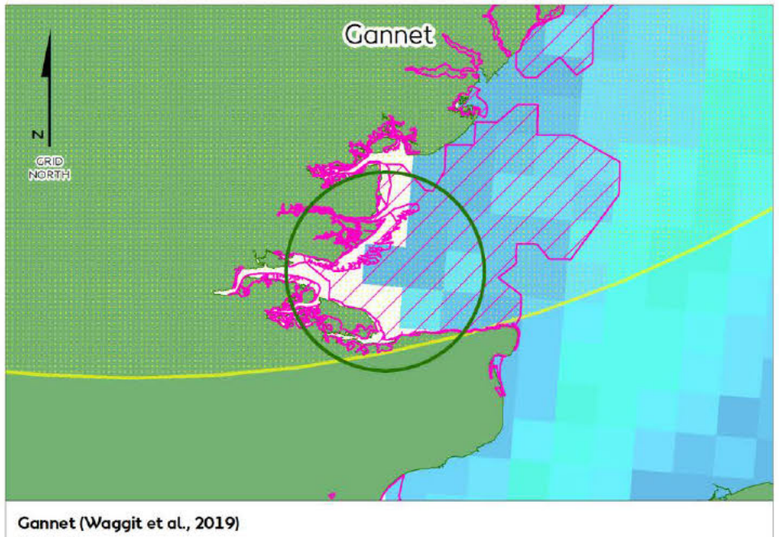
~~**Figure 75: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Marine Mammals.**~~







Hornsea Four

Compensation Measures
Areas of Search
Seagrass
E6: Essex Estuaries
Ornithology

Special Protection Area (SPA) with Marine Components

Mean-Max Foraging Range (Woodward 2019)

- Common Guillemot - 73.2km Buffer
- Gannet - 315.2km Buffer
- Kittiwake - 156.1km Buffer
- Razorbill - 88.7km Buffer

Compensation Measures Areas of Search

- Seagrass

Waggitt et al 2019 densities data. Spatial variation in predicted densities (animals per km) of seabird species in July in the North-East Atlantic. Values are provided at 10km resolution.

Coordinate system: ETRS 1989 UTM Zone 31N

0 25 50 Kilometres

0 10 20 Nautical Miles

REV	REMARK	DATE
---	First Issue	03/09/2021

Compensation Measures
Ornithology
Document no: HOW04GB0348
Created by: BPHB
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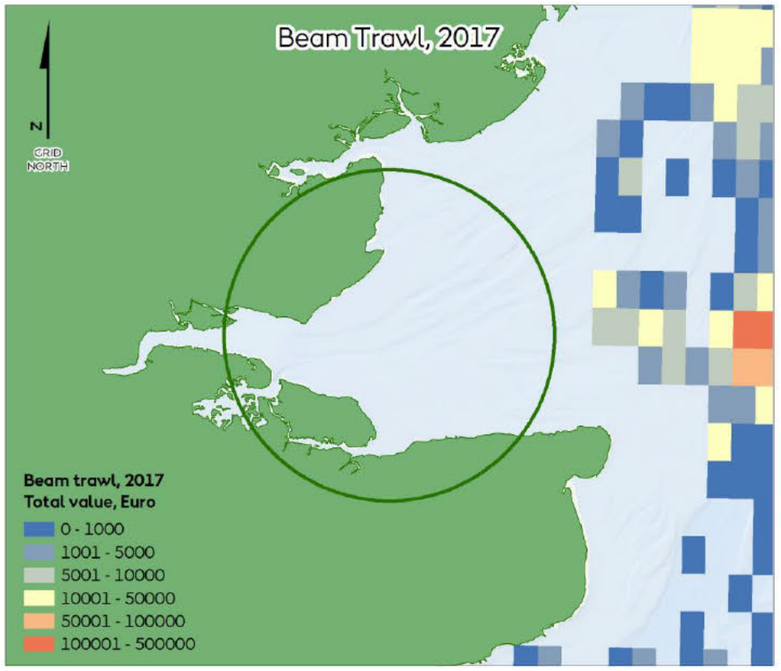
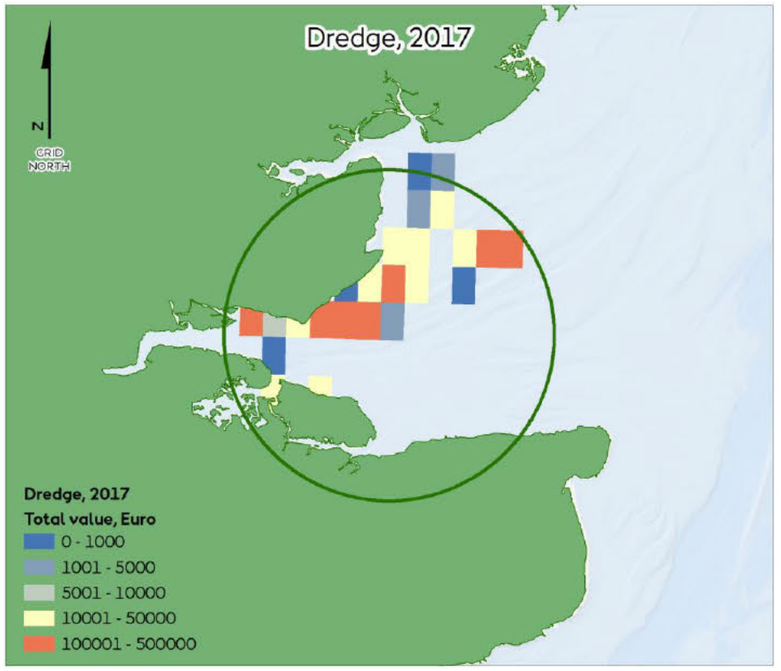
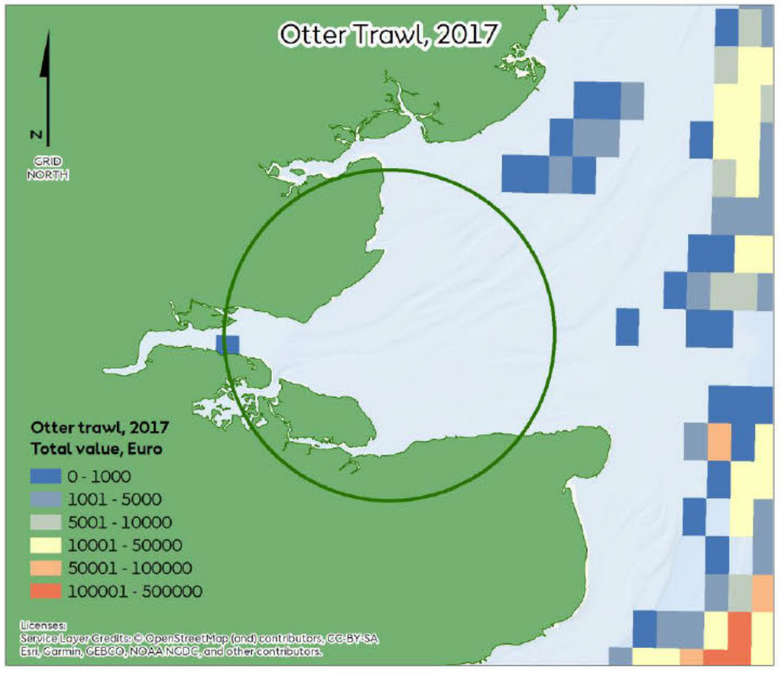
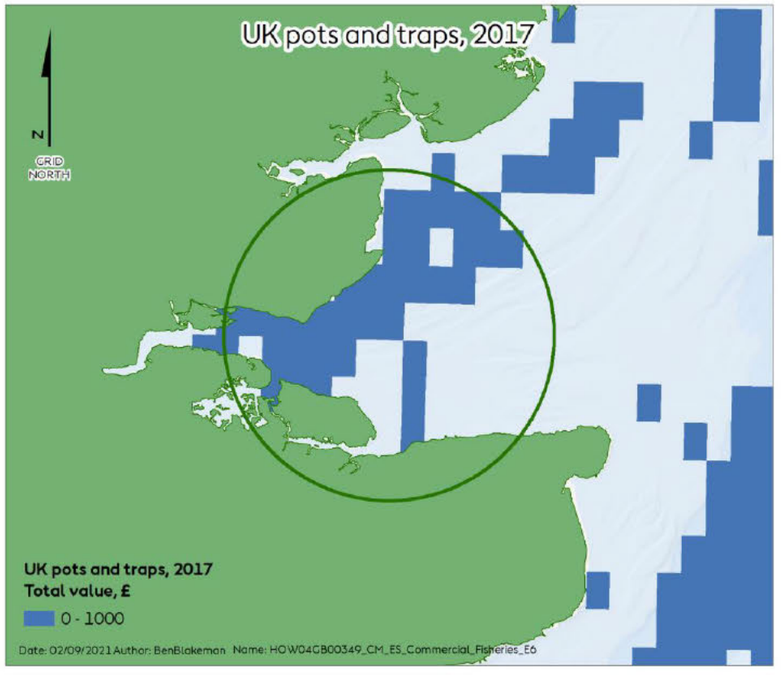
~~**Figure 76: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Ornithology.**~~









Hornsea Four
Compensation Measures
Areas of Search
Seagrass
E6: Essex Estuaries
Commercial Fisheries

