Hornsea Project Four: Environmental Statement (ES)

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Volume A5, Annex 2.3: Marine Conservation Zone Assessment

Prepared	GoBe Consultants Ltd. August 2021
Checked	GoBe Consultants Ltd. August 2021
Accepted	David King, Orsted. August 2021
Approved	Julian Carolan, Orsted. September 2021

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Glossary

Term	Definition
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 Environmental Statement (ES). Secondary commitments are incorporated to reduce LSE to environmentally acceptable levels following initial assessment i.e. so that residual effects are acceptable.
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 Four.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Projects (NSIP).
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 importance, 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 Statement.
Export cable corridor (ECC)	The specific corridor of seabed (seaward of Mean High Water Springs (MHWS)) and land (landward of MHWS) from the Hornsea Four array area to the Creyke Beck National Grid substation, within which the export cables will be located.
Habitats Regulations Assessment (HRA)	A process which helps determine likely significant effects and (where appropriate) assesses adverse impacts on the integrity of European conservation sites and Ramsar sites. The process consists of up to four stages of assessment: screening, appropriate assessment, assessment of alternative solutions and assessment of imperative reasons of over-riding public interest (IROPI) and compensatory measures.
High Voltage Alternating Current (HVAC)	High voltage alternating current is the bulk transmission of electricity by alternating current, whereby the flow of electric charge periodically reverses direction.
High Voltage Direct Current (HVDC)	High voltage direct current is the bulk transmission of electricity by direct current (DC), whereby the flow of electric charge is in one direction.
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.
Order Limits	The limits within which Hornsea Four (the 'authorised project') may be carried out.
Orsted Hornsea Project Four Ltd.	The Applicant for the proposed Hornsea Project Four Offshore Wind Farm Development Consent Order (DCO).

Acronyms

Acronym	Definition
AfL	Agreement for Lease
CBRA	Cable Burial Risk Assessment
CEA	Cumulative Effects Assessment
CFE	Controlled Flow Excavation
CPEMMP	Construction Project Environmental Management and Monitoring Plan
DCO	Development Consent Order
DML	Deemed Marine Licences
DMRB	Design Manual for Roads and Bridges
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
EP	Evidence Plan
ES	Environmental Statement
HDD	Horizontal Directional Drilling
HRA	Habitats Regulations Assessment
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
LSE	Likely Significant Effect
MCAA	Marine and Coastal Access Act
MCZ	Marine Conservation Zone
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MSFD	Marine Strategy Framework Directive
NREC	Natural Environment and Rural Communities
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
RIAA	Report to Inform Appropriate Assessment
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SPA	Special Protection Area
SSC	Suspended Sediment Concentration
SSSI	Sites of Special Scientific Interest
TPOs	Tree Preservation Orders
WTG	Wind Turbine Generator

Units

Unit	Definition
m	Metre
km	Kilometre
mg/l	Milligrams per litre

1 Introduction

1.1 Project Background

1.1.1.1 Orsted Hornsea Project Four Ltd (hereafter the 'Applicant') is proposing to develop the Hornsea Project Four offshore wind farm (hereafter 'Hornsea Four'). Hornsea Four will be located approximately 69 km offshore from the East Riding of Yorkshire coast in the Southern North Sea and will be the fourth project to be developed in the former Hornsea Zone (please see **Volume A1, Chapter 1: Introduction** for further details on the Hornsea Zone). Hornsea Four will include both offshore and onshore infrastructure including offshore generating stations (within the wind farm), export cables to the landfall, and connection to the electricity transmission network (please see **Volume A1, Chapter 4: Project Description** for full details on the Project Design).

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 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 3: Site Selection and Consideration of Alternatives** and **Volume A4, Annex 3.2: Selection and Refinement of the Offshore Infrastructure**.

1.2 Aims and Objectives

1.2.1.1 Specific consideration of Marine Conservation Zones (MCZs) is required for any Marine Licence or DCO application containing deemed Marine Licences (DMLs). The Marine Management Organisation (MMO) has specific duties for MCZs and Marine Licence decision making under section 126 of the Marine and Coastal Access Act (MCAA) 2009. Section 126 applies where:

- A public authority has the function of determining an application (whenever made) for authorisation of the doing of an act; and
- The act is capable of affecting (other than insignificantly):
    - The protected features of an MCZ; and / or
    - Any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependent.

1.2.1.2 This document has been produced as an annex to the Hornsea Four ES to provide evidence on whether the potential impacts of Hornsea Four give rise to a significant risk of hindering

the conservation objectives of the following two MCZs that have been identified within one tidal excursion (up to 14 km) of Hornsea Four and are shown in **Figure 1**:

- Holderness Inshore MCZ; and
- Holderness Offshore MCZ.

1.2.1.3 This document follows guidance published by the MMO (2013) on how these assessments should be undertaken. The MCZ assessment has been undertaken based on the Hornsea Four project information provided in **Volume A1, Chapter 4: Project Description**.

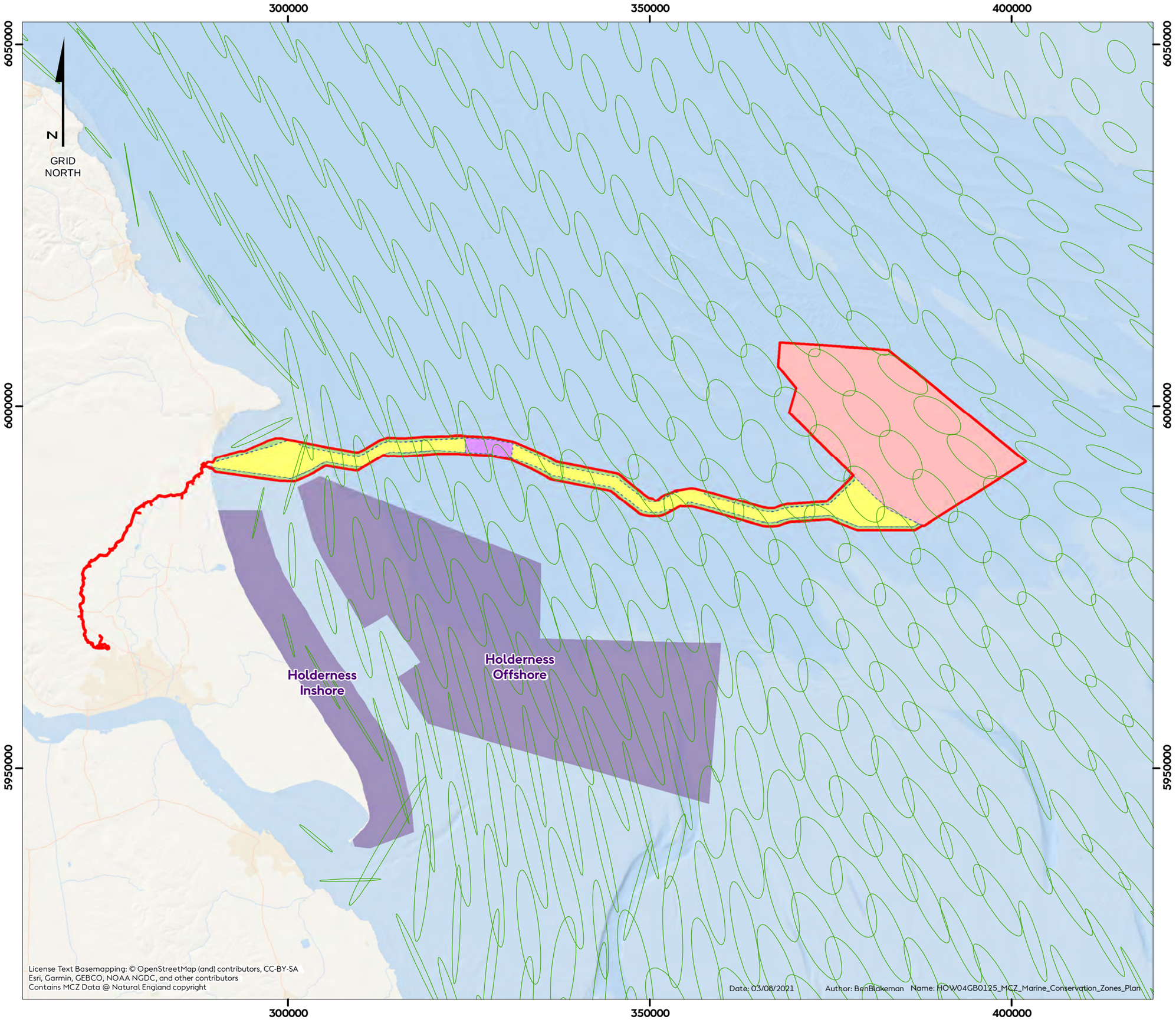
1.2.1.4 This MCZ assessment should be read alongside the following chapters of the ES, which are referred to and drawn upon throughout this document:

- **Volume A1, Chapter 4: Project Description**;
- **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes**;
- **Volume A2, Chapter 2: Benthic and Intertidal Ecology**;
- **Annex 1.1: Marine Geology, Oceanography and Physical Processes Technical Report**; and
- **Annex 2.1: Benthic and Intertidal Ecology Technical Report**.

Hornsea Four

Figure 1

Marine Conservation Zones (MCZs) within one tidal excursion of Hornsea Four



- Order Limits
- Array Area
- HVAC Booster Station Works Area
- Offshore Temporary Works Area
- Offshore Export Cable Corridor
- Marine Conservation Zones
- Spring Tidal Ellipses

Coordinate system: ETRS 1989 UTM Zone 31N

Scale@A3: 1:500,000

0 10 20 Kilometres

0 5 10 Nautical Miles

REV	REMARK	DATE
....	First Issue	04/07/2019
A	Updated following PEIR consultation, for DCO	03/08/2021

Marine Conservation Zones Plan
Document no: HOW04GB0125
Created by: BPHB
Checked by: AL
Approved by: LK

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1.3 Project Overview

1.3.1.1 This section provides a brief overview of the key components of Hornsea Four (**Figure 1**). A full description of the project is described in **Volume A1, Chapter 4: Project Description**.

1.3.1.2 In order to inform the EIA, Hornsea Four has created an indicative layout of 190 foundation positions, containing 180 potential wind turbine generator (WTG) positions and 10 potential platform positions (i.e. offshore substations, accommodation platforms and High Voltage Direct Current (HVDC) converter substations) within the array area. The Hornsea Four array area will be approximately 69 km due east of Flamborough Head at its closest point.

1.3.1.3 In the event that a High Voltage Alternating Current (HVAC) transmission system is taken forward, up to three HVAC booster stations will be located in the Hornsea Four offshore Export Cable Corridor (ECC). An early project decision was made to commit to the avoidance of any direct overlap with the Hornsea Four offshore ECC and either the Holderness Inshore MCZ or the Holderness Offshore MCZ (see commitments Co2, Co44, and Co45 in **Volume A4, Annex 5.2: Commitments Register**, and **Table 2**). Since submission of the PEIR, the final landfall has been selected and the nearshore section of the offshore ECC tapers towards this landfall location on the coast (southeast of Fraisthorpe) where a commitment has been made to install cables across the intertidal by Horizontal Directional Drilling (HDD) only (Co187). Details of the site selection and route refinement process can be found in **Volume A4, Annex 3.2: Selection and Refinement of Offshore Infrastructure**.

1.3.1.4 Hornsea Four will include up to a maximum of six offshore electrical export cables within the offshore ECC. Where possible, the offshore export cables will be buried below the seabed, through one, or a combination of the following installation methods: trenching, dredging, jetting, ploughing, vertical injection, controlled flow excavation (CFE) and rock cutting. The installation method and target burial depth will be defined post-consent based on a cable burial risk assessment (CBRA) (or similar) considering ground conditions, as well as the potential for impacts upon cables such as from trawling and vessel anchors. For detailed cable installation techniques see **Volume A1, Chapter 4: Project Description**.

1.3.1.5 The Hornsea Four Order Limits were selected following a consideration of both engineering and environmental matters. For further details regarding the site selection of Hornsea Four see **Volume A1, Chapter 3: Site Selection and Consideration of Alternatives**.

2 Consultation

2.1.1.1 In order to determine whether an MCZ assessment was required for Hornsea Four, an initial screening exercise was undertaken as part of the Hornsea Four EIA Scoping Report (Annex F - Orsted 2018). Comments received as part of the EIA Scoping process in relation to MCZs are summarised in **Table 1**.

2.1.1.2 Consultation post-Scoping has been important to the evolution of Hornsea Four and the parameters for assessment. As part of the EIA process, ongoing consultation has been undertaken with various statutory and non-statutory stakeholders, under the auspices of the Evidence Plan (EP) process. A draft MCZ Assessment was submitted with the PEIR, forming part of the Section 42 consultation materials. Stakeholder Section 42 responses in relation to MCZs are also summarised in **Table 1**, along with how these responses have been considered within the ES. Only one Section 42 comment was received specifically on the MCZ Assessment published as part of the PEIR. However, as noted in their response, Natural

England also made several comments of relevance to the MCZ Assessment within comments specifically addressing the Physical Processes and Benthic Ecology chapters. Those comments are addressed in full in the relevant documents, as described in **B1.1: Consultation Report**, however the comments of principal importance to the MCZ Assessment are included in **Table 1** here for completeness.

Table 1: Summary of consultation relating to the MCZ Assessment.

