MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS

Dredging and disposal – site characterisation plan

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Glossary

Term	Meaning
Applicants	Morgan Offshore Wind Limited (Morgan OWL) and Morecambe Offshore Wind Ltd (Morecambe OWL)
Benthic ecology	Benthic ecology encompasses the study of the organisms living in and on the sea floor, the interactions between them and impacts on the surrounding environment.
Biotope	The combination of physical environment (habitat) and its distinctive assemblages of conspicuous species.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process.
Habitat	The environment that a plant or animal lives in.
Infauna	The animals living in the sediments of the seabed.
Information to Support an Appropriate Assessment	A report setting out a study to consider whether the Transmission Assets could have adverse effects, either alone or in combination with other plans or projects, on the integrity of designated European sites for which the potential for likely significant effects has been previously established.
Marine Conservation Zone Assessment	An assessment of the potential for the Transmission Assets to affect the protected features of Marine Conservation Zones, and any ecological or geomorphological processes which the protected feature is dependent on.
Marine licence	The Marine and Coastal Access Act 2009 requires a marine licence to be obtained for licensable marine activities. Section 149A of the Planning Act 2008 allows an applicant for to apply for 'deemed marine licences' in English waters as part of the development consent order process.
Maximum Design Scenario	The realistic worst case scenario, selected on a topic-specific and impact specific basis, from a range of potential parameters for the Transmission Assets.
Morecambe Offshore Windfarm: Generation Assets	The offshore generation assets and associated activities for the Morecambe Offshore Windfarm.
Morgan Offshore Wind Project: Generation Assets	The offshore generation assets and associated activities for the Morgan Offshore Wind Project.
Morecambe OWL	Morecambe Offshore Windfarm Limited is owned by Copenhagen Infrastructure Partners' (CIP) fifth flagship fund, Copenhagen Infrastructure V (CI V).
Morgan OWL	Morgan Offshore Wind Limited is a joint venture between JERA Nex bp (JNbp) and Energie Baden-Württemberg AG (EnBW).

Term	Meaning
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	The offshore and onshore infrastructure connecting the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm to the national grid. This includes the offshore export cables, landfall site, onshore export cables, onshore substations, 400 kV grid connection cables and associated grid connection infrastructure such as circuit breaker compounds. Also referred to in this report as the Transmission Assets, for ease of reading.
Suspended Sediment Concentration	Mass of sediment in suspension per unit volume of water.
Transmission Assets Order Limits	The area within which all components of the Transmission Assets will be located, including areas required on a temporary basis during construction and/or decommissioning (such as construction compounds).
Transmission Assets Order Limits: Offshore	The area within which all components of the Transmission Assets seaward of Mean Low Water Springs will be located, including areas required on a temporary basis during construction and/or decommissioning. Also referred to in this report as the Offshore Order Limits, for ease of reading.

Acronyms

Acronym	Meaning
AL1/2	Action Level 1/2
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CSIP	Cable Specification and Installation Plan
EIA	Environmental Impact Assessment
EMODnet	European Marine Observation Data Network
ERL	Effects Range Low
ES	Environmental Statement
ICES	International Council for the Exploration of the Sea
IEF	Important Ecological Features
MCZ	Marine Conservation Zone
MDS	Maximum Design Scenario
MMO	Marine Management Organisation
NPS	National Policy Statement
NSTA	North Sea Transition Authority
OWL	Offshore Wind Ltd

Acronym	Meaning
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PEIR	Preliminary Environmental Information Report
PEL	Probable Effect Level
SAC	Special Area of Conservation
SCOS	Special Committee on Seals
SPA	Special Protection Area
SSC	Suspended Sediment Concentration
TEL	Threshold Effect Level
UKHO	United Kingdom Hydrographic Office

Units

Unit	Description
%	Percentage
m^3	Metres cubed
cm	Centimetre
m	Metre
km	Kilometre
nm	Nautical mile
mg/l	Milligrams per litre
$m^3/s/m$	Metres cubed per second per metre
$m^3/d/m$	Metres cubed per day per metre

1 Transmission Assets – Dredging and disposal – site characterisation plan

1.1 Background

1.1.1 Introduction

1.1.1.1 This document forms the Dredging and disposal - site characterisation plan prepared for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets (referred to hereafter as 'the Transmission Assets').

1.1.2 Project overview

1.1.2.1 Morgan Offshore Wind Limited (Morgan OWL), a joint venture between JERA Nex bp (JNbp) and Energie Baden-Württemberg AG (EnBW), is developing the Morgan Offshore Wind Project. The Morgan Offshore Wind Project is a proposed wind farm in the east Irish Sea.

1.1.2.2 Morecambe Offshore Windfarm Ltd (Morecambe OWL), owned by Copenhagen Infrastructure Partners' (CIP) fifth flagship fund, Copenhagen Infrastructure V (CI V), is developing the Morecambe Offshore Windfarm, also located in the east Irish Sea.

1.1.2.3 Morgan OWL and Morecambe OWL (the Applicants), being in agreement with the output from the Holistic Network Design Report, are jointly seeking a single consent for their electrically separate transmission assets comprising aligned offshore export cable corridors to landfall and aligned onshore export cable corridors to separate onshore substations (and associated infrastructure), and onward connection to the National Grid at Penwortham, Lancashire.

1.1.2.4 The purpose of the Transmission Assets is to connect the Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets (referred to collectively as the 'Generation Assets') to the National Grid. The key components of the Transmission Assets include offshore elements, landfall and onshore elements. Details of the activities and infrastructure associated with the Transmission Assets are set out in Volume 1, Chapter 3: Project description of the Environmental Statement (ES) (document reference F1.3).