Compensation Measures Areas of Search
Seagrass

Coordinate system: ETRS 1989 UTM Zone 31N

0 20 40 Kilometres
0 10 20 Nautical Miles

REV	REMARK	DATE
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Compensation Measures
Commercial Fisheries
Document no: HOW04GB0349
Created by: BPHB
Checked by: TB
Approved by: LK

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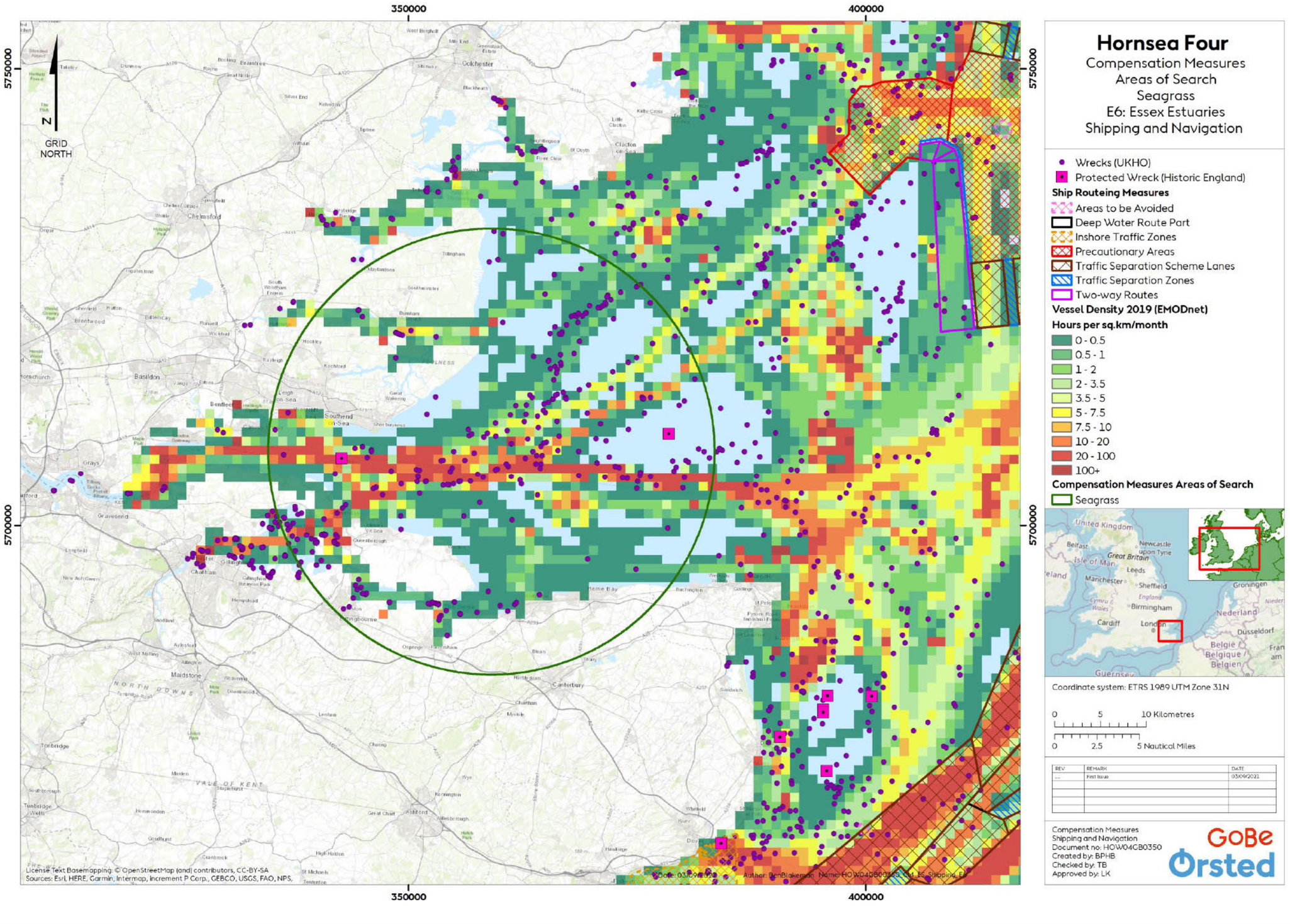
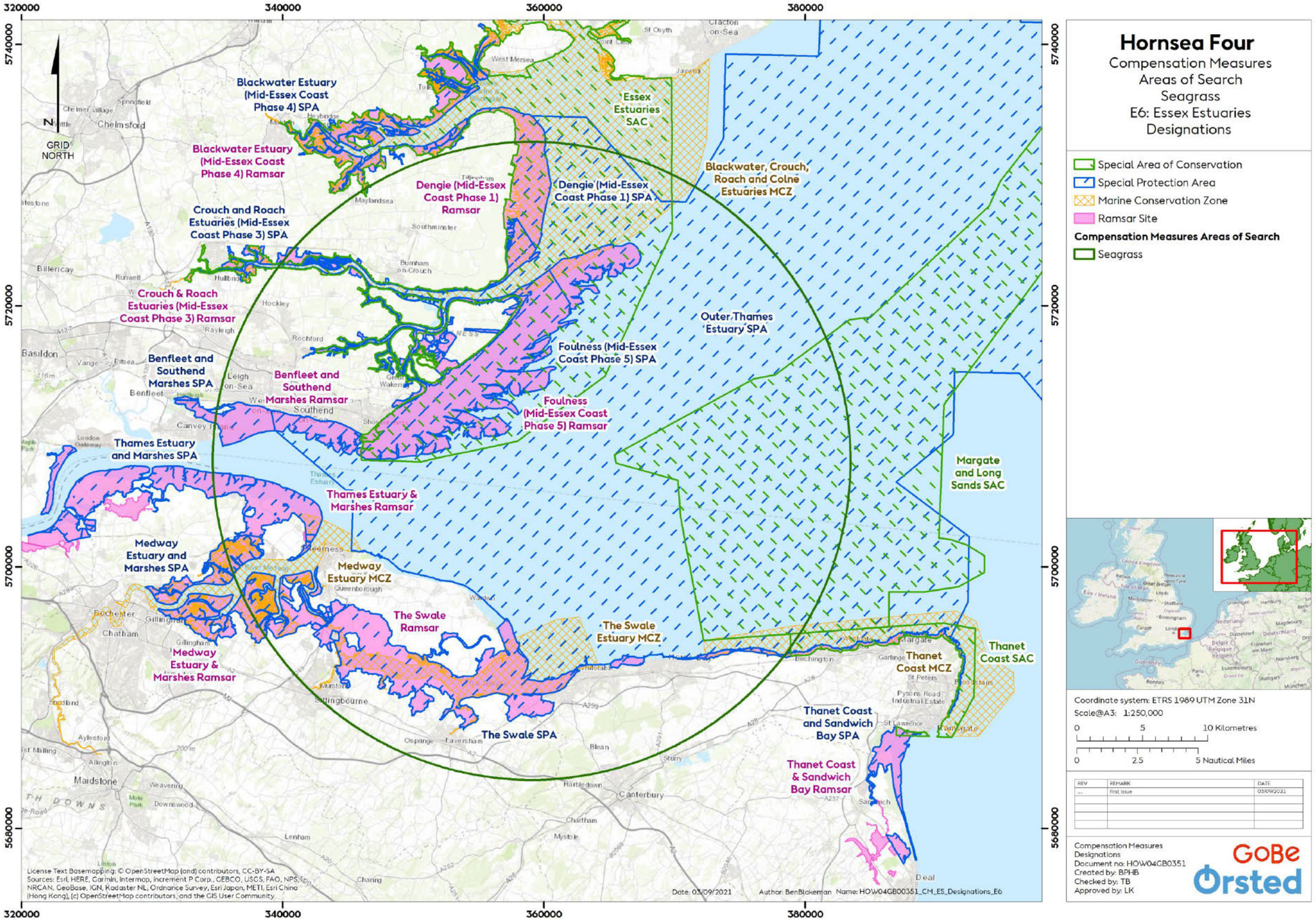
~~**Figure 77: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Commercial Fisheries.**~~



~~Figure 78: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Shipping and Navigation.~~