Consultee, Forum and Date	Comment	Where addressed in the ES
Natural England, Scoping Response, November 2018	In relation to the screening criteria proposed by Hornsea Four (suspended sediment dispersal ranges from other Hornsea projects) it needs to be clearly demonstrated why the assumptions made in relation to other projects are appropriate in the context of Hornsea Four.	Appendix A of **Annex 1.1: Marine Processes Technical Report** compares the environmental conditions between Hornsea Project One, Hornsea Project Two and Hornsea Three with Hornsea Four. In addition, the final options for Hornsea Project One and Hornsea Project Two are now based on a fewer number of smaller foundations which would further lessen their potential environmental impact. Furthermore, project-specific marine processes modelling has been undertaken (Appendix C of **Annex 1.1: Marine Processes Technical Report**), the results of which have been used to inform and refine suspended sediment dispersal ranges for the MCZ assessment.
Natural England, Scoping Response, November 2018	Direct impacts should not be scoped out of the MCZ assessment until it can be clearly demonstrated that the cable route and working area does not directly interact with the features of the MCZ. Concerns raised about how Commitment to avoid MCZs will be secured.	Hornsea Four has made Commitments (Co2, Co44, and Co45 – see **Volume A4, Annex 5.2: Commitments Register**) to avoid any spatial overlap with the Holderness Inshore MCZ and the Holderness Offshore MCZ, so that the offshore ECC, will not interact directly with either site. As a result, the offshore ECC is approximately 4,400 m from the boundary of the Holderness Inshore MCZ and approximately 753 m from the boundary of the Holderness Offshore MCZ (**Figure 1**). This avoidance will be secured by means of the Hornsea Four Order Limits that are defined in **C1.1: Draft DCO including Draft DML**. As such, any direct impacts are scoped out.
Natural England, EP Marine Ecology & Processes Technical Panel Meeting 3, April 2019	Concerns raised about the apparent overlap of the Scoping boundary and the Holderness Inshore MCZ and Holderness Offshore MCZ.	
Natural England, Section 42 Response	Natural England welcomes the commitment to avoid direct impacts on Holderness Inshore and Holderness Offshore MCZs, however, as identified within the MCZ assessment, there remains the potential for indirect impacts on both sites. Natural England has provided a number of comments in relation to marine process and	**Section 7** of this document has been updated to reflect the most up-to-date conclusions of **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes** and **Volume A2, Chapter 2: Benthic Subtidal and Intertidal Ecology**. Comments on the physical processes and benthic assessments that relate

Consultee, Forum and Date	Comment	Where addressed in the ES
	benthic ecology that are relevant to the MCZ assessment that may have a bearing on the conclusions, and consequently, we do not support the conclusions of the assessment at this time. Rather than repeat the comments we have previously made in Annex 2 and 3 above, we propose that the MCZ assessment is updated once they have been addressed. In particular, Natural England would draw attention to our comments relating to nearshore and longshore sediment flow and their potential influence on designated sites, and it should be noted that potential impacts on coastal erosion are also relevant considerations in this regard. As a specific comment we would highlight that the potential impacts on the geological feature of Holderness Inshore 'the Binks' should be fully considered. As a minor point, in terms of providing a proportionate level of information it may be simpler to signpost to the MMO guidance on MCZ assessment than to repeat it in the Methodology section.	to the MCZ Assessment have been included in the rows of this table below for completeness. **Paragraphs 7.1.2.12** and **7.1.2.13** have been updated specifically in relation to nearshore and longshore sediment flows, drawing on information presented in **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes** (Impact MP-O-4: Impacts to nearshore sediment transport pathways). The geological feature 'The Binks' has now been included as a subset of the Spurn Head feature as defined in the designation order (The Holderness Inshore MCZ Designation Order 2016[1]). Specific consideration of this feature is given in **Section 7.1.**
Section 42 on other aspects of the PEIR related to the MCZ Assessment		
Natural England, Section 42 Response	For all locations along the Holderness Coast, potential impacts on the Humber Estuary and Holderness Inshore MCZ should be considered in the context of marine physical processes under 'Nature Conservation'. The implication of cable crossings with Dogger Bank A&B should also be considered in terms of potential Ecological Impact (Marine Processes).	**Section 7** of this document provides an overview on the physical processes effects of these MCZs and **paragraph 7.1.5.6** specifically addresses the implication of cable crossings with Dogger Bank A & B. Further details can be found in **Volume A2, Chapter 2: Benthic and Intertidal Ecology**.
Natural England, Section 42 Response on Physical Processes Assessment	All sites that could potentially be affected by the interruption of sediment transport along the Holderness Coast should be considered, particularly the Humber Estuary Special Area of Conservation (SAC), Special Protection Area (SPA), Site of Special Scientific Interest (SSSI) and Ramsar. Clarifications/ updates should be made in the relevant ES chapters and the MCZ assessment	All sites potentially affected by the interruption of sediment transport along the Holderness Coast have been considered in **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes** and **Annex 1.1: Marine Processes Technical Report**.

[1] http://www.legislation.gov.uk/ukmo/2016/11/contents/created

Consultee, Forum and Date	Comment	Where addressed in the ES
	and the Report to Inform Appropriate Assessment (RIAA) updated accordingly."	
Natural England, Section 42 Response on Physical Processes Assessment	Smithic Sands is a classic banner bank and as such is essential for the connection of sediment pathways from the North of Flamborough to the Holderness Coast and beyond. The importance of this is not really drawn out in the text. On this basis additional receptors should also be considered, including but not limited to Holderness Inshore MCZ and the Humber Estuary SAC, SPA, SSSI and Ramsar. Sections to be updated with full consideration of receptors.	Smithic Sands is identified as a pertinent feature, formed largely by local sediment supply. Additional comment has been added to **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes**. Receptors in **Annex 1.1: Marine Processes Technical Report** refer to the Holderness Inshore MCZ and the Humber Estuary SAC, SPA, Ramsar, and SSSI, where relevant.
Natural England, Section 42 Response on Physical Processes Assessment	Blockage to nearshore sediment transport has the potential to impact along the full extent of the Holderness coast and beyond. The current list of receptors is incomplete. The Humber Estuary SPA, SAC, SSSI Ramsar and Holderness Inshore MCZ should be included as a minimum. List of receptors should be re-evaluated.	Table 11.1 of **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes** recognises the Holderness Coast cliffs as a receptor. Receptors have been updated in **Annex 1.1: Marine Processes Technical Report** to refer to the Holderness Inshore MCZ and the Humber Estuary SAC, SPA, Ramsar, and SSSI, where relevant.
MMO Section 42 Response on Benthic Ecology Assessment	Whilst most of the potential impacts have been considered, there are two that have not: Temporary habitat loss due to foundation drilling deposits should be assessed; Impacts on the habitats outside the array and cable corridor should be assessed in relation to increased suspended sediment. Currently only habitats within the boundaries and those specific to the Holderness MCZ and Flamborough Head SAC have been considered. There seems to be data available to undertake this assessment (according to Figure 2 and Figure 9 of Annex 5 Benthic and Intertidal Ecology Technical Report). This should be considered in the final ES.	**Volume A2, Chapter 2: Benthic and Intertidal Ecology** and **Annex 2.1: Benthic and Intertidal Ecology Technical Report** have been updated to include the assessment of these impacts.

3 Commitments

3.1.1.1 Hornsea Four has adopted commitments (primary design principles inherent as part of Hornsea Four, installation techniques and engineering designs/modifications) as part of the pre-application phase, to eliminate and/or reduce the likely significant effect (LSE) arising from a number of impacts. These are outlined in **Volume A4, Annex 5.2 Commitments**

Register. Further commitments (adoption of best practice guidance), referred to as tertiary commitments are embedded as an inherent aspect of the EIA process. Secondary commitments are incorporated to reduce LSE to environmentally acceptable levels following initial assessment i.e. so that residual effects are reduced to environmentally acceptable levels.

3.1.1.2 The Commitments adopted by Hornsea Four that are relevant to the MCZ assessment are summarised in Table 2. A full list of the Commitments made by Hornsea Four is presented in Volume A4, Annex 5.2: Commitments Register.

Table 2: Relevant MCZ Commitments.

Commitment ID	Measure proposed	How the measure will be secured
Co2	Primary: A range of sensitive historical, cultural and ecological conservation areas (including statutory and non-statutory designations) have been directly avoided by the permanent Hornsea Four footprint, at the point of Development Consent Order Submission (DCO). These include, but are not restricted to: Listed Buildings (564 sites); Scheduled Monuments (30 sites); Registered Parks and Gardens (Thwaite Hall and Risby Hall); Onshore Conservation Areas (18 sites); Onshore National Site Network (one site); Offshore National Site Network (three sites); Offshore Marine Conservation Zones (two sites); Sites of Special Scientific Interest (two sites); Local Nature Reserves (none have been identified); Local Wildlife sites (33 sites); Yorkshire Wildlife Trust Reserves (none have been identified); Royal Society for the Protection of Birds (RSPB) Reserves (none have been identified); Heritage Coast; National Trust land; Ancient Woodland (10 sites and known Tree Preservation Orders (TPOs)); non-designated built heritage assets (334 sites); and historic landfill (none have been identified). Where possible, unprotected areas of woodland, mature and protected trees (i.e. veteran trees) have and will also be avoided.	DCO Works Plan - Onshore (Volume D1, Annex 4.2: Works Plan – Onshore); and DCO Works Plan - Offshore (Volume D1, Annex 4.1: Works Plan – Offshore)
Co44	Primary: The Holderness Inshore Marine Conservation Zone (MCZ) will not be crossed by the offshore export cable corridor including the associated temporary works area.	DCO Works Plan - Offshore (Volume D1, Annex 4.1: Works Plan – Offshore)
Co45	Primary: The Holderness Offshore Marine Conservation Zone (MCZ) will not be crossed by the offshore export cable corridor including the associated temporary works area.	DCO Works Plan - Offshore (Volume D1, Annex 4.1: Works Plan – Offshore)
Co83	Primary: Where possible, cable burial will be the preferred option for cable protection.	DCO Schedule 11, Part 2 - Condition 13(1)(h) and; DCO Schedule 12, Part 2 - Condition 13(1)(h) (Cable Specification and Installation Plan)
Co84	Primary: Presence of habitats of principal importance (Section 41 of the 2006 Natural Environment and Rural Communities (NERC) Act) will be identified through a review of the latest available benthic datasets and pre-construction surveys.	DCO Schedule 11, Part 2 - Condition 13(1)(a)(v) and; DCO Schedule 12, Part 2 - Condition 13(1)(a)(v)

Commitment ID	Measure proposed	How the measure will be secured
	Foundations and cables will be micro-sited around habitats of principal importance wherever reasonably practicable (subject to agreement with the MMO) to an extent not resulting in a hazard for marine traffic and Search & Rescue capability.	(Pre-Construction Plans and Documentation)
Co111	Tertiary: A Construction Project Environmental Management and Monitoring Plan (CPEMMP) will be developed and will include details of: • a marine pollution contingency plan to address the risks, methods and procedures to deal with any spills and collision incidents of the authorised project in relation to all activities carried out below Mean High Water Springs (MHWS); • a chemical risk review to include information regarding how and when chemicals are to be used, stored and transported in accordance with recognised best practice guidance; • a marine biosecurity plan detailing how the risk of introduction and spread of invasive non-native species will be minimised; • waste management and disposal arrangements; • a vessel management plan, to determine vessel routing to and from construction sites and ports, to include a code of conduct for vessel operators; and • the appointment and responsibilities of a company fisheries liaison officer.	DCO Schedule 11, Part 2 - Condition 13(1)(d) and; DCO Schedule 12, Part 2 - Condition 13(1)(d) (Construction Project Environmental Management and Monitoring Plan)
Co181	Tertiary: An Offshore Decommissioning Plan will be developed prior to decommissioning.	DCO Schedule 11, Part 1(6) and; DCO Schedule 12, Part 1(6) (General Provisions)
Co187	Secondary: The installation of the offshore export cables at the landfall will be undertaken by Horizontal Directional Drilling or other trenchless methods.	DCO Requirement 17 (Code of construction practice); and DCO Schedule 12, Part 2 - Condition 13(1)(h) (Cable Specification and Installation Plan)
Co188	Secondary: No cable protection will be employed within 350 m seaward of MLWS	DCO Schedule 11, Part 2 - Condition 13(1)(h) and; DCO Schedule 12, Part 2 - Condition 13(1)(h) (Cable Specification and Installation Plan)
Co189	Secondary: The Dogger Bank cable crossing will be positioned east of Smithic Bank (as identified at https://data.gov.uk/dataset/d19f631c-27c0-4c74-804f-d76a4632b702/annex-i-sandbanks-in-the-uk-v2-public) and seaward of the 20 m depth contour.	DCO Schedule 11, Part 2 - Condition 13(1)(h) and; DCO Schedule 12, Part 2 - Condition 13(1)(h) (Cable Specification and Installation Plan)

4 Methodology

4.1.1.1 Guidance published by the MMO (2013) describes how MCZ Assessments could be undertaken in the context of marine licensing decisions (Note: there is no published Planning Inspectorate (PINS) guidance or advice on MCZ Assessments for DCO applications). These MMO guidelines recommend a staged approach to the assessment, with three sequential stages: Screening, Stage One Assessment and Stage Two Assessment (see **Figure 2**). Full details of each of these stages of the approach are detailed within the MMO (2013) guidance.

4.1.1.2 If certain activities, sites or impacts are screened into the MCZ assessment process, these are then considered within the Stage One Assessment. This is then followed by Stage Two Assessment if significant risks to the achievement of the MCZ conservation objectives have been identified in the Stage One Assessment.