1.1.2.5 This Dredging and disposal – site characterisation plan has been developed for offshore elements of the Transmission Assets, seawards of Mean High Water Springs, with the proposed Disposal Site (with disposal shared over areas where both projects are aligned) shown in **Figure 1.1**. In summary, the offshore elements of the Transmission Assets will comprise:

- offshore export cables, linking the Morgan Offshore Wind Project: Generation Assets to the landfall site; and
- offshore export cables, linking the Morecambe Offshore Windfarm: Generation Assets to the landfall site.

1.1.2.6 Separate Dredging and disposal – site characterisation plans have been produced for the Morgan Offshore Wind Project: Generation Assets (Morgan Offshore Wind Ltd, 2024) and the Morecambe Offshore Windfarm: Generation Assets (Morecambe Offshore Windfarm Ltd, 2024a).

~~1.1.2.6~~1.1.2.7 This Dredging and disposal – site characterisation plan has been updated in response to questions to the Applicants set out in the Secretary of State's ~~letter to interested parties~~request for information, issued 12 March 2026.

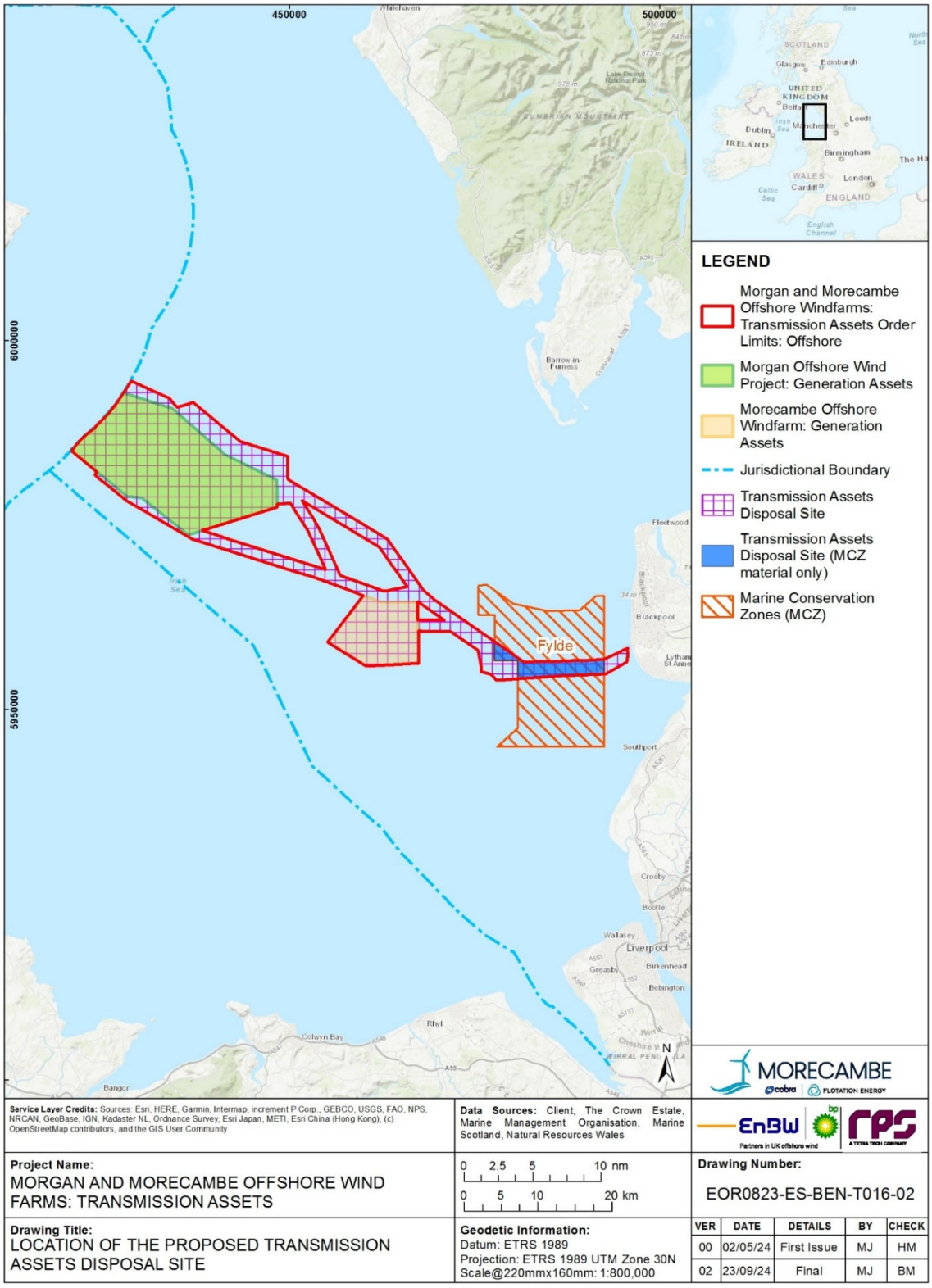


Figure 1.1: Location of the proposed Transmission Assets disposal site

1.1.3 Scope and purpose of document

1.1.3.1 This document is the Dredging and disposal – site characterisation plan which is required to apply for a licence for the disposal of seabed and sub-bottom geological material within the Transmission Assets Order Limits: Offshore (hereafter referred to as Offshore Order Limits) (as shown in **Figure 1.1**) that may arise during the construction of the Transmission Assets.

1.1.3.2 This Dredging and disposal – site characterisation plan draws on the findings of the technical reports and chapters of the Transmission Assets ES, to support the application for licensing of the Transmission Assets disposal site.