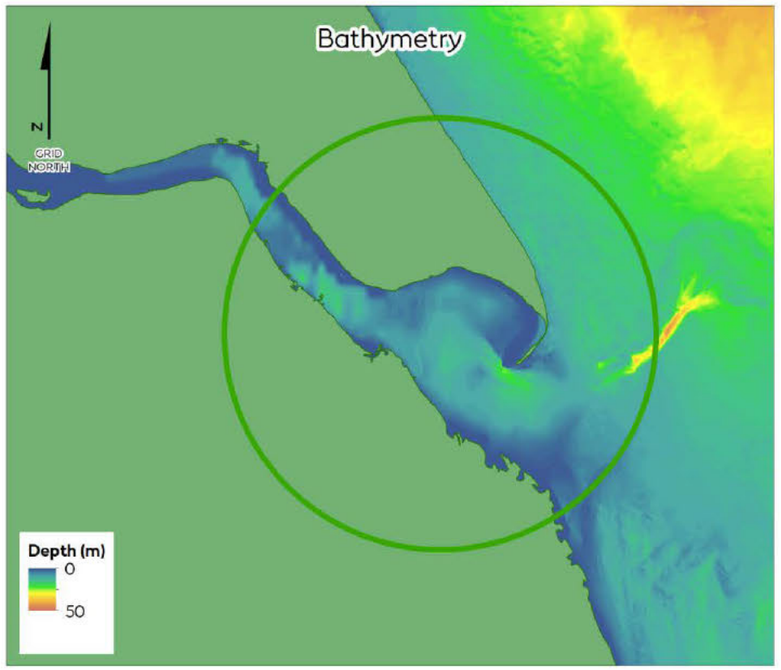


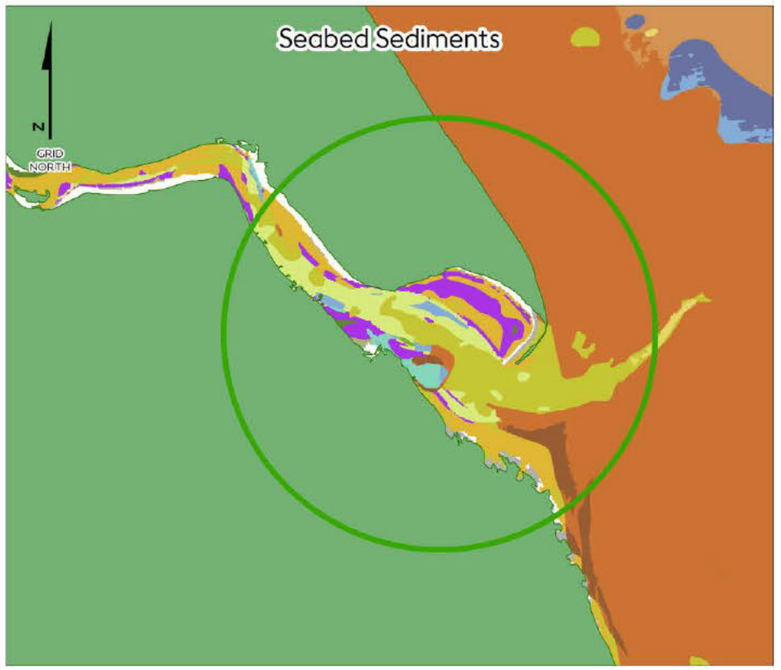
~~Figure 79: Resilience Measures Areas of Search Seagrass E6: Essex Estuaries Designations.~~

Table 11: Summary of baseline environment in relation to the Area of Search E~~3~~17 (Humber Estuary) for resilience measure ~~- fish~~- fish habitat enhancement (seagrass).

Topic	Summary of Baseline Environment
Marine Geology, Oceanography and Physical Processes	The baseline environment for physical processes is illustrated in Figure 22. • The AoS coastline is dominated by Spurn Head, a dynamic 5.5 km sand and gravel spit at the mouth of the Humber and the position of which is controlled by a deep water channel in the estuary mouth (HADA, 2012). Spurn Head provides protection for the extensive mudflats within the Humber Estuary. The Outer Humber Estuary is characterised by mudflats, saltmarshes and beach areas (Scott Wilson, 2010). • Surficial seabed sediments are dominated by sandy gravels outwith the mouth of the Humber Estuary (DECC, 2016a), whilst within the estuary, muds and silts predominate (Scott Wilson, 2010). • Generally, the direction of sediment transport is into the Humber Estuary along the coast and outwards within the channels, although localised pathways and circulatory systems occur in the estuary mouth (HADA, 2012). Suspended sediments are typically high in this region and characterised by the presence of the Humber Plume (E.On, 2009)
Benthic and Intertidal Ecology	The baseline environment for benthic ecology is illustrated in Figure 23. • In the Humber Estuary they include gravels and sands, muddy sands and mud, which reflects varying degrees of exposure to waves, currents and inflowing rivers. Substantial areas of mud and sandflat have been lost due to land claim but are still a major component of the Humber Estuary and represent 4.5% of the UK's total mud and sandflat resource. • There are approximately 630 Ha of saltmarsh on the Humber, accounting for only 2% of the estuarine area due to large historical losses from land claim. • The subtidal environment of the Humber Estuary is highly dynamic and varies according to the composition of the bottom sediments, salinity, sediment load and turbidity, dissolved oxygen and anthropogenic factors relating to water quality and dredging. • The Humber Estuary is designated as an SAC.
Fish and Shellfish Ecology	The baseline environment for fish and shellfish ecology is illustrated in Figure 24. • The Humber supports a fish assemblages characteristic of the southern North Sea macro-tidal estuary. Shellfish populations are also typical of the estuary typology with commercial interest focusing on: large decapod crustaceans (brown shrimp, *Crangon sp.*; lobster, *Homarus gammarus*; and brown crab, *Cancer pagurus*), bivalve molluscs (cockles, *Cerastoderma edule*; mussels, *Mytilus sp.*) and whelk (*Buccinum undatum*) (PINS, 2011). • This AoS has two Annex II fish species being the sea lamprey (*Petromyzon marinus*) and the river lamprey (*Lampetra fluviatilis*) which both breed in the River Derwent (JNCC, 2021).
Marine Mammals	The baseline environment for marine mammals is illustrated in Figure 25. • The most common marine mammals within the Thames Estuary area include harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*), harbour seal (*Phoca vitulina*), and grey seal (*Halichoerus grypus*) (Hammond et al. 2017).
Offshore and Intertidal Ornithology	The baseline environment for offshore ornithology is illustrated in Figure 26.

Topic	Summary of Baseline Environment
	• The Humber Estuary plays an international role in bird migration and is one of the most important wetland sites in the UK. The region provides a safe feeding and roosting area for species moving from breeding sites in the Arctic and sub-Arctic to wintering grounds in southern Europe and Africa, as well as for species which use the Humber as an overwintering site (Humber Nature, 2021). • Within the AoS there are two SPAs with offshore ornithology designated features, the Humber Estuary SPA and the Greater Wash SPA. The litter tern (*Sterna albifrons*) is the only species present at both sites, with the Humber Estuary SPA designated for an additional 37 species, and the Greater Wash SPA designated for an additional five species.
Commercial Fisheries	The baseline environment for commercial fisheries is illustrated in **Figure 27.** • Commercial fish species or those with recreational angling relevance that are routinely recorded in the Humber include: whiting (*Merlangius merlangus*), sprat (*Sprattus sprattus*), common (or Dover) sole (*Solea solea*) and flounder (Platichthys flesus). Less common but still relevant are cod (*Gadus morhua),* saithe (*Pollachius virens*), pollack (*Pollachius pollachius*), dab (*Limanda limanda*), plaice (*Pleuronectes platessa*) and eel (*Anguilla anguilla*) (PINS, 2011). • As shown on **Figure 27**, the key methods of fishing in the AoS are beam trawling, potting and trapping.
Shipping and Navigation	The baseline environment for shipping and navigation is illustrated in **Figure 28**. • The Humber Estuary is one of the most important estuaries in the UK for commerce, with an expanding port complex and extensive bank-side industries. The four main ports on the estuary (Grimsby, Hull, Immingham and Goole) are operated by Associated British Ports. • Outside the Humer Estuary within the AoS, traffic is managed through a traffic separation scheme.
Marine Archaeology	The baseline environment for marine archaeology is illustrated in **Figure 28**. • Within the AoS, there are many different types of archaeological features including both ship and aircraft wrecks. The Humber region has a long and busy maritime history, but the seas here can be hazardous.





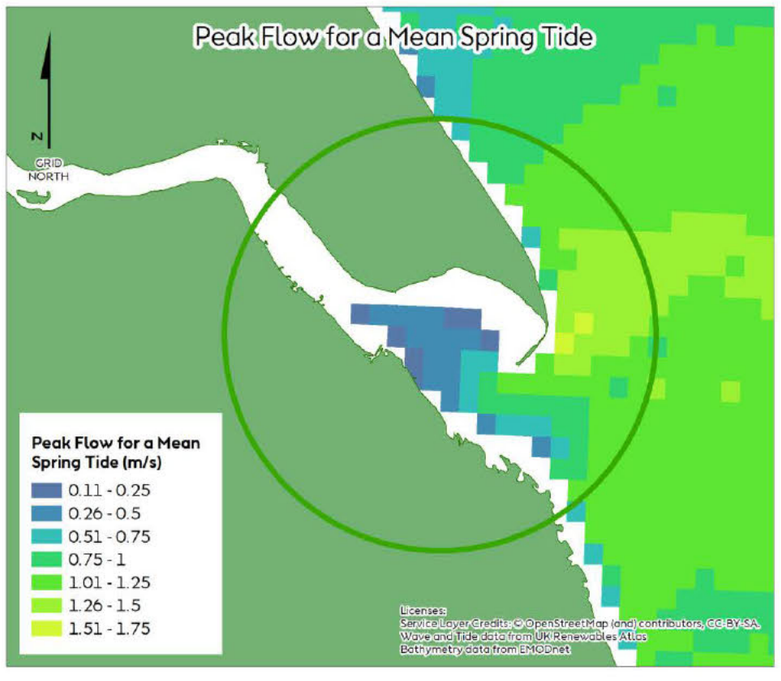
Hornsea Four

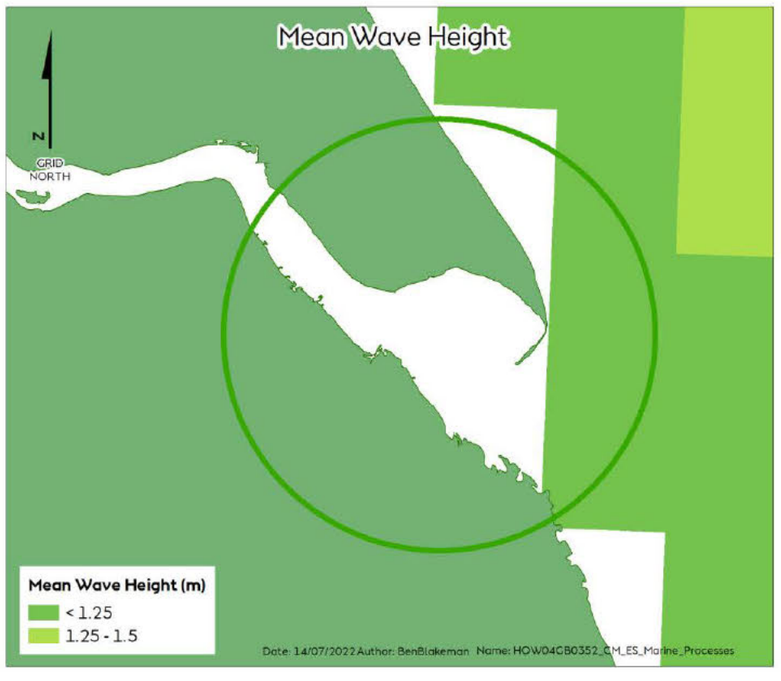
Compensation Measures
Areas of Search
Seagrass
Humber Estuary
Marine Processes