4.1.1.3 This assessment has considered MCZs that have been designated during the first three tranches of MCZ designations (Tranche One in 2013, Tranche Two in 2016, and Tranche Three in 2019). The Holderness Inshore MCZ was designated in Tranche Two (29 January 2016), with the Holderness Offshore MCZ designated in Tranche Three (31 May 2019), and therefore the Conservation Objectives of both sites have been taken into consideration in completing this assessment.

4.1.1.4 **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes** and **Volume A2, Chapter 2: Benthic and Intertidal Ecology** present assessments of the impacts of Hornsea Four on the physical and ecological marine environment respectively, with definitions of the magnitude of impacts, sensitivity of receptors, and the significance of effects on those receptors. These definitions, adopted from the Design Manual for Roads and Bridges (DMRB) (Highways England 2019) are set out in **Volume A1, Chapter 5: Environmental Impact Assessment Methodology**, have also been adopted for the purposes of this MCZ assessment, with the term *'effect'* used to express the consequence of an impact. This is expressed as the *'significance of effect'* and is determined by considering the magnitude of the impact alongside the sensitivity of the receptor or resource, in accordance with defined significance criteria as defined in the respective chapters and bringing forward the conclusions of the assessments from the relevant ES chapters.

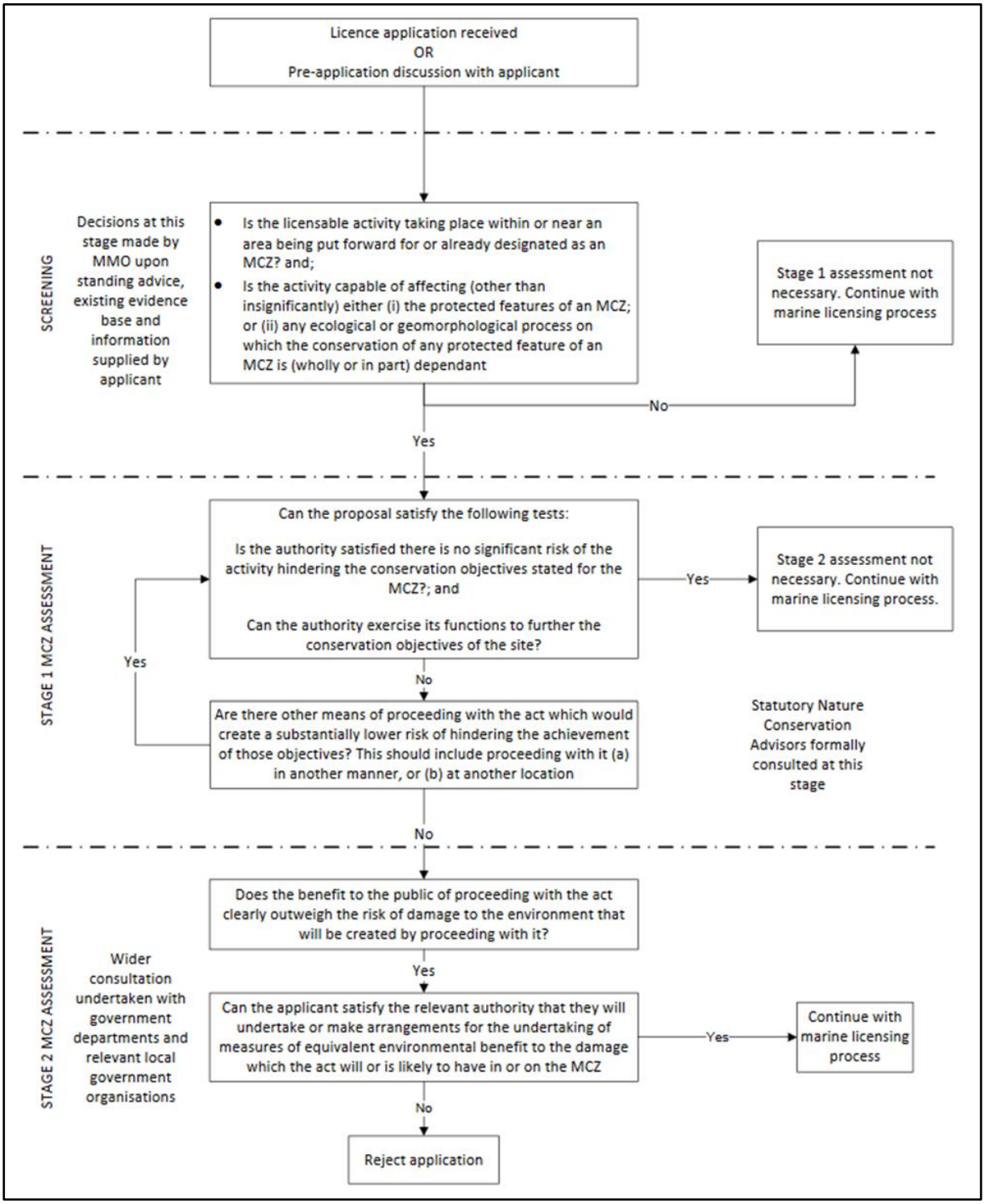

Figure 2: Summary of the MCZ assessment process used by the MMO (MMO 2013).

5 Screening

5.1 Is the licensable activity taking place within or near an area being put forward or already designated as an MCZ

5.1.1.1 The MCZs identified in the MCZ Screening, provided for consultation as part of the EIA Scoping exercise (Annex F of the Scoping Report (Orsted 2018)) as having the potential to

be affected by Hornsea Four, were the Holderness Inshore MCZ and the Holderness Offshore MCZ. The location of the MCZs to Hornsea Four are shown in **Figure 1**.

5.1.1.2 The Hornsea Four offshore ECC is located approximately 4,400 m from the Holderness Inshore MCZ at its nearest point and is approximately 753 m from the Holderness Offshore MCZ at its nearest point.

5.2 Is this activity capable of affecting (other than insignificantly) either (i) the protected features of an MCZ; or (ii) any ecological or geomorphological process on which the conservation of any protected feature of an MCZ (wholly or in part) is dependent

5.2.1.1 Since the offshore ECC does not overlap with either the Holderness Inshore MCZ or the Holderness Offshore MCZ, no direct impacts on either site will occur. All direct impacts (for example temporary or permanent habitat loss due to cable installation, sandwave clearance, placement of cable protection material etc) will occur within the Hornsea Four offshore ECC or temporary working areas (although cables will only be installed within the Hornsea Four offshore ECC) and are therefore scoped out of any further assessment in this MCZ assessment. It should be noted that a 'temporary works area' has been incorporated around the offshore ECC, represented by a 500 m buffer from the offshore ECC in areas of closest proximity to the MCZ boundaries. There is no overlap with this temporary works area and either MCZ. This area will have no permanent infrastructure (i.e. cables or HVAC booster stations) installed within it, however it may be used for temporary works such as vessel anchor placement.

5.2.1.2 Indirect effects from Hornsea Four are considered further given the proximity of the offshore ECC to the boundary of each MCZ site and the potential for indirect effects.

5.2.1.3 In order to determine *the 'nearness'* of the activities that could result in indirect effects associated with the construction and operational phases of Hornsea Four, the same screening criteria are used for the MCZ assessment as are applied for the Habitats Regulations Assessment (HRA). The draft MCZ Assessment submitted with the PEIR used a 15 km range for consideration of indirect impacts. This range was based on a comparison of environmental conditions between Hornsea Project One, Hornsea Project Two and Hornsea Three with Hornsea Four. Sediment plume modelling undertaken for Hornsea Four (Appendix C of **Annex 1.1: Marine Processes Technical Report**) in the nearshore sections of the offshore ECC provides an indication of the likely spread and concentrations of such plumes; the modelling completed predicted that the maximum excursion of the sediment plume could extend up to 14 km on a spring tide from the location of disturbance. However, beyond 2 km from the point of disturbance, the concentration of suspended sediments is predicted to be less than 10 mg/l which is within the typical seasonal variation of up to 14 mg/l. Furthermore, this would likely not be detectable after approximately 20 hours following release. Deposition was predicted to be up to 5.9 cm in the immediate vicinity of release but would quickly drop off to an average depth of less than 0.1 mm with distance from the point of disturbance. A summary of the sediment plume modelling is provided in **Table 3** of this document. As such, a 14 km range has been adopted for the final MCZ Assessment based on the site-specific modelling.

5.2.1.4 To summarise, the criteria used for the Hornsea Four assessment are based on the evidence from **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes**, which, based on physical processes modelling, uses a precautionary potential suspended

sediment dispersal of up to 14 km from the nearshore construction works within the offshore ECC. It should however be noted that this distance is considered to be precautionary, since, assuming sediments are released at the sea surface, sediment plume concentrations were predicted to be less than 10 mg/l for all locations beyond 2 km from the point of release.

5.2.1.5 It is important to note that the Holderness Inshore MCZ and Holderness Offshore MCZ are situated 70.7 km and 29.3 km, respectively from the Hornsea Four array area. As such, there is no receptor-impact-pathway to these sites associated with construction, operation, or maintenance activities within the array area and these activities are screened out of the assessment for both MCZs.

5.2.2 Holderness Inshore MCZ

5.2.2.1 The Holderness Inshore MCZ has been included as the site is within the zone of influence for increased SSC from construction and decommissioning activities in the offshore ECC. The site boundary is approximately 4,400 m from the offshore ECC at its closest point (**Figure 1**).

5.2.2.2 **Annex 1.1: Marine Processes Technical Report** predicts that export cable installation activity (including sandwave clearance, seabed levelling and cable trenching) and HVAC booster station installation in the offshore ECC will result in increased levels of SSC with subsequent deposition of disturbed sediment. Sediment plumes are assumed to be restricted to a distance of a single mean spring tidal excursion (14 km from the offshore ECC based on the site-specific modelling) from slack water to peak flows. However, as described in the paragraph below, this is considered to be precautionary.

5.2.2.3 It is predicted that the majority of the sediment disturbed by cable installation or other works in the offshore ECC will fall out of suspension in relatively close proximity to the location of the disturbance and will not disperse into the Holderness Inshore MCZ; however there is the potential for suspended sediment plumes to extend over a greater distance, albeit at a greatly reduced SSC, and therefore have the capacity to affect the MCZ (i.e. there is a theoretical receptor-impact pathway to the Holderness Inshore MCZ as a result of suspended sediment plumes resulting from the works). Sediment plume modelling undertaken for Hornsea Four (Appendix C of **Annex 1.1: Marine Processes Technical Report**) was used to inform the assessment of Holderness Inshore MCZ. A summary of the sediment plume modelling is provided in **Table 3** of this document.

5.2.2.4 The receptor-impact pathway is expected to occur during the construction phase (and specifically for the installation of the export cables or other associated works occurring in the nearshore region closest to the MCZ and is tidally aligned with it). It is noted, by reference to **Figure 1**, that for works within the majority of the ECC that lies seaward of Flamborough Head, including the HVAC booster station search area, the tidal axis means that there is no such receptor-impact-pathway to the Holderness Inshore MCZ. As such, construction, operation and decommissioning impacts associated with HVAC booster stations are screened out of the Holderness Inshore MCZ assessment.

5.2.2.5 Impacts during the operation and maintenance phase could arise from cable maintenance activities. The effects from these operational impacts are expected to be similar (or less) in magnitude to those arising during the construction phase as described above, with impacts localised to site of maintenance works, but are predicted to be much more limited in extent (by merit of the more limited nature of the works) and unlikely to significantly impinge on

the MCZ. During the decommissioning phase, cables are likely to be left *in situ*, and therefore impacts from this phase are also likely to be limited; however, even if the export cables were to be removed, impacts would be no greater (and likely less than) those arising from the construction works. It is noted that the decommissioning methodology will be confirmed through the development of a decommissioning plan during the post-consent phase (Co181).

5.2.2.6 Given the theoretical potential for sediment plumes arising from works within the ECC during the construction, operation and maintenance and decommissioning phases, it is concluded that the works are capable of indirectly affecting the features of the Holderness Inshore MCZ, and therefore the indirect impact from increases in SSC and subsequent sediment deposition from the plume are screened into the Stage One Assessment.

5.2.3 Holderness Offshore MCZ

5.2.3.1 The Holderness Offshore MCZ has been included as the site is within the zone of influence for increased SSC from construction activities in the offshore ECC. The site boundary is approximately 753 m from the offshore ECC at its closest point (**Figure 1**).

5.2.3.2 The potential impacts on the Holderness Offshore MCZ are expected to be similar in nature to those described for the Holderness Inshore MCZ, with indirect impacts arising from the disturbance and subsequent deposition of sediment arising from the construction process during cable installation process (and also potentially from the HVAC booster station installation) in the ECC, the operation and maintenance phase, and the decommissioning process. The closer proximity of the Holderness Offshore MCZ to the ECC means that there is the potential for somewhat greater quantities of sediment dispersing in the vicinity of the MCZ as plumes, and subsequently a somewhat greater potential level of deposition when compared to levels likely to impact the Holderness Inshore MCZ. It is noted, by reference to **Figure 1**, that this potential exists for works in the ECC landward of the HVAC booster station search area (and including the HVAC booster station search area), with works seaward of this being either at a distance beyond a single tidal excursion or not aligned with the MCZ on the tidal axis.

5.2.3.3 Therefore, given the theoretical potential for sediment plumes arising from works within the ECC during the construction, operation and maintenance and decommissioning phases, it is concluded that there is the potential for interaction with the Holderness Offshore MCZ, and therefore the indirect impact from increases in SSC and subsequent sediment deposition from the plume are screened into the Stage One Assessment.