1.1.3.3 Site characterisation is the process whereby the existing environment for a proposed marine disposal site for spoil material generated by construction activities is described, using all available data sources. It is a requirement that a site characterisation report be submitted to the relevant statutory body, in this case the Marine Management Organisation (MMO), to inform the decision-making process and to allow the licensing of the disposal site as well as facilitating the consideration of the need for any relevant conditions in relation to the disposal activity within the marine licences for the Transmission Assets. The disposal of inert material is a licensable marine activity which will be authorised by the deemed marine licences (included in the draft Development Consent Order, document reference C1).

1.1.3.4 This Dredging and disposal - site characterisation plan references the following chapters and their associated annexes.

- Volume 2, Chapter 1: Physical processes of the ES (document reference F2.1).
- Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES (document reference F2.2).
- Volume 2, Chapter 3: Fish and shellfish ecology of the ES (document reference F2.3).
- Volume 2, Chapter 4: Marine mammals of the ES (document reference F2.4).
- Volume 2, Chapter 5: Offshore ornithology of the ES (document reference F2.5).
- Volume 2, Chapter 6: Commercial fisheries of the ES (document reference F2.6).
- Volume 2, Chapter 7: Shipping and navigation of the ES (document reference F2.7).
- Volume 2, Chapter 8: Marine archaeology of the ES (document reference F2.8).
- Volume 2, Chapter 9: Other sea users of the ES (document reference F2.9).
- MCZ Screening and Stage 1 Assessment Report (document reference E4).

- HRA Stage 2 Information to Support an Appropriate Assessment (document reference E2.1, E2.2 and E2.3).

1.1.4 Structure of this document

1.1.4.1 This document is set out as follows.

- **Section 1.1**: Background.
- **Section 1.2**: Predicted spoil sources and volumes.
- **Section 1.3**: Measures adopted as part of the Transmission Assets (Commitments).
- **Section 1.4**: Consideration of alternative disposal options.
- **Section 1.5**: Characteristics of the disposal site.
- **Section 1.6**: Characteristics of the material to be disposed.
- **Section 1.7**: Assessment of potential adverse effects.
- **Section 1.8**: Monitoring.
- **Section 1.9**: Summary.
- **Section 1.10**: References.

1.1.5 Consultation

1.1.5.1 A summary of the key comments raised during consultation activities undertaken to date and specific to this Dredging and disposal - site characterisation plan is presented in **Table 1.1**. These comments are listed by date received and grouped by consultee and type of response, and this table provides details of how and where within this dredging and disposal – site characterisation plan the comments have been addressed.

1.1.5.2 It should be noted that formal responses are provided for **all** consultation responses received and can be accessed in the Consultation Report (document reference E1).

Table 1.1: Summary of key consultation topics raised during consultation activities undertaken for the Transmission Assets relevant to the Transmission Assets Dredging and disposal - site characterisation plan

Date	Consultee and type of response	Comment raised	Response to comment
November 2023	Marine Management Organisation (MMO) – Section 42 comments	MMO noted inconsistencies in the reporting of the sediment chemistry data.	The sediment chemistry data has been reviewed post-Preliminary Environmental Information Report (PEIR) and inconsistencies corrected in Volume 2, Annex 2.1: Benthic subtidal and intertidal ecology technical report of the ES (document reference F2.2.1). The sediment chemistry results are presented in **section 1.6.3**.
November 2023	MMO – Section 42 comments	Given that there will be approximately more than 1 cubic megametres (Mm^3) of material to be cleared in terms of sandwaves, a designation of a disposal site for the Transmission Asset works will be necessary, and adequate characterisation for the site should be provided ensuring the chemical analysis is appropriate.	Noted, and as detailed in this Dredging and disposal - site characterisation plan, a disposal site within the Offshore Order Limits is proposed.
November 2023	Natural England – Section 42 comments	While Natural England supported the use of sandwave levelling as a form of mitigation measure to reduce using cable protection; there was a considerable amount of sandwave clearance and seabed preparation footprint proposed. Natural England advised that all efforts should be made to avoid areas of sandwaves or minimise the need for clearance by micro- routing cables. Therefore, Natural England encourage refinement of the maximum design scenario (MDS) as much as possible.	The MDS for sandwave clearance has been refined post-PEIR. These refinements have significantly reduced the requirements for sandwave clearance (and associated temporary habitat disturbance) from 60% to 5% for the Morgan export cables and from 30% to 5% for the Morecambe export cables (CoT47, **Table 1.6**). The width of the sandwave clearance corridor has also reduced from 104 m to 60 m for the Morgan cables and 48 m for the Morecambe cables.
		Natural England recommended the use of best practice methods to reduce the area of the Fylde Marine Conservation Zone (MCZ) impacted by disposal of sandwave clearance materials. Natural England advised that site-specific geophysical survey data should be used to refine the MDS. Natural	A number of project design refinements have been made between the PEIR and final application. These refinements have significantly reduced the requirements for sandwave clearance (and associated temporary habitat disturbance) within the Fylde MCZ. The MDS for sandwave clearance in the Fylde MCZ has reduced from 60% to 5% for the Morgan export cables and from