Seagrass Area of Search

EUNIS Habitats (UKSeaMap 2018)

- A5.13: Infralittoral coarse sediment
- A5.14: Circalittoral coarse sediment
- A5.15: Deep circalittoral coarse sediment
- A5.23 or A5.24: Infralittoral fine sand or infralittoral muddy sand
- A5.25 or A5.26: Circalittoral fine sand or circalittoral muddy sand
- A5.27: Deep circalittoral sand
- A5.33 or A5.34: Infralittoral sandy mud or infralittoral fine mud
- A5.33: Infralittoral sandy mud
- A5.34: Infralittoral fine mud
- A5.35 or A5.36: Circalittoral sandy mud or circalittoral fine mud
- A5.35: Circalittoral sandy mud
- A5.36: Circalittoral fine mud
- A5.37: Deep circalittoral mud
- A5.43: Infralittoral mixed sediments
- A5.44: Circalittoral mixed sediments
- A5.45: Deep circalittoral mixed sediments
- No EUNIS habitat assigned





Coordinate system: ETRS 1989 UTM Zone 31N

0 10 20 Kilometres

0 5 10 Nautical Miles

REV	REMARK	DATE
---	First Issue	14/07/2022
A	Second Issue - Refined Search Areas	14/07/2022

Compensation Measures
Marine Processes
Document no: HOW04GB0352
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Checked by: TB
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Figure 22: Resilience Measures Areas of Search Seagrass E1~~7~~: Humber Estuary Marine Processes.

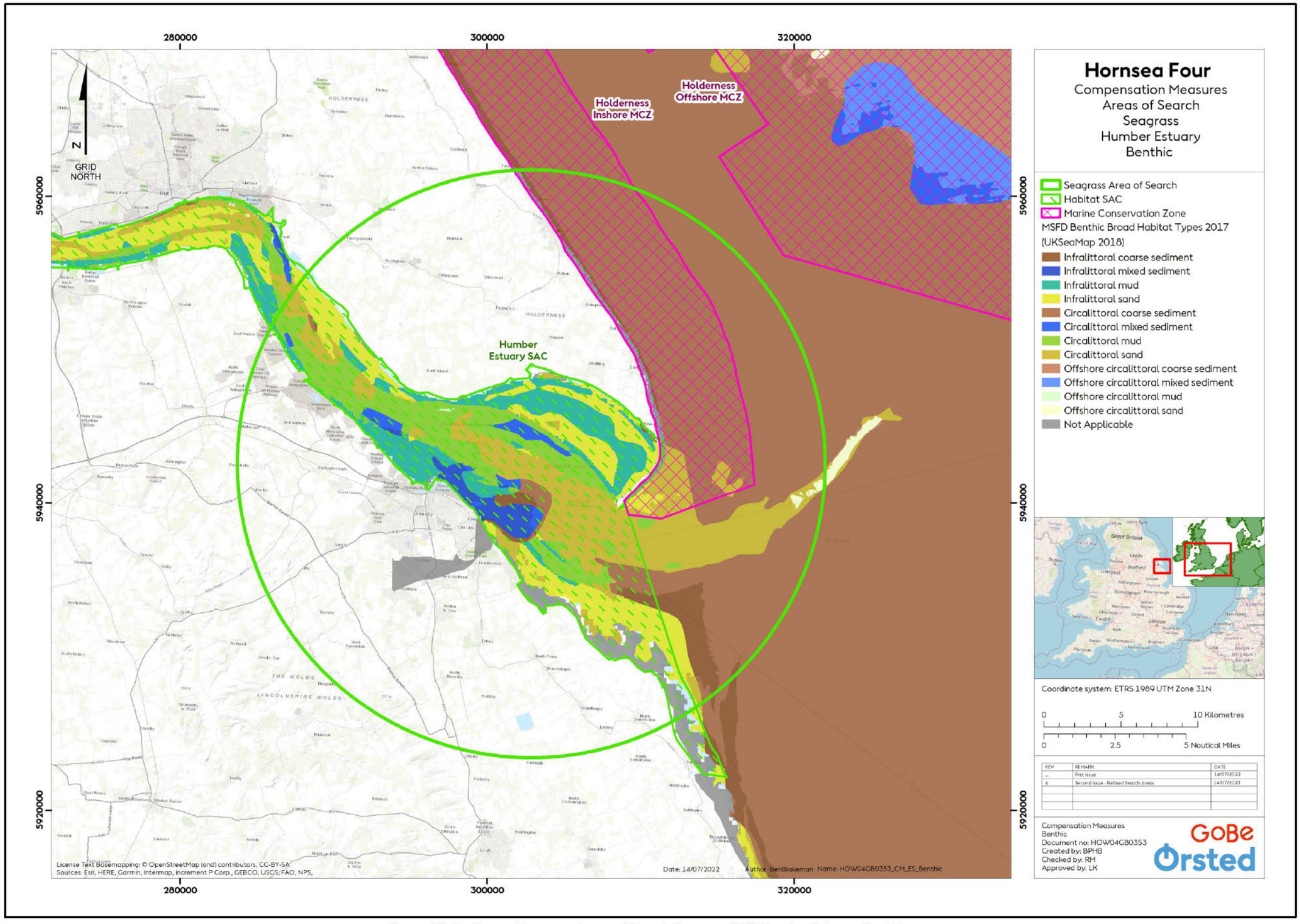


Figure 23: Resilience Measures Areas of Search Seagrass E1~~7~~: Humber Estuary Benthic.