5.2.4 Screening Conclusions

5.2.4.1 The scoped-in indirect effects on the Holderness Inshore MCZ and the Holderness Offshore MCZ are those arising from the temporary increase in SSC and subsequent sediment deposition in the vicinity of the Hornsea Four offshore ECC arising from export cable (and for the Holderness Offshore MCZ, also the HVAC booster station(s) installation, maintenance and removal).

5.2.4.2 In accordance with the MMO guidelines (MMO 2013), any impacts that are concluded to have a negligible impact on benthic ecology receptors (including features of an MCZ) can be screened out and are therefore not taken through to the Stage One Assessment.

5.2.4.3 Impacts which can be concluded as having a negligible impact magnitude (in EIA terms) on features of an MCZ are considered to present a sufficiently low risk, to its protected features or the ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependent, to allow these impacts to be screened out at this stage.

5.2.4.4 The only relevant impacts on benthic ecology receptors that have effects considered to be greater than negligible significance are the impacts arising from increased SSC and deposition on benthic ecology receptors arising from the construction and decommissioning phase related to the installation and decommissioning of the export cables and HVAC booster stations in the ECC. **Volume A2, Chapter 2: Benthic and Intertidal Ecology** concluded that the significance of the effects are predicted to be of **slight adverse** significance (not significant in EIA terms). The impacts are therefore screened into the Stage One assessment process.

5.2.4.5 As described above, the Applicant has undertaken suspended sediment modelling to investigate the temporary increase in SSC and sediment deposition as a result of construction activities at the different project elements of Hornsea Four. **Table 3** below outlines the key findings of this sediment plume modelling in relation to construction activities as relevant to the MCZ Assessment. It is considered that operational and decommissioning phase activities will result in no greater increases in SSC and deposition than those for construction and presented in **Table 3**.

Table 3: Temporary increases in SSC and sediment deposition as a result of construction activities at Hornsea Four.

Construction Impact	Location	Maximum sediment plume distance	Details of increase in SSC and deposition
Sandwave clearance	Nearshore ECC	14 km (springs) / 6 km (neaps)	• SSCs within sediment plumes associated with overspill can be in the order of hundreds of mg/l in the vicinity of the dredger, reducing to tens of mg/l with distance, but also quickly dissipating in time after release; • The deposition of fine sediment under low flow conditions is predicted to be less than 2 mm from overspill; • Dredge spoil disposal plume concentrations remain less than 10 mg/l for all locations 2 km beyond the point of release and are not detectable after about 20 hours; and • The depth of spoil deposition (for all sediments) is typically very small (around 0.1 mm) but reaches 5.9 cm for the spring tide in a confined area and 10 cm for a neap release. These depths of deposition cover a very small area and are due to coarser grained sediments (gravels).
Seabed preparation for foundations	Offshore array	7 km (neaps) and 10 km (springs) along the axis of the tide	• SSCs within sediment plumes associated with overspill can be in the order of hundreds of mg/l in the vicinity of the dredger, reducing to tens of mg/l with distance, but also quickly dissipating in time after release; • Dredge spoil disposal plume concentrations will remain less than 2 mg/l, 2 km from the point of release and will not be detectable after 40 hours; and • The depth of spoil deposition after three days is typically very small (around 0.1 mm) but reaches 3.8 cm for the neap tide scenario and 2.9 cm for spring tides, in a confined area (where deposition material consists primarily of coarser materials).
	HVAC booster station	7 km (neaps) and 12 km (springs) along the axis of the tide	• SSCs within sediment plumes associated with overspill can be in the order of hundreds of mg/l in the vicinity of the dredger, reducing to tens of mg/l with distance, but also quickly dissipating in time after release; • Dredge spoil disposal plume concentrations will remain under 10 mg/l, 2 km from the point of release and will not be detectable after 60 hours; and • The depth of spoil deposition after three days is typically small (0.1 mm) but reaches 0.4 cm for a spring tide, but in a confined area.
Offshore trenching for cables	Offshore ECC	14 km along the axis of the tide	• Within 5 m of trenching very high plume concentrations are expected. SSC could be millions of mg/l. This is only expected to occur while the CFE is active; • At 2 km from the source, the silt content will be approximately 100 mg/l during the trenching period and will fully dissipate and will fully dissipate after around 65 hours; and • The maximum depth of deposition is 7.1 cm on neaps and 5.3 cm on springs, along the trench. The maximum settlement depth reduces exponentially in range from the trench reaching 0.12 m at 50 m and 0.06 m at 100 m.
	Offshore array	10 km along the axis of the tide	• Concentrations of SSC can reach 1,000 mg/l in the vicinity of the trenching with only the silt fraction dispersing away from the trench with plume concentrations of around 100 mg/l up to 2 km;

Construction Impact	Location	Maximum sediment plume distance	Details of increase in SSC and deposition
			• The maximum depth of deposition is 11.6 cm on neaps and 13.2 cm on springs along the trench; • A wider spread of deposition under spring tides, with the lowest depth of sediment deposition (circa 0.1 mm); and • The silt contribution to the sediment deposition represents 2.3 mm on neaps and 1.6 mm on spring tides.
Drilling at foundations	Offshore array/ HVAC booster station	10 - 14 km along the axis of the tide	Results comparable to sediment plumes and deposition of fines to those presented for sandwave clearance, but considerably less in proportion.

6 Background information on MCZs

6.1.1.1 This section provides a summary of the baseline information for the MCZs which are considered within the Stage One Assessment.

6.2 Holderness Inshore MCZ

6.2.1.1 The Holderness Inshore MCZ is located to the south of the landward end of the offshore ECC (**Figure 1**). The site begins in Skipsea and extends along the coast south to the mouth of the Humber estuary. The MCZ has an area of approximately 309 km^2, and is designated for, amongst other features, the geological feature, Spurn Head which includes a ridge of clay banks known locally as 'The Binks' located at the southern end of the MCZ. The Binks is a harder geological area than that which surrounds it, thought to be Quaternary boulder clay, and has a 'sand trap' element that traps sediment reducing erosion to the Spurn Head feature. The sediment composition of the site is variable, consisting of cobble habitats, mixed sediments, sand, and mud. The features of the MCZ, along with feature types, general management approaches and conservation objectives are summarised in **Table 4**.

6.2.1.2 Broadscale marine habitat mapping (Marine Strategy Framework Directive (MSFD) 2017) of the MCZ revealed the habitats with the closest proximity to the offshore ECC are intertidal sand and subtidal coarse sediment (**Figure 3**), both of which are designated features of the MCZ (**Table 4**). Sediment chemistry analysis of the site (within the coastal section of the offshore ECC, where there is an overlap with the Dogger Bank A & B cable corridor) showed contaminant levels below the threshold to cause significant effects to benthic organisms (Forewind, 2013).

6.2.1.3 Natural England's Advice on Operations for the Holderness Inshore MCZ[2] (Natural England 2021), outlines the sensitivities of each protected feature to various pressures. These are summarised in **Appendix A** and **B**.

6.3 Holderness Offshore MCZ

6.3.1.1 The Holderness Offshore MCZ is located approximately 11 km offshore from the Holderness coast and covers an area of approximately 1,176 km^2. The MCZ lies approximately 753 m to the south of the nearshore section of the offshore ECC at its closest point (**Figure 1**).

6.3.1.2 The site is designated for, amongst other features, part of a glacial tunnel valley, and for the Ocean Quahog (*Arctica islandica*).

6.3.1.3 The MCZ seabed is predominantly composed of sediment habitats ranging from subtidal sand to subtidal coarse sediments (**Table 4**). Broadscale marine habitat mapping of the MCZ (MSFD 2017) revealed the habitats with the closest proximity to the offshore ECC are circalittoral coarse sediment, circalittoral mixed sediment and offshore circalittoral coarse sediment (**Figure 3**), all of which are designated features of the MCZ (**Table 4**). Sediment chemistry analysis of the site (within the coastal section of the offshore ECC, where there is

[2] https://designatedsites.naturalengland.org.uk/Marine/FAPMatrix.aspx?SiteCode=UKMCZ0035&SiteName=holderness&SiteNameDisplay=Holderness+Inshore+MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality=0

an overlap with the Dogger Bank A & B cable corridor) showed contaminant levels below the threshold to cause significant effects to benthic organisms (Forewind 2013).

6.3.1.4 The Joint Nature Conservation Committee (JNCC) and Natural England's Advice on Operations for the Holderness Offshore MCZ[3] (JNCC and Natural England 2021), outlines the sensitivities of each protected feature to various pressures. These are summarised in **Appendix A** and **B**.

[3] https://data.jncc.gov.uk/data/d439f5d1-5440-4547-84fb-8bd6ec970e44/HoldernessOffshore-AdviceOnOperations-V1.0.xlsx

Table 4: Sites screened into the Hornsea Four MCZ assessment, their designated features and conservation objectives.

Site Name	Protected Features	Type of Features	Condition and General Management Approach (GMA)	Conservation Objective
Holderness Inshore MCZ	Intertidal sand and muddy sand	Broadscale marine habitat	Favourable condition. GMA to maintain feature at favourable condition.	Remain in favourable condition.
	Moderate energy circalittoral rock			
	High energy circalittoral rock			
	Subtidal coarse sediment			
	Subtidal mixed sediments			
	Subtidal sand			
	Subtidal mud			
	Spurn head (subtidal) and 'The Binks'	Geological feature		
Holderness Offshore MCZ	North Sea glacial tunnel valleys (Inner Silver Pit)	Geological/Geomorphological feature	Favourable condition. GMA to maintain feature at favourable condition.	Remain in favourable condition.
	A5.1 Subtidal coarse sediment	Broadscale marine habitat	Unfavourable condition. GMA to recover the feature to favourable condition.	Be brought into favourable condition, and remain in such condition.
	A5.2 Subtidal sand			
	A5.4 Subtidal mixed sediments			
	Ocean quahog (*Artica islandica*)	Marine species		

Hornsea Four

Figure 3

Broadscale habitats of the Holderness Inshore and Offshore MCZs

300000 320000 340000 360000

6000000 5980000 5960000 5940000

N

GRID NORTH

Nearshore Ebb Channel

Holderness Offshore

Holderness Inshore

- Order Limits
- HVAC Booster Station Works
- Offshore Temporary Works
- Offshore Export Cable Corridor
- Marine Conservation Zones

MSFD Benthic Broad Habitat Types 2017

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

Coordinate system: ETRS 1989 UTM Zone 31N

Scale@A3: 1:250,000

0 5 10 Kilometres

0 3 6 Nautical Miles

REV	REMARK	DATE
....	First Issue	04/07/2019
A	Updated following PEIR consultation, for DCO	03/08/2021

Broadscale Marine Habitats
Document no: HOW04GB0126
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GoBe Ørsted

Date: 03/08/2021 Author: BenBlakeman Name: HOW04GB0126_MCZ_Broadscale_Marine_Habitats

7 Stage One Assessment

7.1 Holderness Inshore MCZ

7.1.1.1 This MCZ assessment on the features of the Holderness Inshore MCZ has been undertaken with reference to Natural England's Advice on Operations, and Supplementary Advice on Conservation Objectives (summarised in **Appendix A** and **B**).

7.1.2 Construction Phase

Temporary increase in SSC and sediment deposition in the offshore ECC area

7.1.2.1 Increases in SSC and associated sediment deposition are predicted to occur during the construction phase as a result of cable route pre-sweeping (sandwave clearance and seabed levelling), and cable installation. **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes** and **Volume A2, Chapter 2: Benthic and Intertidal Ecology** provide a full description of the assessment of these potential impacts arising from the construction phase on marine processes and indirect impacts on the benthos respectively (with the maximum design scenarios (MDSs) associated with this impact presented in these ES chapters).

Sandwave clearance along the ECC

7.1.2.2 Increased SSC and plume formation from sandwave clearance will result from overspill of finer sediment fractions; the overspill is considered to occur local to the sandwave clearance operation along the ECC. As detailed in Appendix C of **Annex 1.1: Marine Processes Technical Report**, modelling for sandwave clearance was undertaken for Hornsea Four. The modelling estimated the sandwave to have up to 5% fine sediment content, with the results indicating a plume footprint of fine sediments aligned to the main tidal flow direction. SSCs within sediment plumes associated with overspill from dredgers is expected to be in the order of hundreds of mg/l in the vicinity of the dredger, reducing to tens of mg/l with distance, but also quickly dissipating with time after release. The maximum sediment plume distance is estimated to be 14 km from point of release under spring tidal conditions. SSC is predicted to remain below 10 mg/l at locations beyond 2 km from the point of release, dispersing with time and becoming undetectable after 20 hours.

7.1.2.3 Discharge from the dredger is likely to consist of coarser sediment fractions, as a result of most of the finer sediment being lost to overspill (see **paragraph 7.1.2.2**), and as a result there is less concern for the formation of a sediment plume. In contrast, the majority of the spoil will fall more quickly to the seabed with limited opportunity to disperse (but correspondingly leading to a greater depth of accumulation at the seabed). Modelling of spoil disposal from Hornsea Four in the nearshore sections of the ECC indicated that even in low flow (low dispersion) conditions, deposition of fine sediments would be less than 2 mm from dredger overspill. The greatest settlement depth would result from coarse sediments and gravels within a very small area close to the point of release, up to 10 cm under neap conditions and 5.9 cm under spring conditions.