Date	Consultee and type of response	Comment raised	Response to comment
		England advised full consideration should also be given to relocation of any disposal material and impacts that may have.	30% to 5% for the Morecambe export cables. It should also be noted that sandwave clearance is an important tool to facilitate the successful burial of cables and to minimise the requirements for external cable protection. The techniques used for sandwave clearance will be undertaken with the aim of depositing material in the direct vicinity of its original location, with no sediment being removed from the sediment cell, with further details provided in the Outline Offshore Cable specification and installation plan (CSIP) (document reference J15). Within the Fylde MCZ, a Controlled Flow Excavator will be the only method used for sandwave clearance.
		Natural England requested clarity around the sandwave volume MDS figures, namely the: • length of cable route requiring sandwave clearance (km); • width of sandwave clearance disturbance corridor (m); • indicative depth of sandwave clearance dredging (m); • area of seabed disturbed by sandwave clearance (m^2); and • seabed preparation areas for foundations (m2).	The length, width and area of sandwave clearance has been provided in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES (document reference F2.2). Details regarding the sandwave preparation areas for foundations and interconnector cables have not been provided as offshore substation platforms, the Morgan offshore booster station and interconnector cables have been removed from the project design envelope.
February 2024	Natural England – 3rd benthic ecology, fish and shellfish and physical processes EWG	Natural England also stated that within designated sites the Applicants would need to dispose of sandwave material upstream within the site to ensure sediment is not lost from the system.	Sandwave clearance is an important tool to facilitate the successful burial of cables and to minimise the requirements for external cable protection. Material arising from sandwave clearance for example by controlled flow excavation, and cable installation within the Fylde MCZ will naturally disperse within the immediate vicinity of the Transmission Assets Order Limits from which it was displaced ensuring that material remains within the

Date	Consultee and type of response	Comment raised	Response to comment
			same sediment cell and that material is not lost from the system. Material will not be physically removed from the system but allowed to settle around the seabed from which it originated. Further details are provided in the Outline Offshore CSIP (document reference J15).

1.2 Predicted spoil sources and volumes

1.2.1 Sources of spoil

1.2.1.1 In the context of this Dredging and disposal – site characterisation plan for the Transmission Assets the term 'spoil' covers all material (i.e. sediment) which is extracted from (i.e. by dredging), and subsequently deposited on, the seabed during the construction of the Transmission Assets.

1.2.1.2 Spoil will be generated from sandwave clearance activities within the Transmission Assets Offshore Order Limits prior to the installation of export cables. Many of the cable installation tools and techniques such as ploughing, trenching, or jetting require a stable, flat seabed surface in order to install cables as it may not be possible to install the cable up or down a slope over a certain angle. In addition, the cables must be buried to a depth where they can be expected to stay buried for the duration of the lifetime of the Transmission Assets, within the proposed minimum burial depth of 0.5 m. Sandwaves are generally mobile in nature, therefore cables are anticipated to be buried beneath the level where natural sandwave movement could uncover them.

1.2.1.3 Site-specific geophysical data from the Offshore Order Limits and bathymetry data were used to identify sandwaves and it was determined that the maximum design scenario equates to up to 9% of the total length of the Morgan offshore export cables and up to 9% of the Morecambe offshore export cables may require sandwave clearance (see **Table 1.2** and CoT47 in **Table 1.6**). Further specific details are provided in the Outline Offshore CSIP (document reference J15) as required by CoT45 (**Table 1.6**).

1.2.1.4 The site specific geophysical and bathymetry data were also used to determine reduced parameters (compared to the parameters described in **paragraph 1.2.1.3**) for the maximum design scenario for sandwave clearance requirements for cables to be installed within the Fylde MCZ. Sandwave clearance may be required for up to 5% of the Morgan export cables within the Fylde MCZ and up to 5% of the Morecambe export cables within the Fylde MCZ (see **Table 1.2**).

1.2.1.5 Dredging, if required, would be carried out by dredging vessels using suction hoppers or similar, outwith the MCZ. Within the Fylde MCZ, a Controlled Flow Excavator will be the only method used for sandwave clearance.

Table 1.2: Maximum design scenarios for sandwave clearance for Morgan and Morecambe export cables and for cables within the Fylde MCZ

Export Cable Corridor	Cables requiring sandwave clearance for all offshore export cables (%)	Cables requiring sandwave clearance within the Fylde MCZ (%)
Morgan export cables	9	5

Export Cable Corridor	Cables requiring sandwave clearance for all offshore export cables (%)	Cables requiring sandwave clearance within the Fylde MCZ (%)
Morecambe export cables	9	5

1.2.2 Volume of spoil for disposal

1.2.2.1 The total spoil volume for the Transmission Assets disposal site is calculated using the MDS for sandwave clearance associated with the relevant infrastructure within the Offshore Order Limits.

1.2.2.2 The maximum amount of spoil that is anticipated to arise within the Offshore Order Limits, as a result of sandwave clearance, which would require disposal within the Transmission Assets disposal site, is 1,161,600~~1,426,800~~ m^3 as detailed in **Table 1.3**.

Table 1.3: Summary of MDS spoil volumes associated with sandwave clearance in the Transmission Assets disposal site

Source	Sandwave clearance/spoil (m^3)
Morgan offshore export cables	~~1,080,000~~1,003,2~~0~~00
Morecambe offshore export cables	~~346,800~~158,4~~5~~00
Total	~~1,426,800~~1,161,600

1.2.2.3 The maximum amount of spoil that is anticipated to arise as a result of sandwave clearance within the area of overlap between the Fylde MCZ and the Offshore Order Limits, which would require disposal within the Transmission Assets disposal site, is 124,800~~270,000~~ m^3 as detailed in **Table 1.4**. It is important to note that the commitment CoT116 (**Table 1.5**) requires that only material arising from sandwave clearance within the Fylde MCZ will be disposed of within the immediate vicinity of the portion of the Transmission Assets disposal site that overlaps with the Fylde MCZ. Within the Fylde MCZ, a Controlled Flow Excavator will be the only method used for sandwave clearance. Spoil generated within the Fylde MCZ will be returned to the seabed within the immediate vicinity to ensure that material is not lost from the system.