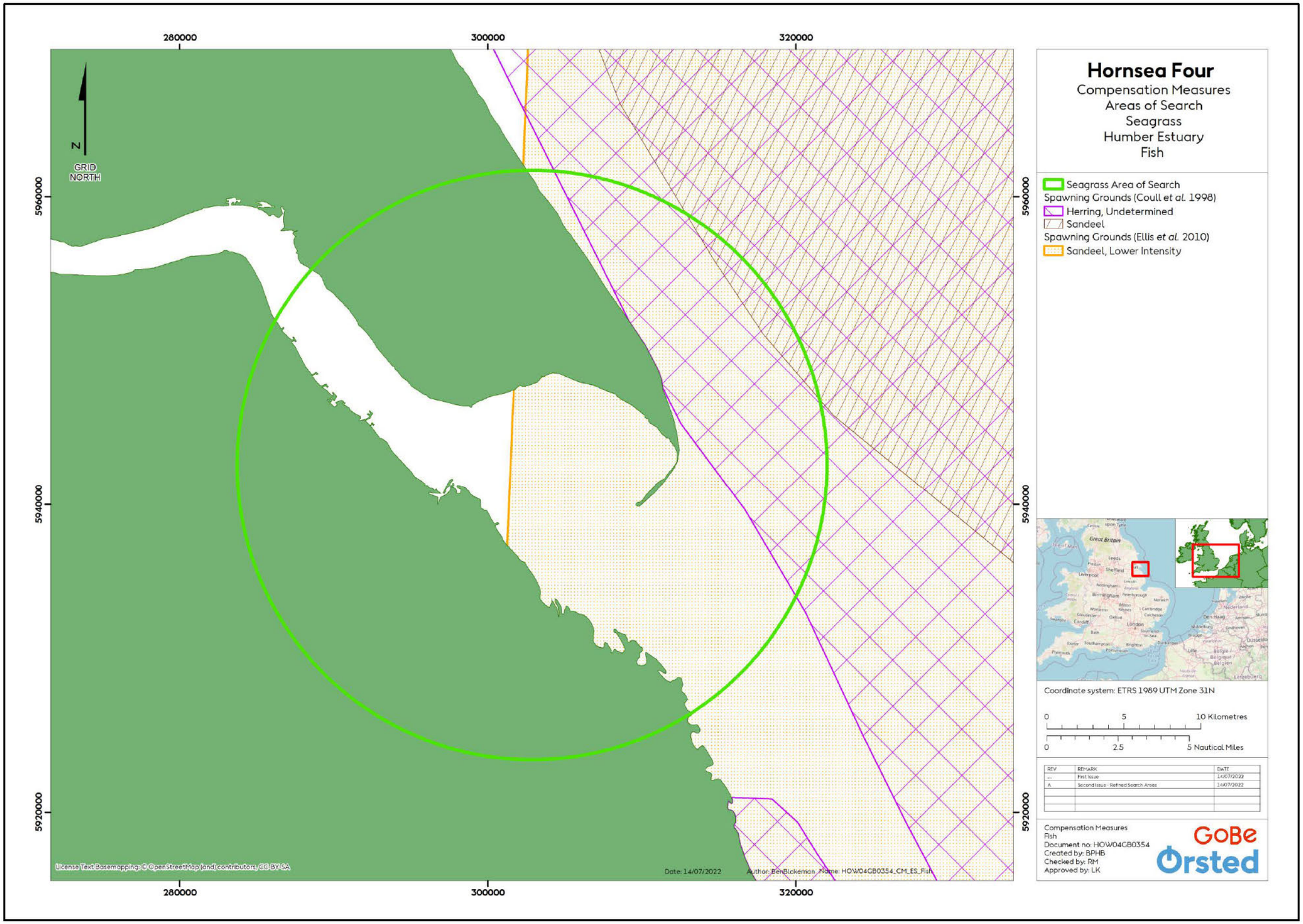
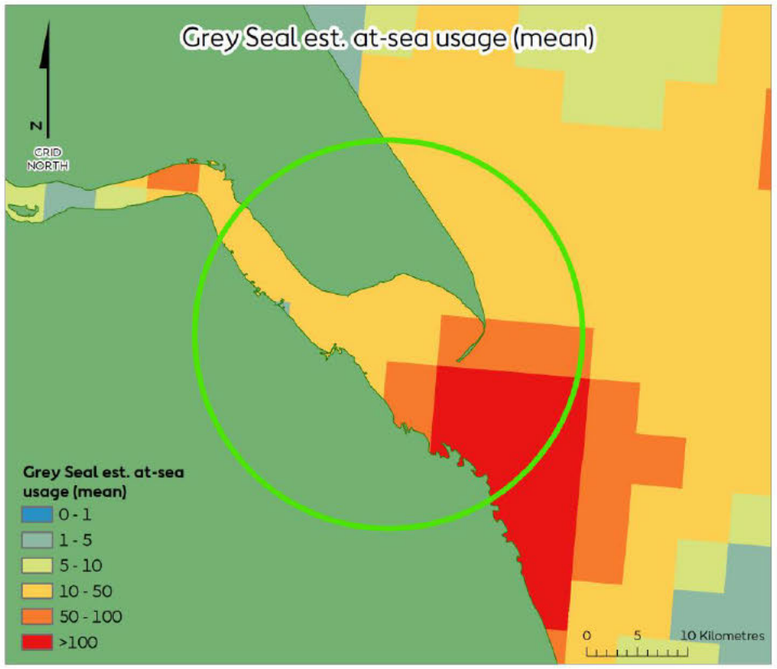
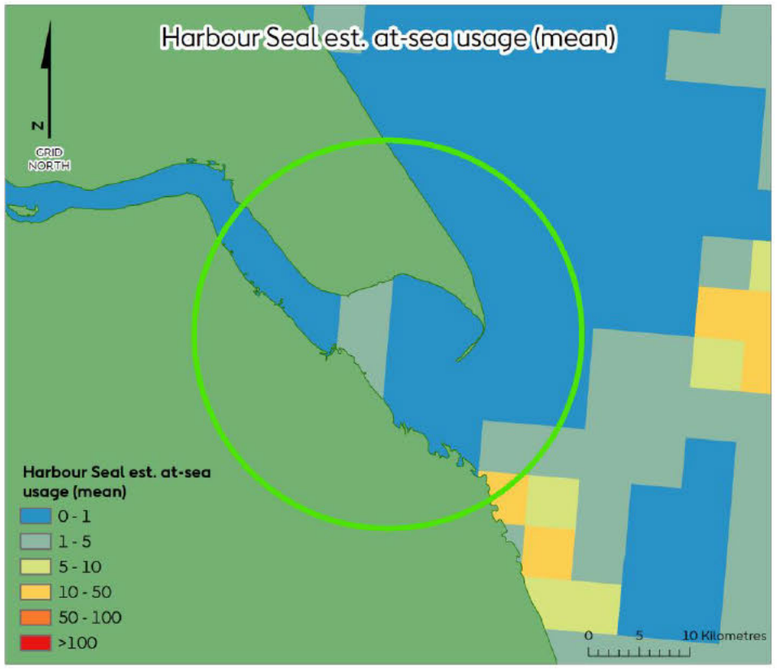


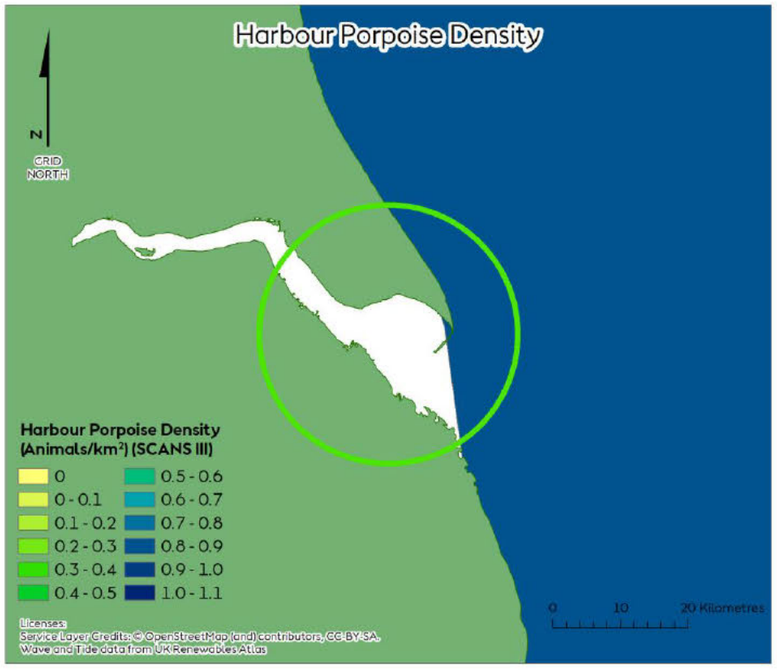
Figure 24: Resilience Measures Areas of Search Seagrass E17: Humber Estuary Fish.

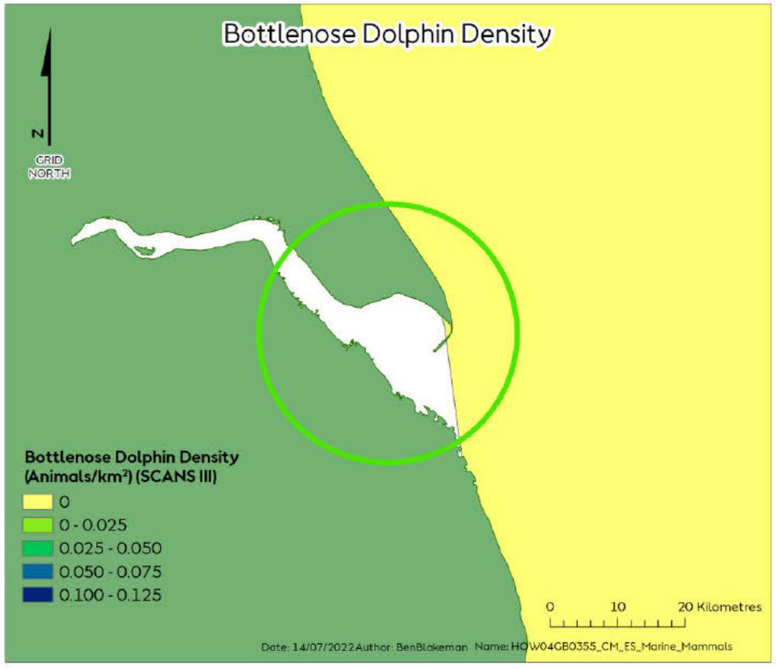




Hornsea Four
Compensation Measures
Areas of Search
Seagrass
Humber Estuary
Marine Mammals

Seagrass Area of Search





Estimated at-sea Distribution of Grey and Harbour Seals maps data from Sea Mammal Research Unit (SMRU) and Marine Scotland, 2017

Coordinate system: ETRS 1989 UTM Zone 31N

REV	REMARK	DATE
---	First Issue	14/07/2022
A	Second Issue - Refined Search Areas	14/07/2022

Compensation Measures
Marine Mammals
Document no: HOW04GB0355
Created by: BPHB
Checked by: TB
Approved by: LK