Export Cable installation

7.1.2.4 The export cable installation scenario that represents the MDS for increases in SSC and associated sediment deposition is the use of CFE for cable trenching. The majority of the excavated material from this process is expected to be coarse sediments (sands and gravels) which will drop back to the seabed relatively quickly and close to the point of disturbance as previously described in **paragraph 7.1.2.2**.

7.1.2.5 The main axis of any plume trajectory will be governed by tidal advection at the point of release with reduced concentrations around this axis due to dispersion and diffusion mixing processes spreading the plume.

7.1.2.6 Plume modelling for cable trenching for representative locations in the offshore ECC (detailed in Appendix C of **Annex 1.1: Marine Processes Technical Report** and summarised within **Table 3** in this document) demonstrates the scale of tidal advection where the silt fraction determines the material held in suspension to form a sediment plume. Concentrations are anticipated to reach millions of mg/l within a very small footprint of 5 m from CFE. At 2 km from the activity, the concentration of fines is predicted to be approximately 100 mg/l during active CFE, which will fully dissipate after 65 hours.

7.1.2.7 In terms of deposition, the maximum depth in the immediate vicinity of trenching is predicted to be up to 7.1 cm on neap tides (low flow conditions), and up to 5.3 cm on spring tides. This largely consists of coarse sediments and gravels which are not advected over large distances, with deposition depth reducing exponentially with distance.

Magnitude

7.1.2.8 The magnitude of the impact from SSC and associated deposition on the features of the Holderness Inshore MCZ is determined to be **minor**, (as described in **Volume A2, Chapter 2: Benthic and Intertidal Ecology**), taking account of the local spatial extent, short-term and intermittent and reversible nature of these impacts. **Volume A2, Chapter 2: Benthic and Intertidal Ecology** assessed this impact in the context of both the offshore ECC and within the intertidal zone. For the intertidal zone specifically, the impact magnitude was concluded to be negligible due to the commitment to install cables across the intertidal by HDD only (Co187, see **Table 2**).

Sensitivity

7.1.2.9 The effects from increases in SSC and associated deposition on the benthic ecology were assessed in **Volume A2, Chapter 2: Benthic and Intertidal Ecology**; the subtidal habitats were deemed to be a maximum of medium vulnerability, medium recoverability (at most) and of regional to national value. The broadscale habitat features of the Holderness Inshore MCZ were deemed to be not vulnerable, with high recoverability and national importance. The habitats in the region, including those of the Holderness Inshore MCZ, being considered tolerant to periodic increases in SSC and associated deposition.

7.1.2.10 Natural England's Advice on Operations (summarised in **Appendix A** and **B**) provides information on the sensitivities of the MCZ features in relation to a variety of pressures; of relevance to the cable installation works the pressures 'changes in suspended solids (water

clarity)' and 'smothering and siltation rate changes (light)' are provided and are both assigned a 'medium to high' risk profile, with all features identified as sensitive to the pressures, with the exception of the geological feature Spurn Head (effects are not assessed), and subtidal mixed sediments and high energy circalittoral rock which are not considered sensitive to increases in SSC.

7.1.2.11 The habitats identified as being closest to the offshore ECC (4,400 m) in **paragraph 6.2.1.2** (**Figure 3**) are intertidal sand and subtidal coarse sediment; these are both identified as being sensitive to these pressures (**Appendix A** and **B**).

7.1.2.12 The geological feature, Spurn Head is located 250 m from the Holderness Inshore MCZ. Supplementary Advice on Conservation Objectives (**Appendix A** and **B**) was consulted to provide additional information on the Spurn Head feature; Spurn Head is referred to as a dynamic spit system, with a consistent supply of sediment from erosion of the Holderness coast, which results in the spit continuously shifting its position. As raised by Natural England in their Section 42 response (Natural England 2019) on the draft MCZ Assessment, any barrier to longshore drift within the Holderness Inshore MCZ would be likely to decrease sediment supply to Spurn Head, leading to a net increase in erosive activity along both sides of the spit (May and Hansom 2003). The Spurn Head geological feature also includes 'The Binks', an area of clay banks comprising a harder geological area compared to the surrounding area, thought to be Quaternary boulder clay, and that has an element that traps sediment reducing erosion to the Spurn Head feature. Taking this into consideration, the feature Spurn Head would not be considered sensitive to increases in SSC and deposition, due to its distance from the point source activity.

7.1.2.13 In terms of nearshore sediment transport, the area in which the Hornsea Four landfall is located can effectively be regarded as a sediment divide, with a balance of material transported north and south and therefore having a net annual longshore drift of approximately zero. It is therefore considered that Hornsea Four is not introducing any barrier to nearshore sediment transport. Taking the above into account, it is concluded that the features of the Holderness Inshore MCZ have a maximum sensitivity of **medium**.

Significance of effect

7.1.2.14 The **medium** sensitivity and **minor** magnitude of impacts arising from increases in SSC and sediment deposition during the construction phase on the features of the Holderness Inshore MCZ could result in either a slight (not significant) or moderate (significant) effect. However, taking into account the short term and localised nature of this impact and the tolerance and recoverability of the benthic features of the Holderness Inshore MCZ to increased SSC and deposition, the significance of effect is deemed **slight adverse** rather than moderate, which is not significant in EIA terms. It is important to note that much of the MCZ will not be subject to indirect effects given the distance from the offshore ECC, the variable plume dispersion distances for the various construction activities, and that the construction activity in much of the offshore ECC seaward of Flamborough Head will not have potential to affect the MCZ given the alignment of the prevailing tidal axis.

7.1.2.15 With respect to the conservation objectives of the Holderness Inshore MCZ, as outlined in **Table 4**, it can be concluded that there is no significant risk to the site achieving its conservation objectives, as:

- Increases in SSC and associated deposition will not affect the maintenance of the extent of the designated features remaining stable; and
- The structure and function, quality and composition of characteristic biological communities will remain in a stable condition and will not deteriorate.

7.1.3 Operation and Maintenance Phase

Temporary increase in SSC and sediment deposition in offshore ECC area

7.1.3.1 Increases in SSC and associated sediment deposition are predicted to occur during the operation and maintenance phase as a result of, for example, cable remedial burial, repairs, and cable protection replenishment. If a section of cable is damaged, the repair may include deburial of the damaged cable followed by reburial, these activities will utilise similar methodologies to those proposed to install the cables during construction. Therefore, the effects are considered comparable to cable installation but are moderated by the limits on the maximum amount of cable per event. **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes** and **Volume A2, Chapter 2: Benthic and Intertidal Ecology** provide a full description of the assessment of these potential impacts on marine processes and indirect impacts on the benthos respectively (with the MDS associated with this impact presented in these ES chapters).

7.1.3.2 Modelling was not undertaken explicitly for sediment plumes and deposition in the operation and maintenance phase of Hornsea Four. However, the modelling of activities during the construction (and decommissioning) phase is analogous to that of deburial and/or reburial of cables during the operational phase. The resultant plume SSC and deposition depths are expected to be similar to (or less than) those during the construction phase owing to the similar proposed methodologies. Furthermore, these activities will occur on a smaller scale (i.e. shorter lengths of cabling (up to 2 km sections for cable re-burial)), being localised (i.e. to segments of a cable), short-term and intermittent. They are therefore considered minor in comparison to those occurring during either the construction or decommissioning phase.

7.1.3.3 As described for the construction phase above, cable remedial burial and cable repairs are both predicted to cause sediment plumes. Plumes are expected to be restricted to within the tidal excursion, over a maximum distance of 14 km from the source. Sediment plumes are expected to quickly dissipate after cessation of the activities, due to settling and wider dispersion with the concentrations reducing quickly over time to background levels. Sediment deposition will consist primarily of coarser sediments deposited close to the source, with a small proportion of silt deposition (reducing exponentially from source).

Magnitude

7.1.3.4 The magnitude of the maximum potential increase in SSC resulting from operation and maintenance activities is expected to be broadly the same (or less than) that during construction, with each event being discrete, short term, and of localised extent.

7.1.3.5 The impacts of increases in SSC and associated deposition on features of the Holderness Inshore MCZ during the operation and maintenance phase are therefore predicted to be of local spatial extent, short-term and intermittent and reversible to the baseline conditions following the cessation of activities. It is predicted that this impact would be of **minor** magnitude.

Sensitivity

7.1.3.6 The sensitivities of the MCZs features to this pressure are expected to be the same as those described in **Section 7.1.2**, which assessed the features to have a maximum sensitivity of **medium** to temporary increases in SSC and deposition.

Significance of effect

7.1.3.7 Increases in SSC and associated sediment deposition from cable maintenance activities are expected to be discrete events, representing a temporary and short-term impact, affecting a relatively small and localised portion of Holderness Inshore MCZ. Most receptors are predicted to have some tolerance to this impact. The features of the Holderness Inshore MCZ are predicted to have a maximum sensitivity of **medium**, and the magnitude of effects are assessed as **minor**, resulting in a significance of **slight adverse** (not significant in EIA terms) for impacts arising from increases in SSC and sediment deposition during the operation and maintenance phase, and noting also that activity during the operational phase in much of the ECC seaward of Flamborough Head will have not potential to affect the MCZ given the alignment of the prevailing tidal axis.

7.1.3.8 With respect to the conservation objectives of the Holderness Inshore MCZ, as outlined in **Table 4**, it can be concluded that there is no significant risk to the site achieving its conservation objectives, as:

- Increases in SSC and associated deposition will not affect the maintenance of the extent of the designated features remaining stable; and
- The structure and function, quality and composition of characteristic biological communities will remain in a stable condition and will not deteriorate.

7.1.4 Decommissioning phase

Increased SSC and sediment deposition from removal of cables

7.1.4.1 Increases in SSC and associated sediment deposition are predicted to occur during the decommissioning phase as a result of the decommissioning of the export cables (for a detailed methodology for cable removal see **Volume A1, Chapter 4: Project Description**). For the purposes of this assessment, it is assumed that decommissioning will involve full removal of the export cables. However, the final extent of cable decommissioning will be

determined through the development of a Decommissioning Plan (see Co181 in **Volume A4, Annex 5.2 Commitments Register)**.

7.1.4.2 The effects of increases in SSC and associated deposition due to the decommissioning of the export cables in the Holderness Inshore MCZ are expected to be equal or less than those described for the construction phase affecting the same MCZ features and their relevant attributes as outlined in the preceding assessment for the construction phase. For the purposes of this assessment, it is assumed that cable removal will lead to increases in SSC and subsequent deposition to levels similar to those experienced during the construction phase (i.e. due to the similarity in some of the methods that might be used to install and remove cables, e.g. jetting).

Significance of effect

7.1.4.3 As a result, and as for the construction phase, the features of the Holderness Inshore MCZ are predicted to have a maximum sensitivity of **medium** and the magnitude of effects were assessed as **minor**, resulting in a significance of **slight adverse** (not significant in EIA terms) for impacts arising from increases in SSC and sediment deposition during the decommissioning phase.

7.1.4.4 With respect to the conservation objectives of the Holderness Inshore MCZ, as outlined in **Table 4**, it can be concluded that there is no significant risk to the site achieving its conservation objectives, as:

- Increases in SSC and associated deposition will not affect the maintenance of the extent of the designated features remaining stable; and
- The structure and function, quality and composition of characteristic biological communities will remain in a stable condition and will not deteriorate.

7.1.5 Cumulative Effects

7.1.5.1 The MCAA does not provide any explicit legislative requirement for cumulative effects on features of MCZs to be considered during the assessment process. However, the MMO guidelines (MMO 2013) state that the MMO considers that in order for the MMO to fully discharge its duties under section 69 (1) of the MCAA, cumulative effects must be considered.

7.1.5.2 As outlined in **Volume A1, Chapter 5: Environmental Impact Assessment Methodology**, for the purposes of the Hornsea Four cumulative effects assessment (CEA), all projects, plans and activities that were built and operational at the time of Hornsea Four data collection (field surveys etc.) were screened out of the CEA (where there are no ongoing effects). This is because the effects of these projects have already been captured within the Hornsea Four surveys and desktop study, and hence their effects have already been accounted for within the baseline assessment. The exclusion of built and operational projects that were in place at the time of data collection/survey in this way avoids the double counting that would occur if projects were to be included within both the baseline and the CEA.

7.1.5.3 A buffer of 14 km from the boundary of the Holderness Inshore MCZ has been used to identify any projects that may have a cumulative effect on the MCZ. A buffer of 14 km

represents a maximum distance sediment will travel, as sediment plumes, from the construction, operation and maintenance, or decommissioning activity in one tidal excursion (**Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes**).

7.1.5.4 With respect to the Holderness Inshore MCZ, other plans or projects that lie within this buffer are detailed in **Table 5** and shown in **Figure 4**. None of the operational disposal sites directly overlap the Holderness Inshore MCZ; the Bull Sand Fort Extension disposal site is located in closest proximity to the MCZ (approximately 2.8 km). All disposal sites are used intermittently, with no information available on the frequency of deposition. One of the key impacts associated with the disposal of spoil at these sites is a resulting increase in SSC and sediment deposition. The Dogger Bank A & B export cable corridor crosses the Hornsea Four offshore ECC north of the Holderness Inshore MCZ, with construction of the Dogger Bank cables due to be completed between 2021 and 2024. There is also a further planned interconnector, the Scotland England Green Link 2 (SEGL2) cable (awaiting consent), which clips the northern boundary of the Hornsea Four offshore ECC north of the Holderness Inshore MCZ. The survey work for Scotland England Green Link 2 (SEGL2)is underway and planning applications are expected to be submitted in early 2022, with construction proposed for 2025. Additionally, subject to successful consenting, the Endurance Carbon Capture Storage (CCS) site is proposed to undergo construction in early 2023, with the proposed pipeline entering the southern region of the Holderness Inshore MCZ (see **Figure 4**).