Table 1.4: Summary of MDS spoil volumes associated with sandwave clearance and associated disposal in the area of overlap between the Offshore Order Limits and the Fylde MCZ

Source	Sandwave clearance/spoil (m^3)
Morgan offshore export cables	~~172,800~~96,000
Morecambe offshore export cables	~~97,200~~28,800
Total	~~270,000~~124,800

1.3 Measures adopted as part of the Transmission Assets (Commitments)

1.3.1.1 **Table 1.5** details the measures (commitments) adopted as part of the Transmission Assets which are of relevance to this Dredging and disposal – site characterisation plan.

Table 1.5: Measures (commitments) adopted as part of the Transmission Assets

Commitment number	Measure adopted	How the measure will be secured
CoT45	The Outline Offshore Cable Specification and Installation Plan (CSIP) for the Fylde MCZ includes: details of cable burial depths, cable protection, and cable monitoring. The Outline CSIP also includes an Outline Cable Burial Risk Assessment (CBRA). Detailed CSIP(s) and CBRA(s) will be prepared by the Applicants covering the full extent of their respective offshore export cable corridors. Detailed CSIPs will be developed in accordance with the Outline CSIP and will ensure safe navigation is not compromised including consideration of under keel clearance. No more than 5% reduction in water depth (referenced to Chart Datum) will occur at any point on the offshore export cable corridor route without prior written approval from the licensing authority in consultation with the MCA and Trinity House.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition 18(1)(e) (Pre-construction plans and documentation)
CoT47	The Outline Offshore Cable Specification and Installation Plan (CSIP) includes measures to limit the extent of cable protection to 3% of the offshore export cable route within the Fylde (Marine Conservation Zone) MCZ (excluding cable crossings). Within the Fylde MCZ, external cable protection will only be used where deemed to be essential, e.g. for cable crossings or in the instance that adequate burial / reburial is not possible for any section of the route through the Fylde MCZ. The Outline CSIP also includes measures to limit sandwave clearance to up to 5% of the offshore export cable corridor route within the Fylde MCZ. Material arising from sandwave clearance in the Fylde MCZ, which will only be undertaken using Controlled Flow Excavator, will be deposited within the Fylde MCZ. The requirements for cable protection and sandwave clearance will be informed through the undertaking of survey works pre-construction. Detailed CSIP(s) will be developed in accordance with the Outline CSIP.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition 18(1)(e) (Pre-construction plans and documentation)
CoT49	Construction Method Statement(s) (CMSs) including Offshore Cable Specification and Installation Plan(s) (document reference J15), will be produced and implemented prior to construction. These will contain: - details of cable installation and methodology	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission

Commitment number	Measure adopted	How the measure will be secured
		Assets), Part 2 - Condition 18(1)(e) (Pre-construction plans and documentation).
CoT54	An Outline Offshore CSIP (document reference J15) will include for cable burial to be the preferred option for cable protection, where practicable. Detailed CSIP(s) will be developed in accordance with the Outline Offshore CSIP.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition 18(1)(e) (Pre-construction plans and documentation).
CoT63	An Outline Offshore Written Scheme of Investigations (WSI) for Archaeology has been prepared and submitted with the application for development consent. The Outline Offshore WSI for Archaeology includes: • the requirement for Archaeological Exclusion Zones (AEZs) around those sites identified as having high and medium archaeological potential, as presented in the Offshore Historic Environment Plan; • the requirement for Temporary Archaeological Exclusion Zones (TAEZs), as presented in the Offshore Historic Environment Plan; • implementation of a Protocol for Archaeological Discoveries (PAD) in accordance with 'Protocol for Archaeological Discoveries: Offshore Renewables Projects' (The Crown Estate, 2014); • the incorporation of marine archaeology specification and analysis in further pre-construction surveys such as geophysical, geotechnical, or ROV/diver surveys; • operational awareness and avoidance, where possible, of low potential anomalies; • where avoidance of low potential anomalies is not possible, mitigation measures for potential direct impacts to marine archaeology; and • details of reporting and archival requirements. Detailed Offshore WSI(s) for Archaeology will be developed in accordance with the Outline Offshore WSI for Archaeology, in consultation with Historic England.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(g) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition18(1)(g) (Pre-construction plans and documentation).
CoT116	Any material arising from sandwave clearance within the Transmission Assets Order Limits outwith the Fylde MCZ will be deposited in close proximity to the works and within the licensed disposal sites within the Order Limits, as detailed in the Dredging and Disposal - Site	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 1 - Condition 2(f) (Design Parameters) and

Commitment number	Measure adopted	How the measure will be secured
	Characterisation Plan prepared and submitted as part of the application for development consent. Within the Fylde MCZ, sandwave clearance, which will only be undertaken by Controlled Flow Excavator, will be deposited in close proximity to the works and only within the portion of the Order Limits overlapping the Fylde MCZ.	Part 2 – Condition16(4) (Chemicals, drilling and debris); and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets) Part 1 - Condition 2(f) (Design Parameters) and Part 2 – Condition16(4) (Chemicals, drilling and debris).
CoT134	As part of the detailed design process, micro-siting of the offshore export cables within the offshore export cable corridors will be considered where successful burial could pose a challenge or where a higher risk of remedial works such as external cable protection may be required.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition 18(1)(e) (Pre-construction plans and documentation)

1.4 Consideration of alternative disposal options

1.4.1.1 Once dredged material has been produced, it is classified as a waste material, and is therefore considered to be part of a waste stream and strictly controlled. Disposal of inert material is a licensable marine activity under the deemed marine licences.