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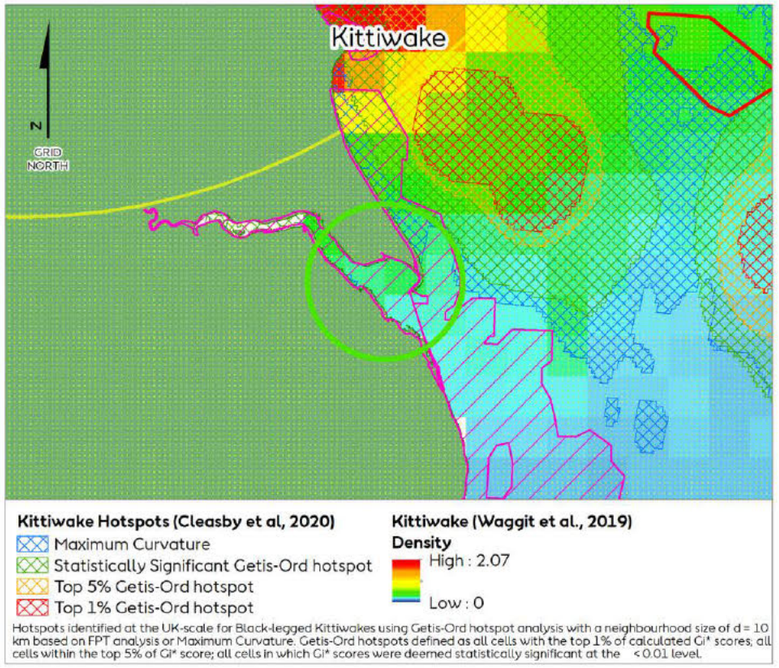
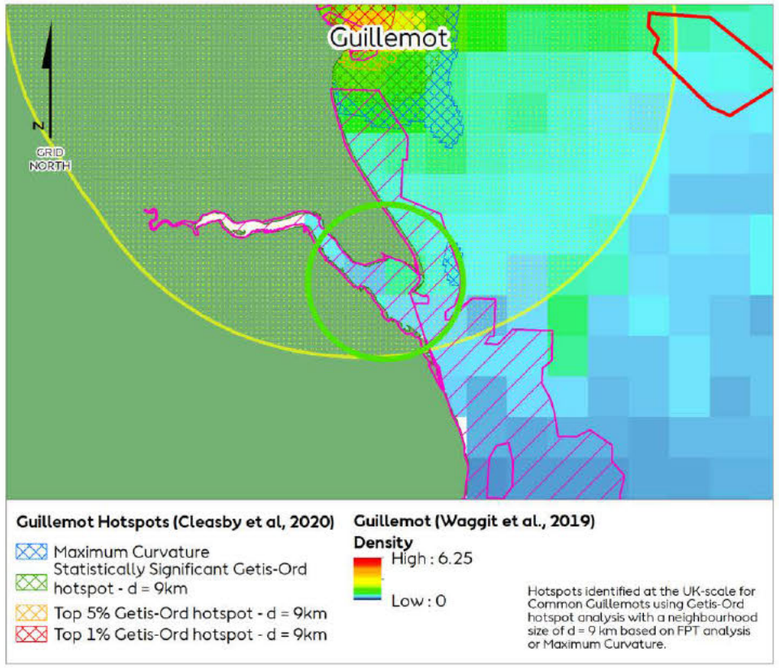
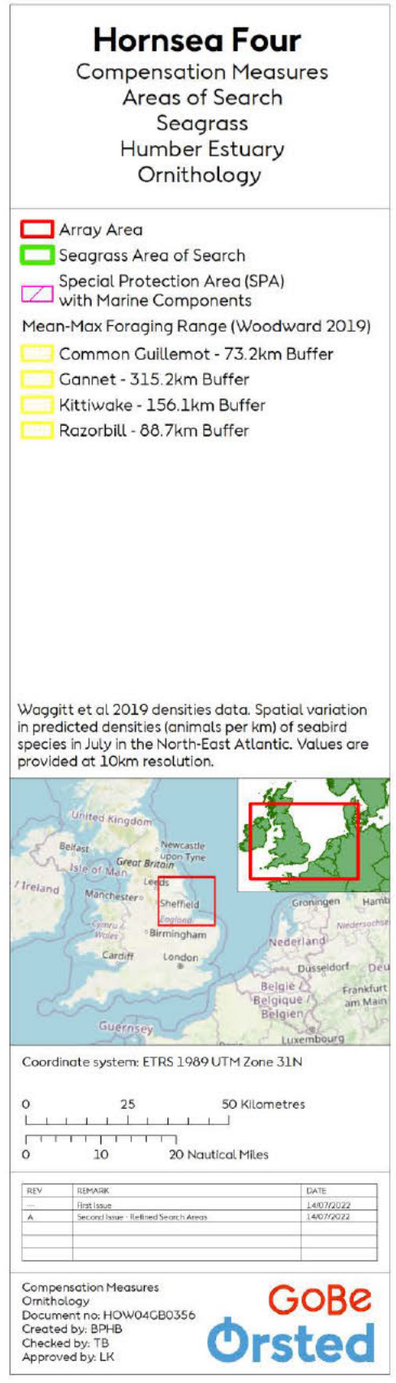
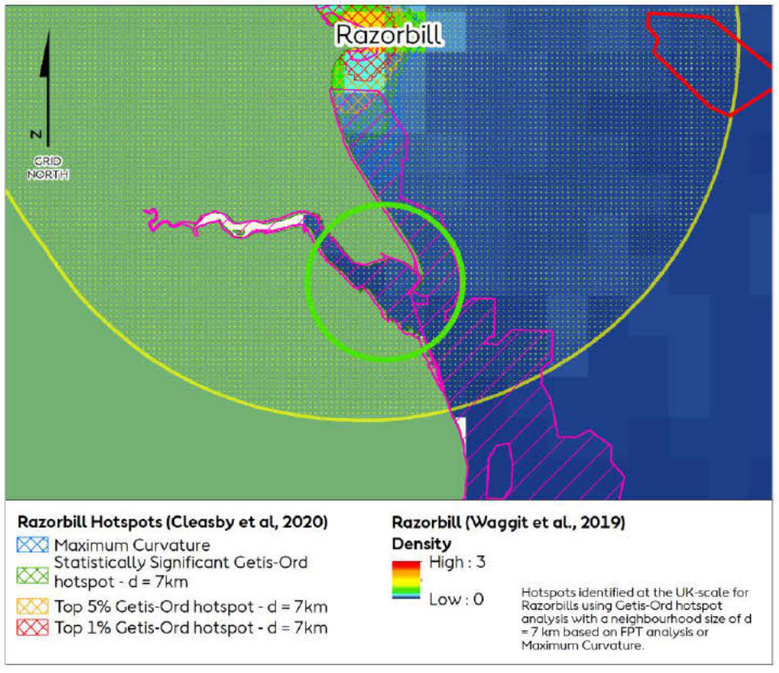
Figure 25: Resilience Measures Areas of Search Seagrass E17: Humber Estuary Marine Mammals.









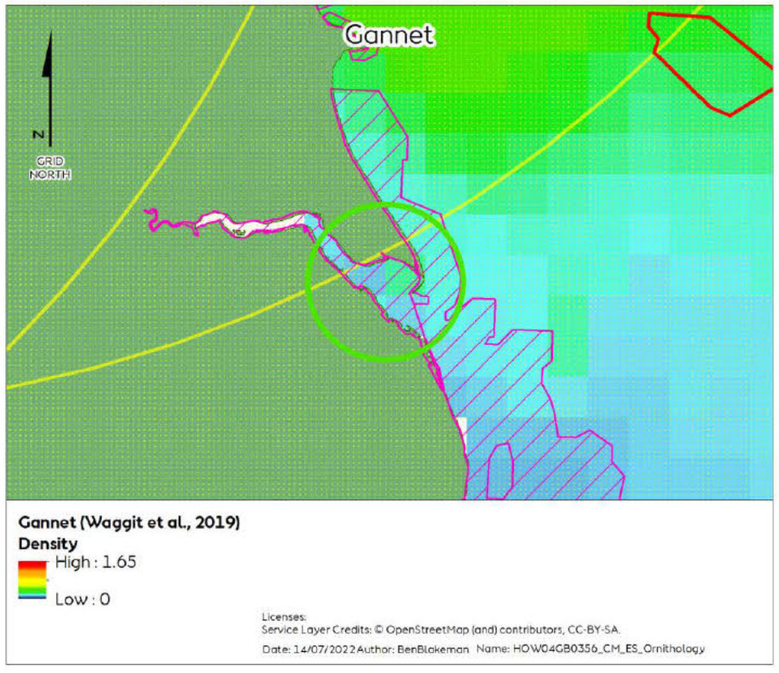
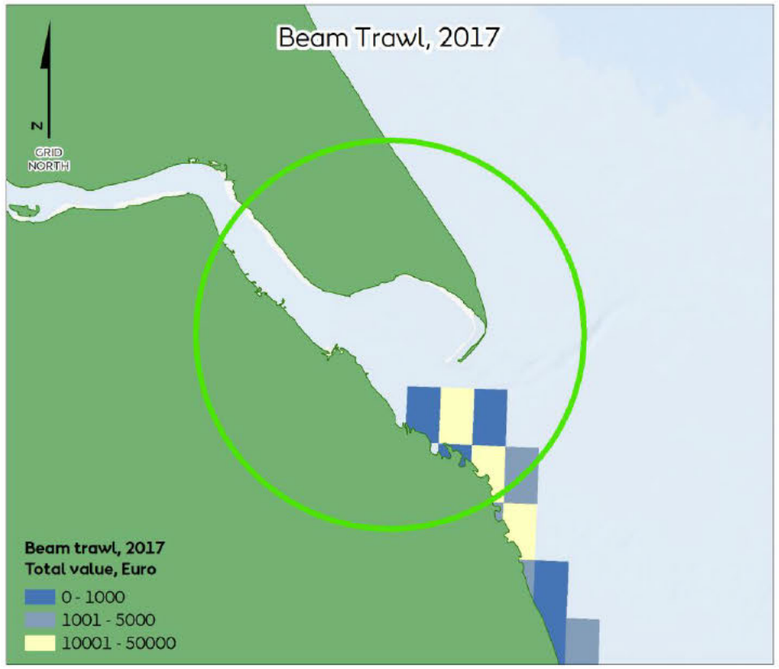
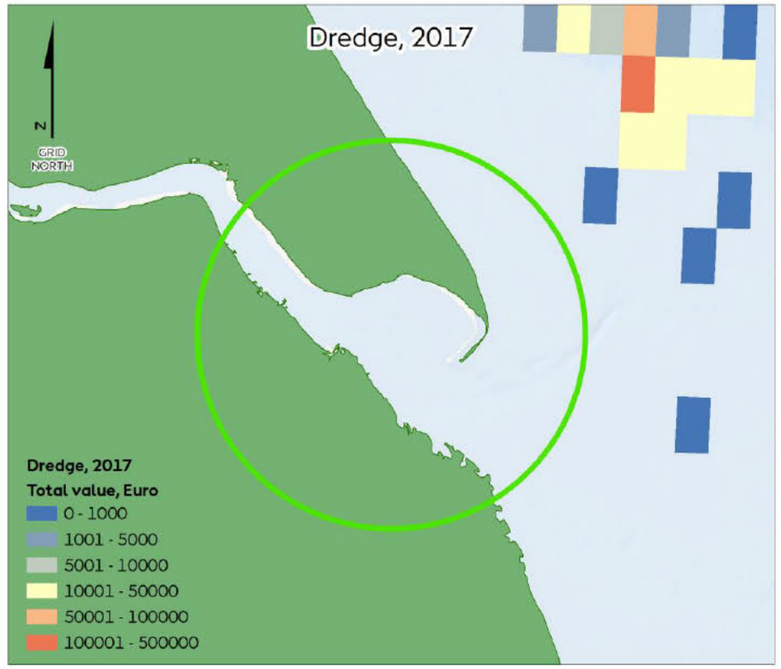