Table 5: Distances of other plans and project to Holderness Inshore MCZ within a 14 km buffer.

Site	Distance to Holderness Inshore MCZ (km)
Dogger Bank A & B export cable corridor (offshore wind farm cable)	2.5
Westermost Rough (offshore wind farm)	2.0
Hornsea Project Two cable corridor (offshore wind farm cable)	3.6
Humber Gateway (offshore wind farm)	2.1
Bridlington A (disposal site)	11
Bull Sand Fort Extension (disposal site)	2.8
Conoco Pipeline Trench (disposal site)	2.9
Humber 1a (disposal site)	8
Humber 2 (disposal site)	12.3
Pyewipe channel (disposal site)	12.7
Sunk Dredge Channel A (disposal site)	9.7
Sunk Dredge Channel Window C (disposal site)	10.6
Scotland England Green Link 2 (SEGL2) (interconnector cable)	7.99
Endurance CCS pipeline (CCS cable)	0

7.1.5.5 Although dependent on the nature and composition of the sediment deposited at each disposal site, it is assumed that the sediment released will behave in a similar manner as that described for the Hornsea Four cable installation process above (and set out in more detail in **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes**). Levels of SSC at the point of release would be expected to be high for all sediment types but with coarser material rapidly descending to seabed during the dynamic plume phase. Coarser sediments in the plume will settle relatively quickly with finer grained material persisting in suspension during the passive plume phase. The resulting plume will be dispersed over greater distances by tidal advection but with SSC reducing to near

background levels with time due to natural dispersion and deposition. The maximum extent of resulting plumes will initially be limited to the tidal excursion distance and would be expected to be at concentrations at or close to background levels at the outer limits of the tidal excursion range.

7.1.5.6 The final year of construction of the Dogger Bank A & B export cables is currently assumed to coincide with the construction of Hornsea Four. As described in **Volume A2, Chapter 2: Benthic and Intertidal Ecology**, the maximum volume of material displaced from the construction of Dogger Bank A & B will be 502,000 m^3, however only a small portion of the Dogger Bank A & B cable corridor (approximately 18 km out of a total length of approximately 200 km) will intersect with the 14 km screening buffer applied around the Holderness Inshore MCZ, and therefore the cumulative increases in suspended sediments will be limited to the impacts arising from cable installation over a relatively small part of the Dogger Bank A & B export cable route.

7.1.5.7 The Westermost Rough and Humber Gateway offshore wind farms are located within 14 km of the Holderness Inshore MCZ, and their export cable corridors cross the site. These sites are currently in the operational phase, and therefore any impacts from increased SSC and deposition are likely to result from cable maintenance activities only. These events are expected to be either direct (export cabling works in the Holderness Inshore MCZ) or indirect (outwith the Holderness Inshore MCZ such as works in the array area), temporary, of short-term duration and comprising of a single event in each location. It should be noted that beyond surveys and monitoring, cable maintenance is not anticipated as a regular occurrence during the operation and maintenance phase. Therefore, cumulative impacts from these sites and Hornsea Four on the MCZ are considered to be minimal.

7.1.5.8 For the Hornsea Project Two export cable corridor, any cumulative impacts will be limited to the operation and maintenance phases for the export cables. Furthermore, impacts are expected to be highly localised to the footprint of any works and the immediate surrounding area. Consequently, it is not expected that there will be significant cumulative effects in terms of increased SSC and deposition. Any maintenance undertaken will be intermittent, short-term and highly localised.

7.1.5.9 The Scotland England Green Link 2 (SEGL2) cable could have the potential to create a cumulative temporary increase in SSC and sediment deposition with Hornsea Four. As described in **Volume A2, Chapter 2: Benthic and Intertidal Ecology**, there is the potential for an overlap with the construction of Hornsea Four, with the remainder of the Scotland England Green Link 2 (SEGL2) construction phase overlapping with the Hornsea Four operation and maintenance phase. There is currently limited detail on the Scotland England Green Link 2 (SEGL2) cable and therefore it is not possible to make a detailed assessment of the significance of effect. However, the cumulative impact associated with the Scotland England Green Link 2 (SEGL2) is predicted to be minimal, short-term and localised to the site. As such, it is not anticipated that any effects, once qualified, would result in a significant impact.

7.1.5.10 Pending successful consent, the Endurance CCS site will be under construction from 2023 and scheduled to be operational by 2026. Therefore, the proposed pipeline associated with the Endurance CCS site will likely be in the final phases of construction during Hornsea Four ECC construction phase. However, only a small portion of the Endurance CCS site pipeline

(approximately 23.7 km out of a total length of approximately 102 km) will intersect with the 14 km screening buffer applied around the Holderness Inshore MCZ, and therefore the cumulative increases in suspended sediments will be limited to the impacts arising from pipeline installation over a relatively small part of the Endurance CCS site pipeline.

7.1.5.11 **Volume A2, Chapter 2: Benthic and Intertidal Ecology** concluded that cumulative effects of increased SSC and deposition would be of local spatial extent, short-term duration, intermittent and reversible, being of **slight adverse** significance (not significant in EIA terms). It is expected that the greatest levels of SSC and the majority of the deposition will occur in close proximity to the source with only low concentrations and levels of deposition extending further in the form of sediment plumes and having the potential to interact with the Holderness Inshore MCZ; therefore it is concluded that there will be no significant cumulative impacts from these sites or projects on the Holderness Inshore MCZ, and therefore no hinderance to the conservation objectives, as:

- The extent of the designated features will be maintained, despite increased SSC or associated deposition, and will remain stable during the construction phase; and
- The structure and function, quality and composition of characteristic biological communities will remain in a stable and healthy condition which will not deteriorate from impacts of the pressure.

Hornsea Four

Figure 4

Cumulative projects identified within the vicinity of the Holderness Inshore MCZ

260000 280000 300000 320000 340000

6000000 5980000 5960000 5940000

N

GRID NORTH

BRIDLINGTON A

Dogger Bank A&B ECC

Westermost Rough

Holderness Inshore

Humber Gateway

SUNK DREDGE CHANNEL WINDOW C

SUNK DREDGE CHANNEL A

HUMBER 1A

HUMBER 2

PYEWIPE CHANNEL

BULL SAND FORT EXTENSION

CONOCO PIPELINE TRENCH

Hornsea Project Two ECC

- Order Limits
- HVAC Booster Station Works Area
- Offshore Temporary Works Area
- Offshore Export Cable Corridor
- Marine Conservation Zones
- 14km Buffer from Holderness Inshore MCZ
- Offshore Wind Farm
- Export Cable Corridor
- Scotland England Green Link 2 (SEGL2)
- Endurance CCUS Pipeline

Dredge Spoil Dumping Area (Status)

- Open
- Disused

Coordinate system: ETRS 1989 UTM Zone 31N

Scale@A3: 1:300,000

0 5 10 Kilometres

0 3 6 Nautical Miles

REV	REMARK	DATE
....	First Issue	04/07/2019
A	Updated following PEIR consultation, for DCO	23/09/2021

Holderness Inshore
Disposal Sites
Document no: HOW04GB0127
Created by: BPHB
Checked by: AL
Approved by: LK

GoBe Ørsted

Date: 23/09/2021 Author: BenBlakeman Name: HOW04GB0127_MCZ_Holderness_Inshore_Disposal_Sites

7.2 Holderness Offshore MCZ

7.2.1.1 This MCZ assessment on the features of the Holderness Offshore MCZ has been undertaken with reference to JNCC and Natural England's Advice on Operations, and Supplementary Advice on Conservation Objectives (**Appendix A** and **B**).

7.2.2 Construction Phase

Temporary increase in SSC and sediment deposition in offshore ECC area and HVAC booster station search area

7.2.2.1 Increases in SSC and associated sediment deposition are predicted to occur during the construction phase as a result of cable route pre-sweeping and export cable installation and during HVAC booster station construction. **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes** provides a full description of the impacts on the physical environment, including the specific assessment with respect to increases in SSC and subsequent sediment deposition, with a summary of the MDS with this impact presented in the ES chapter.

7.2.2.2 A summary of impacts from increased SSC and deposition from sandwave clearance and export cable installation is given in **paragraph 7.1.2.1** *et seq.* above for the Holderness Inshore MCZ. In addition to those activities, the HVAC booster station area is within 14 km of the Holderness Offshore MCZ and therefore there is also the potential for activities associated with seabed preparation for HVAC booster stations to have effects.

7.2.2.3 **Volume A2, Chapter 2, Benthic and Intertidal Ecology** concluded that sediment plumes caused by seabed preparation for HVAC booster stations and export cable installation would be restricted to be well-within one tidal excursion distance, with plumes expected to occur over a maximum distance of 14 km from source (based on the site-specific modelling undertaken). Sediment plumes are expected to quickly dissipate after cessation of construction activities, due to settling and wider dispersion with the concentrations of SSC reducing over time to background levels. Sediment deposition will consist primarily of coarser sediments close to the source, with a small proportion of finer grained sediment deposition, reducing exponentially from the source. Taking this into consideration, **Volume A2, Chapter 2: Benthic and Intertidal Ecology** assessed this impact to be of **slight** significance, which is not significant in EIA terms.

Magnitude

7.2.2.4 The magnitude of impact of increased SSC and deposition from the Hornsea Four construction phase (resulting from sandwave clearance and export cable installation) will be similar in nature to that detailed in **paragraph 7.1.2.1** *et seq.* above, which concluded that the impacts of increased SSC and associated deposition arising from sandwave clearance and export cable installation on features of the MCZ are predicted to localised, short-term and intermittent and reversible. It is predicted that this impact would be of **minor** magnitude. Similar levels of magnitude would arise from HVAC booster station seabed preparation.

Sensitivity

7.2.2.5 The available Advice on Operations (as outlined in **Section 6.3** and summarised in **Appendix A** and **B**) for subtidal coarse sediment, subtidal mixed sediment and subtidal sand indicates that the pressures 'changes in suspended solids (water clarity)', and 'smothering and siltation changes (light)' are considered a medium to high risk profile, with all habitats listed as sensitive to the pressures (with the exception of subtidal mixed sediment which is assessed as not sensitive to changes in suspended solids, and associated deposition). Proxy Advice on Operations for the MCZ feature of North Sea Glacial Tunnel Valley is not available; the feature has, therefore, been assessed in terms of its broadscale habitat type, subtidal mixed sediment (**Figure 3**), which is assessed as not sensitive to increased SSC and deposition.

7.2.2.6 *Artica islandica* is listed as a protected species under the MCZ designation; the species is listed in the MarLIN sensitivity review as not sensitive to changes in suspended solids (water clarity) and light and heavy smothering and siltation rate changes. This conclusion is supported by the Advice on Operations (JNCC and Natural England 2021) for Holderness Offshore MCZ[4] , which lists the species as 'not sensitive' to increased SSC and deposition.

7.2.2.7 Taking the above into consideration, the features of the MCZ are assigned a maximum sensitivity of **medium** to increased SSC and deposition.

Significance of effect

7.2.2.8 The **medium** sensitivity and **minor** magnitude of impacts arising from increases in SSC and sediment deposition during the construction phase on the features of the Holderness Offshore MCZ could result in either a slight (not significant) or moderate (significant) effect. However, taking into account the short term and localised nature of this impact and the tolerance and recoverability of the benthic features of the Holderness Offshore MCZ to increased SSC and deposition, the significance of effect is deemed **slight adverse** rather than moderate, which is not significant in EIA terms. It is noted that construction activity in the ECC seaward of the HVAC booster station search area will be at a distance beyond a single tidal excursion and/or not aligned with the MCZ on the tidal axis.

7.2.2.9 Using the conservation advice documents noted above, it is considered appropriate to conclude that there will be no significant risk to the site achieving the sort of conservation objectives that are likely to be set out for the Holderness Offshore MCZ site.

7.2.3 Operation and Maintenance Phase

Temporary increase in SSC and sediment deposition in offshore ECC area

7.2.3.1 Increases in SSC and associated sediment deposition are predicted to occur during the operation and maintenance phase as a result of cable remedial burial, repairs, and cable protection replenishment. **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes** and **Volume A2, Chapter 2: Benthic and Intertidal Ecology** provide a full description of the assessment of these potential impacts arising from the operation and

[4] https://data.jncc.gov.uk/data/d439f5d1-5440-4547-84fb-8bd6ec970e44/HoldernessOffshore-AdviceOnOperations-V1.0.xlsx

maintenance phase on marine processes and indirect impacts on the benthos respectively (with the MDS associated with this impact presented in these ES chapters).

Magnitude

7.2.3.2 The magnitude of impact of increased SSC and deposition from the Hornsea Four operation and maintenance phase will be the same as that detailed in **Section 7.1.3**, which predicted that the impacts of increased SSC and associated deposition on features of the MCZ would be localised, short-term and intermittent and reversible. It is predicted that this impact would be of **minor** magnitude.

Sensitivity

7.2.3.3 The sensitivities of the MCZs features to this pressure are expected to be the same as those described in **Section 7.2.2**, which assessed the features to have a maximum sensitivity of **medium** to temporary increases in SSC and deposition.