1.4.1.2 The disposal of dredged material falls under the London Convention 1972, the Oslo-Paris (The Convention for the Protection of the Marine Environment of the North-East Atlantic) Convention 1992 and the European Union Waste Framework Directive 2008/98/EC, transposed into UK law through the Waste (England and Wales) Regulations 2011 (SI 2011 No 988).

1.4.1.3 At the core of the Waste Framework Directive is the guidance on applying the Waste Hierarchy (Department for Environment, Food and Rural Affairs, 2011), which comprises:

- prevention;
- re-use;
- other recovery; and
- disposal.

1.4.1.4 Where prevention or minimisation is not possible, management options for dealing with waste material must consider the alternative options in the order

of priority indicated above (i.e. re-use, recycle, other recovery and then disposal).

1.4.1.5 The consideration of alternative solutions to the disposal of dredged material within the Offshore Order Limits is therefore an important part of the site characterisation process and is required in order to inform the decision making process required of the relevant authority. The following **section 1.4.1** presents information on the consideration of potential alternatives to the disposal of material from activity from the Offshore Order Limits.

1.4.1 Waste hierarchy

Prevention

1.4.1.1 The Waste Hierarchy places a strong emphasis on waste prevention or the minimisation of waste. Sandwave clearance is expected to be required in areas where sandwave gradients are in excess of the working limits for standard cable installation equipment, to avoid unnecessary strain on the cables through bending, and to maximise burial efficiency and reduce the chances of burial failure, thereby reducing potential unplanned increases in spoil. Additionally, the cable must be buried to a depth where it may be expected to stay buried for the duration of the project lifetime. Sandwaves are generally mobile in nature therefore the cable must be buried beneath the level where natural sandwave movement would uncover it. Sometimes this can only be done by removing the mobile sediments before installation takes place. Therefore, to install the export cables for the Transmission Assets, sandwave clearance and the associated dredging and disposal works will in some cases be unavoidable.

1.4.1.2 As a result, the safe and effective installation of the Transmission Assets may involve sandwave clearance techniques that give rise to spoil. Whilst volumes of sediment spoil will be minimised to that necessary for safe and effective installation, it is not possible to prevent spoil generation completely. Therefore, consideration must next be given to whether re-use of the spoil generated is possible.

Re-use

1.4.1.3 As prevention of spoil is not possible, the potential for the spoil material to be re-used for a different purpose than being returned to the surrounding environment must next be considered. Potential examples of options for the re-use of dredged material can include:

- beach nourishment/replenishment schemes;
- land reclamation schemes; and
- habitat enhancement schemes.

1.4.1.4 Transfer of the volume of spoil material to another location where material could be re-used, if this was a viable option, would consist of the movement of up to 1,161,600~~1,426,800~~ m^3 from the Offshore Order Limits (see **Table 1.3**). Alternative uses for the spoil are most likely to be on land, which would

require a total of up to approximately 130 dredging cycles for the Transmission Assets (assuming a hopper capacity of 11,000 m^3). Each cycle would form a round trip from the closest port (for example, a port in Liverpool Bay).

1.4.1.5 Dredger movements would lead to additional environmental impacts due to increased vessel emissions that could be avoided if dredged material were disposed of *in situ* (i.e. close to the source of production). Barges for transporting material away from the Offshore Order Limits may also require four-point anchoring systems at each loading point, which would also result in an additional environmental impact that the disposal of material *in situ* would preclude.

1.4.1.6 It is concluded that whilst potential alternative options for use of this material may exist in theory and at some point in the future, the re-use of material onshore is not currently deemed viable.

Recycle

1.4.1.7 As prevention and re-use of spoil are not viable options, the potential for dredged material to be recycled must next be considered. Recycling of dredged material would involve transforming the material into a different form, for example to produce bricks or aggregate material. As outlined in the MMO guidance (MMO, 2011), these are generally land-based solutions with any material produced used in onshore construction projects. As such, the same issues with respect to vessel movements to transport the dredged material to land, as discussed above in **paragraphs 1.4.1.4** to **1.4.1.6**, would apply. The disposal of dredged spoil material *in situ* would preclude the additional environmental impacts that would arise. The re-recycling of material has therefore not been deemed viable.

Other recovery

1.4.1.8 As prevention, re-use and re-cycling of spoil are not viable options, the potential for other means of recovery must next be considered. There are currently very few examples of other recovery options for dredged material (MMO, 2011) and no such options have been identified for the spoil material from the Transmission Assets. Other means of recovering the material arising from the Transmission Assets have therefore not been deemed viable.

Disposal

1.4.1.9 The final option for consideration is therefore disposal, and initial consideration has been given to the potential to dispose of material at an existing disposal site (i.e. rather than licensing a new disposal site). The closest open disposal site is the 'Fleetwood Statutory Harbour Authority Disposal Site', but this is only licenced through to the end of 2025, so will be closed at the point that construction of the Transmission Assets commences. The closest open marine disposal site which has temporal overlap with the

construction phase of the Transmission Assets is the Barrow Disposal Site D, located to the north of the Offshore Order Limits.

1.4.1.10 Disposal sites, such as the Barrow Disposal Site D are, however, generally only licensed to enable the disposal of material from specific projects/locations and activities. It is not, therefore, considered feasible to use an existing disposal site since they are not generally designated for additional volumes beyond those necessary for the specific purpose for which they were licensed.