Figure 26: Resilience Measures Areas of Search Seagrass E17: Humber Estuary Ornithology.





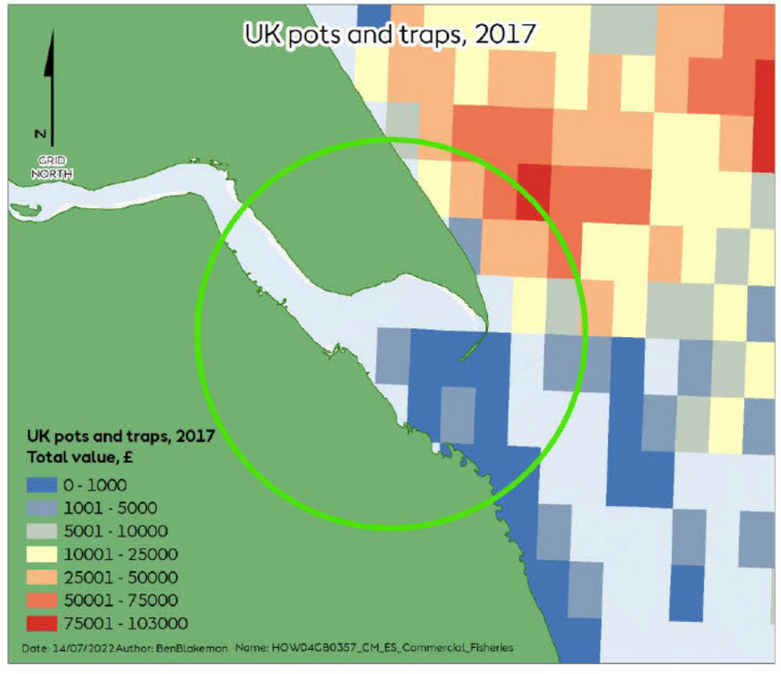


Figure 27: Resilience Measures Areas of Search Seagrass E1~~7~~: Humber Estuary Commercial Fisheries.

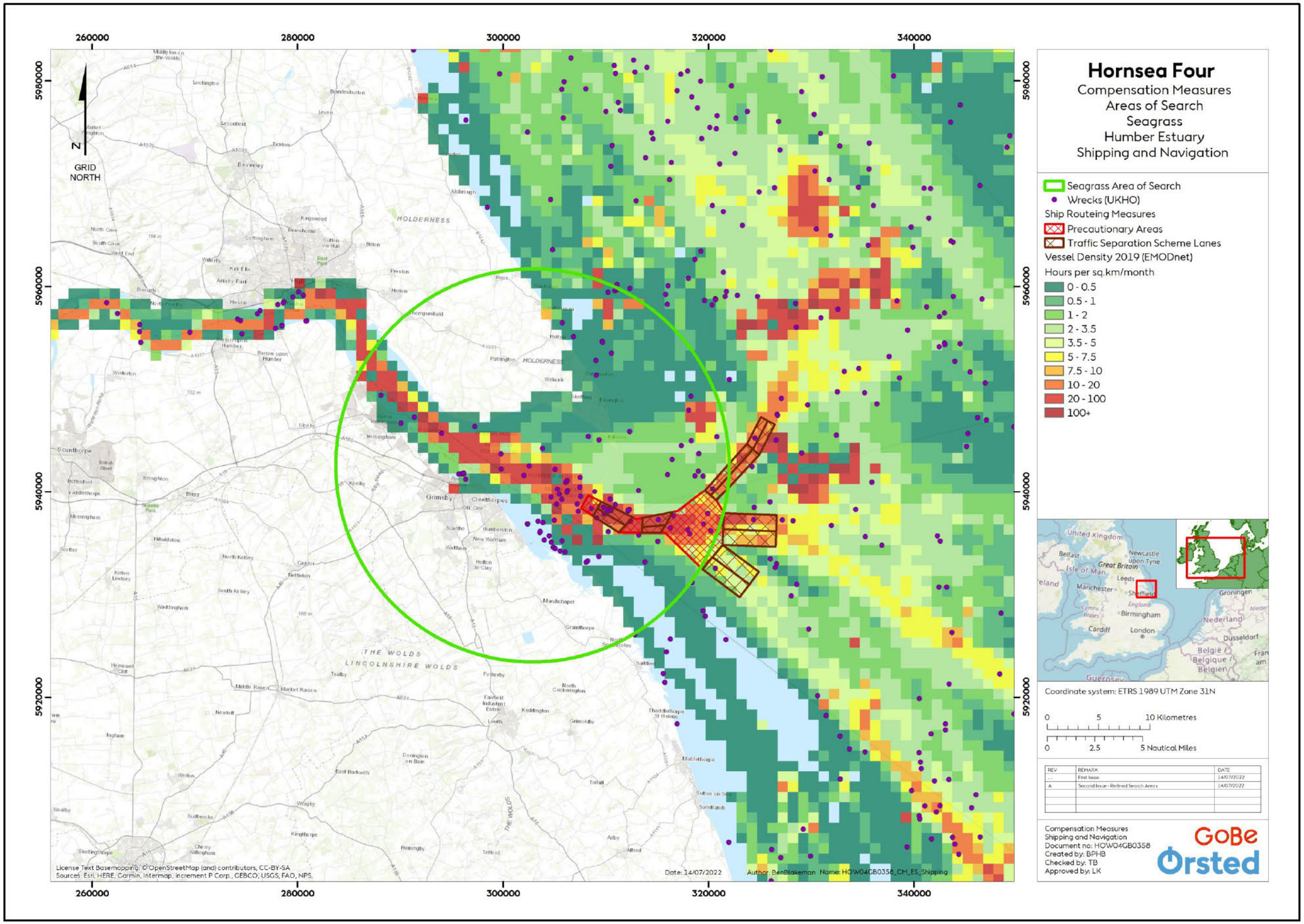


Figure 28: Resilience Measures Areas of Search Seagrass E1~~7~~: Humber Estuary Shipping and Navigation.