Significance of effect

7.2.3.4 Increases in SSC and associated sediment deposition from cable maintenance activities are expected to be discrete events, representing a temporary and short-term impact, affecting a relatively small and localised portion of Holderness Offshore MCZ. Most receptors are predicted to have some tolerance to this impact. The features of the Holderness Inshore MCZ are predicted to have a maximum sensitivity of **medium**, and the magnitude of effects are assessed as **minor**, resulting in a significance of **slight adverse** (not significant in EIA terms) for impacts arising from increases in SSC and sediment deposition during the operation and maintenance phase. It is noted that construction activity in the ECC seaward of the HVAC booster station search area, will be at a distance beyond a single tidal excursion and/or not aligned with the MCZ on the tidal axis.

7.2.3.5 Using the proxy conservation advice documents noted above, it is considered appropriate to conclude that there will be no significant risk to the site achieving the sort of conservation objectives that are likely to be set out for the Holderness Offshore MCZ site.

7.2.4 Decommissioning Phase

Increased SSC and sediment deposition from removal of cables, HVAC booster stations and associated rock protection

7.2.4.1 Increases in SSC and associated sediment deposition are predicted to occur during the decommissioning phase as a result of cable removal, decommissioning of HVAC booster stations and associated rock protection (for a detailed methodology for decommissioning see **Volume A1, Chapter 4: Project Description**). For the purposes of this assessment, it is assumed that decommissioning will involve full removal of all installed infrastructure including the export cables. However, the final extent of cable decommissioning will be determined through the development of a Decommissioning Plan (see Co181 in **Volume A4, Annex 5.2 Commitments Register**).

7.2.4.2 The effects of increases in SSC and associated deposition due to the decommissioning of the export cables in the Holderness Offshore MCZ are expected to be equal or less than those described for the construction phase affecting the same MCZ features and their relevant attributes as outlined in the preceding assessment for the construction phase. For the purposes of this assessment, it is assumed that removal of the installed infrastructure, including the export cables, will lead to increases in SSC and subsequent deposition to levels similar to those experienced during the construction phase (i.e. due to the similarity in some of the methods that might be used to install and remove cables, e.g. jetting).

Significance of Effect

7.2.4.3 As a result, and as for the construction phase, the features of the Holderness Offshore MCZ are predicted to have a maximum sensitivity of **medium** and the magnitude of effects were assessed as **minor**, resulting in a significance of **slight adverse** (not significant in EIA terms) for impacts arising from increases in SSC and sediment deposition during the decommissioning phase.

7.2.4.4 Using the proxy conservation advice documents noted above, it is considered appropriate to conclude that there will be no significant risk to the site achieving the sort of conservation objectives that are likely to be set out for the Holderness Offshore MCZ site.

7.2.5 Cumulative Effects

7.2.5.1 The approach to the CEA for the Holderness Offshore MCZ is as previously described for the Holderness Inshore MCZ under **Section 7.1.5**.

7.2.5.2 The projects within the CEA buffer (14 km) of the Holderness Offshore MCZ are summarised in **Table 6** and shown in **Figure 5**. Any impacts from maintenance activities along the ECC are expected to be intermittent, with any indirect impacts from SSC and deposition occurring, predominantly, local to the ECC. The Dogger Bank A & B export cable corridor crosses the Hornsea Four offshore ECC north of the Holderness Offshore MCZ, with construction of the Dogger Bank cables due to be completed between 2021 and 2024. Westermost Rough and Humber Gateway are already operational, and Triton Knoll offshore wind farm, Viking Link and the Hornsea Project Two export cables are expected to be completed by the time Hornsea Four is under construction. Therefore, cumulative impacts from these projects will be limited to those from the operation and maintenance phase. All disposal sites are used intermittently, and no information is available on the frequency of deposition. Moreover, the Tolmount Platform has recently been constructed, with operational activities to commence in Q4 2021, with the Dana Platypus pipeline expected to be fully operational by the time of Hornsea Four construction, however there is limited information available on the operation and maintenance activities associated with these projects and only a limited qualitative assessment is possible. There is also a further planned interconnector, the Scotland England Green Link 2 (SEGL2) cable, which clips the northern boundary of the Hornsea Four offshore ECC north of the Holderness Inshore MCZ. The survey work for Scotland England Green Link 2 (SEGL2) is underway and planning applications are expected to be submitted in early 2022, with construction proposed for 2025, and operating by 2030. The planned Endurance CCS site is proposed to undergo construction in early 2023 and operation by 2026, with the proposed pipeline travelling across the Holderness Offshore MCZ (see **Figure 5**).

Table 6: Distances of cumulative projects Holderness Offshore MCZ within a 14 km buffer.

Site	Distance to Holderness Offshore MCZ (km)
Dogger Bank A & B (offshore wind farm export cables)	2.9
Hornsea Project Two cable corridor (offshore wind farm export cable)	1.1
Westermost Rough (offshore wind farm)	1.0
Triton Knoll (offshore wind farm)	10.7
Humber Gateway (offshore wind farm)	4.0
Bridlington A (Disposal Site)	10.2
Hornsea Disposal Area 1 (Disposal Site)	4.3
Viking Link (interconnector cable)	0
Dana Platypus (oil and gas pipeline)	12.1
Tolmount Platform (oil and gas platform)	11
Scotland England Green Link 2 (SEGL2) (interconnector cable)	5.8
Endurance CCS pipeline (CCS pipeline)	0

7.2.5.3 As described in **paragraph 7.1.5.6**, the impacts from the Dogger Bank A & B export cable route are expected to be limited to those arising from cable installation in a relatively small part of the route where it overlaps with the Hornsea Four offshore export cable route and are not anticipated to result in significant cumulative effects.

7.2.5.4 As described in **paragraph 7.1.5.7** *et seq.*, for Westermost Rough, Humber Gateway, and Hornsea Project Two, any cumulative impacts will be limited to their operation and maintenance phases. Similarly, cumulative impacts from Triton Knoll and Viking Link will also be limited to their operation and maintenance phases. Furthermore, the impacts of maintenance activities are expected to be highly localised to the footprint of the works and the immediate surrounding area. Consequently, it is not expected that there will be significant cumulative effects in terms of increased SSC and deposition. Any maintenance undertaken will be intermittent, short term and highly localised.

7.2.5.5 In addition, the potential impacts arising from Scotland England Green Link 2 (SEGL2) and the Endurance CCS site pipeline installation (as detailed in **paragraph 7.1.5.9** and **7.1.5.10**, respectively) are expected to be limited to those arising from cable and pipeline installation in a relatively small part of the route where they overlap or are in proximity to the Hornsea Four offshore ECC and are not anticipated to result in significant cumulative effects. Moreover, the Endurance CCS site is scheduled to be operational by 2026, and will, therefore, be in the final phases of construction during Hornsea Four ECC construction phase.

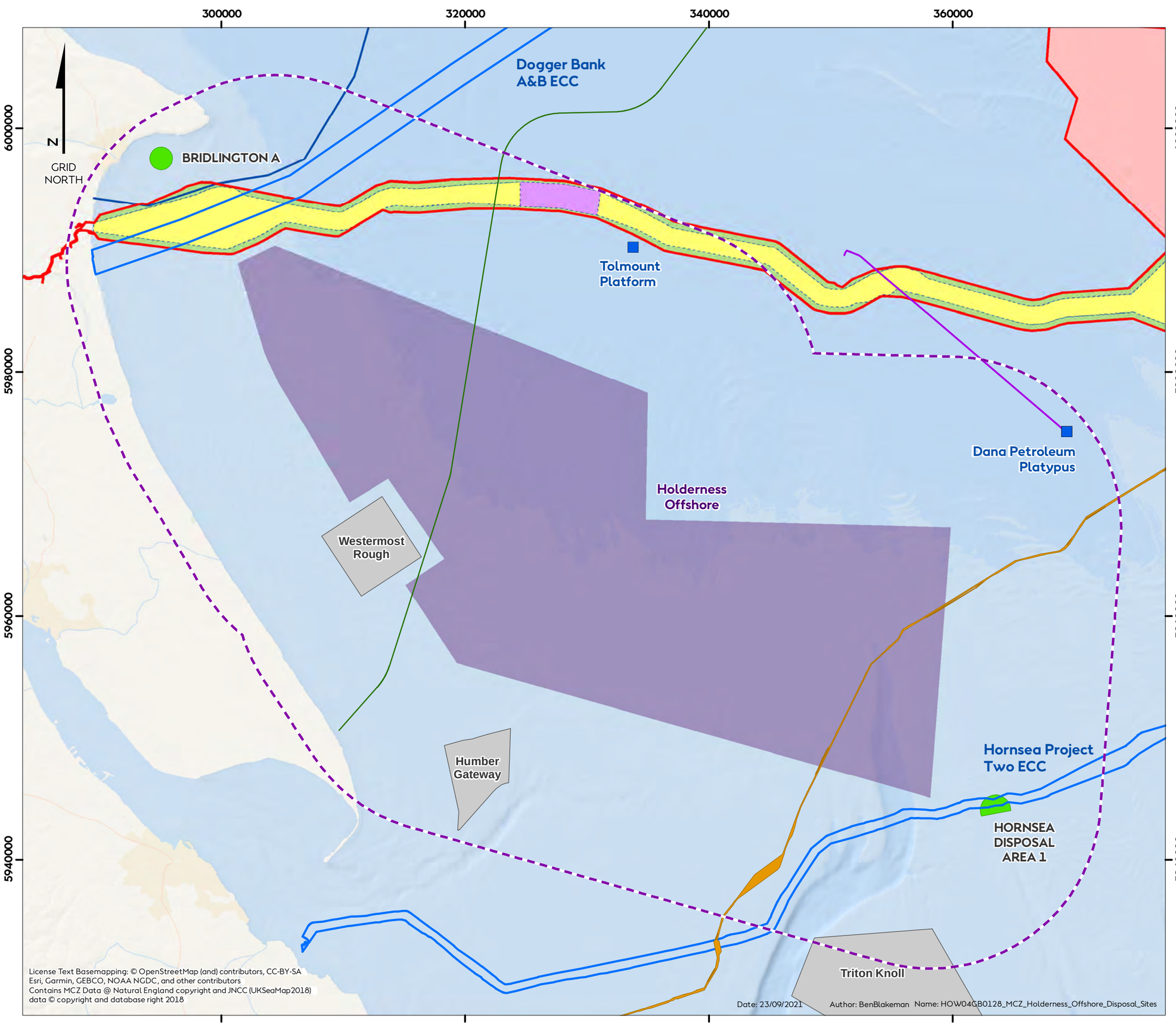
7.2.5.6 Similarly, impacts from the operation and maintenance phases of the Dana Petroleum pipeline and the Tolmount platform are anticipated to occur only within the footprint of any works and to be highly localised to the immediate surrounding area, with limited potential for interaction with the Holderness Offshore MCZ given the distances involved. Therefore, it is not expected that there will be any significant cumulative effects in terms of increased SSCs and deposition from these projects.

7.2.5.7 The activities, generation and persistence of SSC and subsequent deposition are predicted to be similar to those previously described for the CEA for the Holderness Inshore MCZ (see **Section 7.1.5**). It is expected that the highest levels of SSC and the majority of the deposition will occur in close proximity to the source, with finer sediments persisting in a plume over a greater distance but at low concentrations and with reducing levels of sediment deposition. **Volume A2, Chapter 2: Benthic and Intertidal Ecology** concluded that cumulative effects of increased SSC and deposition on benthic communities would be of local spatial extent, short-term, intermittent and reversible, being of **slight adverse** significance (not significant in EIA terms). It is, therefore, concluded that there will be no cumulative impacts from these sites on the Holderness Offshore MCZ. It is therefore it is concluded that there will be no significant cumulative impacts from these plans and projects.

Hornsea Four

Figure 5

Cumulative projects identified within the vicinity of the Holderness Offshore MCZ



- Order Limits
- Array Area
- HVAC Booster Station Works Area
- Offshore Temporary Works Area
- Offshore Export Cable Corridor
- Marine Conservation Zones
- 14km Buffer from Holderness Offshore MCZ
- Offshore Wind Farm
- Export Cable Corridor
- Viking Link Cable
- Scotland England Green Link 2 (SEGL2)
- Oil and Gas Subsea Structure
- Platypus Pipeline
- Endurance CCUS Pipeline

Dredge Spoil Dumping Area (Status)

- Open

Coordinate system: ETRS 1989 UTM Zone 31N

Scale@A3: 1:300,000

0 5 10 Kilometres

0 3 6 Nautical Miles

REV	REMARK	DATE
...	First Issue	04/07/2019
A	Updated following PEIR consultation, for DCO	23/09/2021

Holderness Offshore
Disposal Sites
Document no: HOW04GB0128
Created by: BPHB
Checked by: AL
Approved by: LK

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8 Conclusion

8.1.1.1 This MCZ Assessment has been produced provide the necessary information to allow the MMO to meet their specific duty for MCZs as outlined in section 126 of the MCAA. It is intended (with reference to the detailed information set out in the relevant parts of the ES) to provide the necessary information on the impacts of Hornsea Four to inform the MCZ assessment process.

8.1.1.2 The first stage in the assessment process was Screening to identify those MCZs that had the potential to be affected by the Hornsea Four proposed development. The screening stage identified two MCZs, Holderness Inshore MCZ and the Holderness Offshore MCZ as being relevant and these were both were carried through to the Stage One Assessment for full assessment against the relevant Conservation Objectives in relation to the potential indirect impacts arising from the construction, operation and maintenance and decommissioning activity in the Hornsea Four ECC. Note that direct impacts were scoped out from further assessment given that the ECC does not spatially overlap with either MCZ site.