1.4.1.11 In addition, the use of an existing open disposal site would require the transport of the Transmission Assets spoil material away from the Offshore Order Limits, resulting in additional vessel movements with associated environmental implications as discussed above in **paragraphs 1.4.1.4** to **1.4.1.6**. The receiving seabed environment at an alternative location may also be characterised by a different sediment composition. Disposal of the spoil material *in situ* within the Offshore Order Limits boundary, and close to the point of production, ensures that the spoil will be returned into a broadly similar sedimentary environment to avoid significant changes in habitat. Disposal of material at another disposal site may also require hydrodynamic and sediment transport modelling studies to determine the capacity of the site to accommodate the additional spoil type and volumes.

1.4.1.12 In addition, as outlined in **Table 1.1**, Natural England have raised the importance of ensuring that sediment is not lost from the system, particularly with regards to the Fylde MCZ. Therefore, disposal at existing marine disposal sites does not represent the most efficient or environmentally robust approach to disposal of material from the Transmission Assets.

1.4.1.13 In conclusion, the assessments undertaken in Volume 2, Chapter 1: Physical processes of the ES (document reference F2.1) and Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES (document reference F2.2) have not identified any significant adverse (in Environmental Impact Assessment (EIA) terms) impacts on receptors as a result of the proposed disposal activity. It is concluded that whilst potential alternative options for use of this material may exist in theory, disposal *in situ* remains the most viable option. *In situ* disposal also has the advantage of retaining sediment within the local sedimentary system which may reduce the overall impact of these activities, in line with advice from Natural England and the National Policy Statement (NPS) for Renewable Energy Infrastructure (NPS EN-3, paragraphs 2.8.224) (Department for Energy Security & Net Zero, 2023). This is also important for facilitating the recovery of benthic communities and seabed features (e.g. sandwaves).

1.5 Characteristics of the disposal site

1.5.1 Physical characteristics

1.5.1.1 This section provides a summary of the physical characteristics of the Offshore Order Limits. Further details on the physical environment are set out

in Volume 2, Chapter 1: Physical processes of the ES (document reference F2.1).

Bathymetry

1.5.1.2 Seabed levels across the Offshore Order Limits range from the intertidal zone of 0 m depth to a maximum of 50 m below Mean Sea Level occurring within the west of the Offshore Order Limits, which is intersected at this location by a deep corridor from south west to north east.

Tidal and wave regime

1.5.1.3 The Transmission Assets has an average tidal range of 3.65 m as published by Admiralty (United Kingdom Hydrographic Office (UKHO)) at the standard port of Holyhead and a mean tidal range of 4.55 m at the standard port of Douglas.

1.5.1.4 The semi-diurnal tides are the dominant physical process in the Irish Sea moving into the Irish Sea from the Atlantic Ocean through both the North Channel and St. George's Channel. The tidal range in the Irish Sea is highly variable with the range in Liverpool Bay exceeding 10 m on the largest spring tides, the second largest in Britain.

1.5.1.5 The wave climate within the Offshore Order Limits is described as having dominant short period, south west direction waves. During the metocean buoy deployment the largest wave height recorded was 8.92 m (Hmax) during Storm Franklin (Fugro, 2022).

1.5.1.6 The highest mean annual significant wave height of 1.39 m was recorded between the Isle of Man and Anglesey with the significant wave height reducing closer to the coast with a low of 0.73 m recorded to the west of the Dee Estuary (ABPmer, 2018).

1.5.1.7 Within the Transmission Assets physical processes study area, defined as a single tidal excursion around the Offshore Order Limits, mean annual wave height ranged from 0.5 m near the coast to 1.3 m at the north west extent. Over 40% of the waves near the study area arise from the south west with all significant wave heights (>4 m) arriving from the south west or west. Near the coast, over 40% of the waves arise from the west with significant waves not typically reaching over 2 m (ABPmer, 2018).

Seabed geology

1.5.1.8 Across the Transmission Assets, the underlying geology consists of Triassic and Carboniferous sandstone and mudstone bedrock lithologies (Mellett *et al*., 2015). The bedrock of sandstone and mudstone is covered by sediments from the Quaternary age with small areas exposed (Mellett *et al*., 2015). Potential weathering during the last glacial period may have weakened the uppermost surface of underlying bedrock (Mellett *et al*., 2015). Quaternary sediment thickness in the central Irish Sea is <20 m although in short distances this can increase to >100 m due to the presence of glacial valleys.

However, in the east and west of the Irish Sea sediment thickness is circa 50 m (Mellet *et al*., 2015).

1.5.1.9 In the Irish Sea, there is a high variability in the bedforms ranging from very small ripples (5 cm high) to very large sediment waves (>10 m high). Site specific surveys performed for the Morgan Offshore Wind Project: Generation Assets, which is within the Offshore Order Limits, denote that the physical processes study area contains a number of distinct features such as sandwaves, mega-ripples, sediment waveforms and outcrops, which decrease in frequency to the east of the Offshore Order Limits (Gardline, 2022). Seabed substrate within the Offshore Order Limits included circalittoral mud, circalittoral sandy mud, circalittoral sand and circalittoral coarse sediment, with circalittoral muddy sand near the coast (European Marine Observation Data Network (EMODnet), 2021). These sediment types were further confirmed in the south of the Offshore Order Limits, with the Morecambe Offshore Windfarm: Generation Assets being dominated by circalittoral fine sand/circalittoral muddy sand, deep circalittoral sand, circalittoral sand mud and deep circalittoral mud (Morecambe Offshore Windfarm Ltd, 2024b).