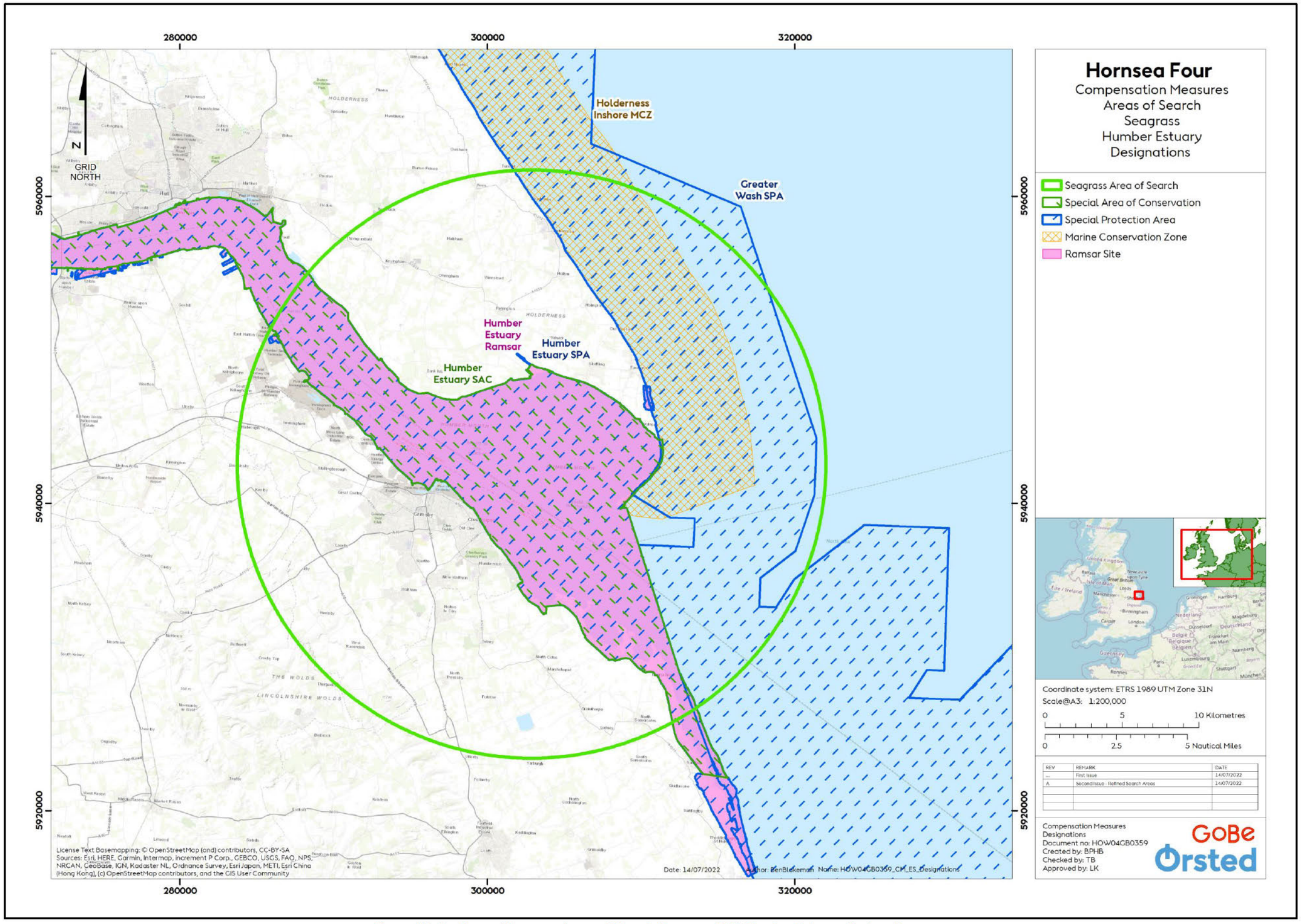


Figure 29: Resilience Measures Areas of Search Seagrass E1~~7~~: Humber Estuary Designations.

12.3 Assessment

12.3.1 Identification of Impacts and Scope of Assessment

12.3.1.1 Based on the information presented in ~~Volume A4, Annex~~A4. ~~6.1: Compensation Project Description~~ (Deadline 7 submission) ~~(APP-057)~~ (and detailed in Section 4.1.9), all activities associated with the construction, implementation/O&M, and decommissioning of the resilience measure – fish habitat enhancement (seagrass) Compensation Measure were defined and potential impact pathways identified.

12.3.1.2 Table 12 details the impacts that were scoped out of the assessment at this stage alongside justification as to why each impact was scoped out.

12.3.1.3 All impacts considered to be scoped into the assessment are detailed in ~~Volume A4, Annex~~A4. 6.3: Compensation Impacts Register (Deadline 7 submission)~~(APP-059)~~.

Table 12: Resilience Measure – Fish Habitat Enhancement (Seagrass) – Impacts Scoped Out of Assessment.

EIA Topic	Phase	Potential Impact	Justification for Scoping Out
Benthic and Intertidal Ecology Fish and Shellfish Ecology Marine Mammals Offshore and Intertidal Ornithology	Installation/ Construction Implementation/ O&M	Accidental release of pollutants (e.g. from accidental spillage/leakage) and resulting in potential effects on receptors.	The magnitude of an accidental spill incident will be limited by the size of chemical or oil inventory on construction vessels. In addition, released hydrocarbons would be subject to rapid dilution, weathering and dispersion and would be unlikely to persist in the marine environment. The likelihood of an incident will be reduced by implementation of a Project Environmental Management and Monitoring Plan (PEMMP), undertaken in accordance with CoC-OFF-7 (~~Volume A4, Annex~~A4.~~ 6.4: Compensation Commitments Register~~ (Deadline 7 submission)~~(APP-060)~~). This impact has therefore been scoped out of the assessment.
Benthic and Intertidal Ecology Fish and Shellfish Ecology	Installation/ Construction Implementation/ O&M	Seabed disturbances leading to the release of sediment contaminants and resulting in potential effects on receptors.	Following any seabed disturbances, the majority of resuspended sediments are expected to be deposited within the immediate vicinity of the works. The release of any potential contaminants that may be present within the small proportion of fine sediments is likely to be rapidly dispersed with the tide and/or currents therefore increased bioavailability resulting in adverse eco-toxicological effects are not expected. As such and combined with the limited extent and duration of any seabed disturbances, the impact has been scoped out of the assessment.
All EIA Topics	Decommissioning	All potential impacts.	It is currently anticipated that the implementation of the resilience measure – fish habitat enhancement (seagrass) Compensation Measure will result in new management practices which shall continue for the lifetime of Hornsea Four. The Compensation Measure sites will be left in perpetuity and as such, all decommissioning impacts have been scoped out of the assessment.
Aviation and Radar	Installation/ Construction Implementation/ O&M	All potential impacts.	Due to the lack of impact pathway, all potential aviation and radar impacts are scoped out.
Seascape, Landscape and Visual Resources	Installation/ Construction Implementation/ O&M	All potential impacts.	Due to the lack of impact pathway, all potential seascape, landscape and visual resources impacts are scoped out.

EIA Topic	Phase	Potential Impact	Justification for Scoping Out
Infrastructure and Other Users	All Phases	All potential impacts on aggregate dredging activities, disposal sites, Carbon Capture and Storage (CCS) sites, cables and pipelines, Oil & Gas (O&G) activities.	The resilience measure – fish habitat enhancement (seagrass) Compensation Measure will not be implemented in immediate proximity to aggregate dredging activities, disposal sites, CCS sites, cables and pipelines, and Oil & Gas (O&G) activities as per CoC-OFF-13. As such, all potential impacts on these receptors have been scoped out of the assessment.

12.3.2 Impact Assessment

12.3.2.1 ~~Volume A4, Annex~~A4.~~6.3: Compensation Impacts Register~~ (Deadline 7 submission)~~(APP-059)~~ identifies the potential scoped in impacts that could result from the installation/construction, implementation/O&M, and decommissioning of the resilience measure – fish habitat enhancement (seagrass)~~–~~, relating to each technical topic under consideration in the EIA process. Each of these impacts have been considered, following the process outlined in **Section 6**, with the MDS defined, magnitude of impact and sensitivity of receptor considered and the level of significance derived by the matrix approach. The Compensation Impacts Register is presented in ~~Volume A4, Annex~~A4.~~6.3: Compensation Impacts Register~~ (Deadline 7 submission)~~(APP-059)~~.

12.3.2.2 As presented in ~~Volume A4, Annex~~A4.~~6.3: Compensation Impacts Register~~ (Deadline 7 submission)~~(APP-059)~~, it has been concluded that found that no LSE is predicted for any of the potential impacts arising from the installation/construction, implementation/O&M and decommissioning of the resilience measure – fish habitat enhancement (seagrass). As such, the potential effects to all receptors are therefore **not significant** in terms of the EIA Regulations (~~Volume A1, Chapter~~A1.~~5: Environmental Impact Assessment Methodology~~ (APP-011)).

13 Conclusions

13.1.1.1 The Hornsea Four Compensation Measures EIA has considered the environmental impacts associated with the implementation of the following proposed Compensation Measures:

- New offshore nesting platform~~(s)~~;
- Repurposed offshore nesting platform~~(s)~~;
- New onshore nesting platform~~(s)~~;
- Bycatch reduction technologies;
- Predator eradication; and
- Resilience Measure – Fish Habitat Enhancement (Seagrass).

13.1.1.2 Each measure is described in terms of the AoS (where the measures could be located), how the measure would be implemented, managed and (where relevant) decommissioned. For each Compensation Measure, the potential impacts has been considered, following the process outlined in **Section 6**, with some impacts scoped out and others taken forward for assessment, with the MDS defined, magnitude of impact and sensitivity of receptor considered and the level of significance derived by the matrix approach. The Compensation Impacts Register is presented in ~~**Volume A4, Annex**~~A4 ~~–~~.**6.3: Compensation Impacts Register** (Deadline 7 submission)~~**(APP-059)**~~.

13.1.1.3 As presented in ~~**Volume A4, Annex**~~A4.~~–~~**6.3: Compensation Impacts Register** (Deadline 7 submission)~~**(APP-059)**~~, for all Compensation Measures, it has been concluded that found that no LSE is predicted for any of the potential impacts arising from the installation/construction, implementation/O&M and decommissioning of the Compensation Measures. As such, the potential effects to all receptors are therefore **not significant** in terms of the EIA Regulations (~~**Volume A1, Chapter**~~A1.~~-~~**5: Environmental Impact Assessment Methodology** (APP-011)).

13.1.1.4 The assessment provided in this document is based on the current understanding of the location, scope and nature of the proposed Compensation Measures. It should be noted, however, that ultimately, the Compensation Measures will not be consented through the Hornsea Four DCO application process and will be subject to (where necessary) standalone EIA and HRA processes as part of their own consenting process (for example a Marine Licence application and/or Planning Application). As part of that consenting process, further assessment work will be undertaken, based on refined design and methodology details.

14 References

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