8.1.1.3 The Stage One Assessment considered the effects of Hornsea Four construction, operation and maintenance, and decommissioning on the protected features of the Holderness Inshore MCZ and Holderness Offshore MCZ, with each of the impacts identified in the screening stage discussed individually. This included consideration of effects on attributes and targets of the relevant protected features, and subsequently on the conservation objectives, using the best available scientific evidence to support the assessment process and with due regard to the relevant Advice on Operations.

8.1.1.4 Indirect effects during construction, operation and maintenance and decommissioning associated with increases in SSC and associated deposition were assessed. It was concluded that the construction, operation and maintenance and decommissioning activities would result in short term, intermittent and localised increases in SSC and localised sediment deposition, resulting in a **minor** magnitude of impact. The sensitivity of the features at each site were assessed as, as a maximum, **medium**, with a maximum significance of **slight adverse** attributed in each case.

8.1.1.5 Cumulative effects on features of the Holderness Inshore MCZ and the Holderness Offshore MCZ were also considered in the Stage One Assessment. Several other projects were also considered in relation to SSC and sediment deposition effects; no significant cumulative effects were predicted.

8.1.1.6 As a result, it is concluded that the Hornsea Four construction, operation and maintenance and decommissioning activities within the ECC will not hinder the achievement of the conservation objectives of either MCZ, either alone or cumulatively. The outcomes of the impact assessments for the Holderness Inshore MCZ and the Holderness Offshore MCZ on their relevant features (and in terms of the attributes of those features), with reference to the pressures and attributes associated with Hornsea Four, are summarised in full in Appendix A and B.

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Appendix A – Summary of Impacts in Respect of Hinderance to Conservation Objectives of the MCZs Assessed

Table A 1: Summary of impacts on the features, attributes, and conservation objectives of the Holderness Inshore MCZ and the Holderness Offshore MCZ. Colour coding relates to conclusions with respect to impacts on attributes: Blue - no significant effect on attribute or target(s); Green - potential for significant effect on attribute or target(s).

Protected Feature(s)	Pressure and Activity	Attribute	Summary of Assessment	Assessment Signposting	Mitigation
Spurn Head (Subtidal) and 'The Binks' - *feature of Holderness Inshore MCZ*	Changes in suspended solids (water clarity)	Extent: extent of geomorphological feature	Spurn Head is not considered sensitive to increased SSC. No barrier to nearshore sediment transport to Spurn Head is expected. No hinderance to conservation objectives in terms of cumulative effects from disposal sites are predicted. No hinderance on conservation objectives.	Construction: Section 7.1.2 Operation & Maintenance: Section 7.1.3 Decommissioning: Section 7.1.4	None proposed beyond existing commitments.
		Structure: structure of geomorphological feature			
		Supporting processes: Sediment transport pathways and connectivity with wider environment			
	Smothering and siltation rate changes	Extent: extent of geomorphological feature	Spurn Head is not considered sensitive to increased sediment deposition. No barrier to nearshore sediment transport to Spurn Head is expected. No hinderance to conservation objectives in terms of cumulative effects from disposal sites are predicted. No hinderance on conservation objectives.	Construction: Section 7.1.2 Operation & Maintenance: Section 7.1.3 Decommissioning: Section 7.1.4	None proposed beyond existing commitments.
		Structure: structure of geomorphological feature			
		Supporting processes: Sediment transport pathways and connectivity with wider environment			
Intertidal sand and muddy sand - *feature of Holderness Inshore MCZ*	Changes in suspended solids (water clarity)	Distribution: presence and spatial distribution of biological communities	This feature is considered to have medium sensitivity to increased SSC. Increased SSC is expected to be of minor magnitude, and therefore results in a slight adverse significance of effect. No hinderance to conservation objectives in terms of cumulative effects from disposal sites are predicted. No hinderance on conservation objectives.	Construction: Section 7.1.2 Operation & Maintenance: Section 7.1.3 Decommissioning: Section 7.1.4	None proposed beyond existing commitments.
		Extent and distribution			
		Structure and function: presence and abundance of key structural and influential species			
		Structure: sediment composition and distribution			
		Structure: species composition of component communities			

Protected Feature(s)	Pressure and Activity	Attribute	Summary of Assessment	Assessment Signposting	Mitigation
		Supporting processes: water quality - turbidity			
	Smothering and siltation rate changes	Distribution: presence and spatial distribution of biological communities	This feature is considered to have medium sensitivity to sediment deposition. Increased sediment deposition is expected to be of minor magnitude, and therefore results in a slight adverse significance of effect. No hinderance to conservation objectives in terms of cumulative effects from disposal sites are predicted. No hinderance on conservation objectives.	Construction: **Section 7.1.2** Operation & Maintenance: **Section 7.1.3** Decommissioning: **Section 7.1.4**	None proposed beyond existing commitments.
		Extent and distribution			
		Structure and function: presence and abundance of key structural and influential species			
		Structure: sediment composition and distribution			
		Structure: species composition of component communities			
		Supporting processes: water quality - turbidity			
High/Moderate energy circalittoral rock - *feature of Holderness Inshore MCZ*	Changes in suspended solids (water clarity)	Distribution: presence and spatial distribution of biological communities	This feature is considered to have medium sensitivity to sediment deposition. Increased sediment deposition is expected to be of minor magnitude, and therefore results in a slight adverse significance of effect. No hinderance to conservation objectives in terms of cumulative effects from disposal sites are predicted. No hinderance on conservation objectives.	Construction: **Section 7.1.2** Operation & Maintenance: **Section 7.1.3** Decommissioning: **Section 7.1.4**	None proposed beyond existing commitments.
		Extent and distribution			
		Structure and function: presence and abundance of key structural and influential species			
		Structure: species composition of component communities			
		Supporting processes: sedimentation rate			
		Supporting processes: water quality - turbidity			
	Smothering and siltation rate changes	Distribution: presence and spatial distribution of biological communities	This feature is considered to have medium sensitivity to sediment deposition. Increased sediment deposition	Construction: **Section 7.1.2**	None proposed beyond existing commitments.
		Extent and distribution			

Protected Feature(s)	Pressure and Activity	Attribute	Summary of Assessment	Assessment Signposting	Mitigation
		Structure and function: presence and abundance of key structural and influential species Structure: species composition of component communities Supporting processes: sedimentation rate Supporting processes: water quality - turbidity	is expected to be of minor magnitude, and therefore results in a slight adverse significance of effect. No hinderance to conservation objectives in terms of cumulative effects from disposal sites are predicted. No hinderance on conservation objectives.	Operation & Maintenance: **Section 7.1.3** Decommissioning: **Section 7.1.4**	
Subtidal mixed sediments, subtidal coarse sediment, subtidal mud, subtidal sand - *features of Holderness Inshore MCZ and Holderness Offshore MCZ*	Changes in suspended solids (water clarity)	Distribution: presence and spatial distribution of biological communities Extent and distribution Structure and function: presence and abundance of key structural and influential species Structure: sediment composition and distribution Structure: species composition of component communities Supporting processes: sediment movement Supporting processes: water quality - turbidity	These features are considered to have a maximum of medium sensitivity to sediment deposition. Increased sediment deposition is expected to be of minor magnitude, and therefore results in a slight adverse significance of effect. No hinderance to conservation objectives in terms of cumulative effects from disposal sites are predicted. No hinderance on conservation objectives.	Holderness Inshore MCZ Construction: **Section 7.1.2** Operation & Maintenance: **Section 7.1.3** Decommissioning: **Section 7.1.4** Holderness Offshore MCZ Construction: **Section 7.2.2** Operation & Maintenance: **Section 7.2.3** Decommissioning: **Section 7.2.4**	None proposed beyond existing commitments.
	Smothering and siltation rate changes	Distribution: presence and spatial distribution of biological communities Extent and distribution Structure and function: presence and abundance of key structural and influential species Structure: sediment composition and distribution	These features are considered to have a maximum of medium sensitivity to sediment deposition. Increased sediment deposition is expected to be of minor magnitude, and therefore results in a slight adverse significance of effect. No hinderance to conservation objectives in terms of cumulative effects from disposal sites are predicted. No hinderance on conservation objectives.		None proposed beyond existing commitments.

Protected Feature(s)	Pressure and Activity	Attribute	Summary of Assessment	Assessment Signposting	Mitigation
		Structure: species composition of component communities			
		Supporting processes: sediment movement			
		Supporting processes: water quality - turbidity			
North Sea Glacial Tunnel Valleys (assessed in context of broadscale habitat type, subtidal mixed sediments) - *feature of Holderness Offshore MCZ*	Changes in suspended solids (water clarity)	Distribution: presence and spatial distribution of biological communities	Hornsea Four is not expected to affect sediment pathways (longshore drift) to the glacial tunnel valley. The feature was assigned a maximum sensitivity of medium to the pressure. Increased sediment deposition is expected to be of minor magnitude, and therefore results in a slight adverse significance of effect. No hinderance to conservation objectives in terms of cumulative effects from disposal sites are predicted. No hinderance on conservation objectives.	Construction: **Section 7.2.2** Operation & Maintenance: **Section 7.2.3** Decommissioning: **Section 7.2.4**	None proposed beyond existing commitments.
		Extent and distribution			
		Structure and function: presence and abundance of key structural and influential species			
		Structure: sediment composition and distribution			
		Structure: species composition of component communities			
		Supporting processes: sediment movement			
		Supporting processes: water quality - turbidity			
	Smothering and siltation rate changes	Distribution: presence and spatial distribution of biological communities	Hornsea Four is not expected to affect sediment pathways (longshore drift) to the glacial tunnel valley. The feature was assigned a maximum sensitivity of medium to the pressure. Increased sediment deposition is expected to be of minor magnitude, and therefore results in a slight adverse significance of effect. No hinderance to conservation objectives in terms of cumulative effects from disposal sites are predicted.	Construction: **Section 7.2.2** Operation & Maintenance: **Section 7.2.3** Decommissioning: **Section 7.2.4**	None proposed beyond existing commitments.
		Extent and distribution			
		Structure and function: presence and abundance of key structural and influential species			
		Structure: sediment composition and distribution			
		Structure: species composition of component communities			

Protected Feature(s)	Pressure and Activity	Attribute	Summary of Assessment	Assessment Signposting	Mitigation
		Supporting processes: sediment movement	No hinderance on conservation objectives.		
		Supporting processes: water quality - turbidity			
Ocean quahog (*Arctica islandica*) - *feature of Holderness Offshore MCZ*	Changes in suspended solids (water clarity)	Population size	Ocean quahog are considered not sensitive to increased SSC. No impacts are predicted to occur on the supporting habitat or supporting processes. There are not expected to be any impacts on population size, presence and spatial distribution of Ocean quahog. No hinderance to conservation objectives in terms of cumulative effects from disposal sites are predicted. No hinderance on conservation objectives.	Construction: **Section 7.2.2** Operation & Maintenance: **Section 7.2.3** Decommissioning: **Section 7.2.4**	None proposed beyond existing commitments.
		Presence and spatial distribution of the species			
		Supporting habitat: extent and distribution			
		Supporting processes: sediment movement			
	Smothering and siltation rate changes	Population size	Ocean quahog are not considered sensitive to smothering and siltation rate changes. There are not expected to be any impacts on population size, presence and spatial distribution of Ocean quahog. No impacts are predicted to occur on the supporting habitat or supporting processes. No hinderance to conservation objectives in terms of cumulative effects from disposal sites are predicted. No hinderance on conservation objectives.	Construction: **Section 7.2.2** Operation & Maintenance: **Section 7.2.3** Decommissioning: **Section 7.2.4**	None proposed beyond existing commitments.
		Presence and spatial distribution of the species			
		Supporting habitat: extent and distribution			
		Supporting processes: sediment movement			

Appendix B – JNCC and Natural England Advice on Operations and Pressure Screening

The tables below summarises the Advice on Operations provided by Natural England for the Holderness Inshore MCZ (Table B 1) and JNCC and Natural England for the Holderness Offshore MCZ (Table B 2).

Table B 1: Holderness Inshore MCZ Advice on Operations (S = sensitive, NS = not sensitive, NA = not assessed).

Pressure	Spurn Head (subtidal) and The Binks'	Intertidal sand and muddy sand	Subtidal coarse sediments	Subtidal mixed sediments	Subtidal mud	Subtidal sand	High energy circalittoral rock	Moderate energy circalittoral rock
Power cable: laying, burial and protection								
Changes in suspended solids (water clarity)	NA	S	S	S	S	S	S	S
Smothering and siltation rate changes (Light)	NA	S	S	S	S	S	S	S
Smothering and siltation rate changes (Heavy)	NA	S	S	S	S	S	S	S
Power cable: Operation and Maintenance, and Decommissioning								
Changes in suspended solids (water clarity)	NA	S	S	NS	S	S	NS	S
Smothering and siltation rate changes (Light)	NA	S	S	S	S	S	S	S

Table B 2: Holderness Offshore MCZ Advice on Operations (S = sensitive, NS = not sensitive).

Pressure	Subtidal coarse sediments	Subtidal mixed sediments	Subtidal sand	Ocean Quahog
Power cable: laying, burial and protection				
Changes in suspended solids (water clarity)	S	S	S	NS
Smothering and siltation rate changes (Light)	S	S	S	NS
Smothering and siltation rate changes (Heavy)	S	S	S	NS

Power cable: Operation and Maintenance, and Decommissioning				
Changes in suspended solids (water clarity)	S	S	S	NS
Smothering and siltation rate changes (Light)	S	S	S	NS