Bedforms and sediment transport

1.5.1.10 Within the east of the Offshore Order Limits, near to the landfall, there are strong circulatory currents where tidal flows interact with headlands and bays around the coast surrounding the landfall. The greatest sediment transport rates are evident in estuaries and at headlands where finer sand fractions are present and where tidal currents are strongest. This corresponds with lower magnitudes of sediment transport in the offshore environment as within the west of the Offshore Order Limits, where the residual current speeds are several orders of magnitude smaller than those along the coastline. Residual currents are the net flow over a full tidal cycle and drive the sediment transport. Residual currents flow into the east Irish Sea from the north of the Isle of Man and also west around Anglesey. This correlates with this region being a sediment sink.

1.5.1.11 In the Offshore Order Limits, sediment transport rates are highest during springs on the flood tide, with total sediment loads of up to 0.00505 m^3/s/m and 0.00005 m^3/s/m on the peak of the flood and ebb tides respectively.

1.5.1.12 It has been shown from the physical processes modelling for the Morgan Offshore Wind Project: Generation Assets as presented in Volume 2, Chapter 1: Physical processes of the ES (document reference F2.1) and Volume 2, Annex 1.1: Physical processes associated modelling studies (document reference F2.1.1) that the region has active sediment transport systems. Net sediment transport rates of approximately 0.75 m^3/d/m have been modelled within the west of the Offshore Order Limits, and this can be increased further during storm events which raise littoral currents and in turn net sediment transport rates. The sand wave features themselves are also mobile, typically moving 1 m in an easterly direction each year (ABPmer, 2023). Net sediment transport within the Offshore Order Limits occurs within an east/north east direction.

Suspended sediment

1.5.1.13 Suspended Sediment Concentrations (SSCs) are regulated by tidal currents and intensify both near bed and extending into the water column during wind-driven storm events. SSC levels have a seasonal pattern due to the seasonality of storm events. Offshore monitoring was not conducted for the entire Offshore Order Limits, but monitoring performed in the west of the Offshore Order Limits for the Morgan Offshore Wind Project: Generation Assets recorded typical SSC levels of 3 mg/l, however, as expected, during a storm event this increased to approximately 20 mg/l, corresponding with increased wave heights (Fugro, 2022).

1.5.1.14 The Centre for Environment, Fisheries and Aquaculture Science (Cefas) records SSC as non-algal suspended particulate matter. Within the physical processes study area, this was estimated to be on average 2 mg/l offshore to approximately 40 mg/l inshore over the 1998 to 2015 period (Cefas, 2016). Average SSC in the west of the Offshore Order Limits, within the Morecambe Offshore Windfarm: Generation Assets site, were approximately 3-5 mg/l, gradually increasing to 5-7 mg/l in the east of the windfarm site (Cefas, 2016). Higher levels of SSC are experienced more commonly in the winter months, however, even during summer months, the levels remain elevated due to the tidal influence.

1.5.2 Biological characteristics

1.5.2.1 This section provides a summary of the biological characteristics of the Offshore Order Limits. Details for further information on each receptor are outlined in **Table 1.6**.

Table 1.6: Chapter information for further information on biological characteristics

Receptor	Chapter reference
Benthic subtidal and intertidal ecology	Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES (document reference F2.2) Volume 2, Annex 2.1: Benthic subtidal and intertidal ecology technical report of the ES (document reference F2.2.1) MCZ Screening and Stage 1 Assessment Report (document reference E4)
Fish and shellfish ecology	Volume 2, Chapter 3: Fish and shellfish ecology of the ES (document reference F2.3) Volume 2, Annex 3.1: Fish and shellfish ecology technical report of the ES (document reference F2.3.1)
Marine mammals	Volume 2, Chapter 4: Marine mammals of the ES (document reference F2.4) Volume 2, Annex 4.1: Marine mammals technical report of the ES (document reference F2.4.1)
Offshore ornithology	Volume 2, Chapter 5: Offshore ornithology of the ES (document reference F2.5) Volume 2, Annex 5.1: Offshore ornithology technical report of the ES (document reference F2.5.1)

Benthic subtidal and intertidal ecology

1.5.2.2 Subtidal sediments recorded from infaunal grab samples collected across the Offshore Order Limits during the site-specific benthic subtidal surveys are presented in Volume 2, Annex 2.1: Benthic subtidal and intertidal ecology technical report of the ES (document reference F2.2.1). Sediments recorded across the Offshore Order Limits graded from sands, gravelly muddy sands and gravelly sands offshore in the west of the Offshore Order Limits to muddy sands which dominated the central and nearshore sections of the Offshore Order Limits (i.e. to the north and east of the Morecambe Offshore Windfarm: Generation Assets). Immediately adjacent to the landfall, the sediments were sands.

1.5.2.3 A total of 46% of the samples were classified as sand and muddy sand, 36% of stations were mud and sandy mud, 10% comprised mixed sediment and 8% comprised coarse sediment. The sediment composition showed a general trend of coarser sediments offshore, in the west of the Offshore Order Limits, with increasing fines in the central and nearshore parts of the Offshore Order Limits approaching the landfall. Full details of the sediment distribution are included in Volume 2, Annex 2.1: Benthic subtidal and intertidal ecology technical report of the ES (document reference F2.2.1) and are shown in **Figure 1.2**.

1.5.2.4 The site-specific survey data showed that the benthic communities in the west were dominated by the *Lagis koreni* and *Phaxas pellucidus* in circalittoral sandy mud (SS.SMu.CSaMu.LkorPpel) biotope. The communities associated with this biotope were characterised by polychaetes, such as *L. koreni*, *Spiophanes bombyx* and *Pholoe baltica*, and bivalves, with most species adapted to sandy habitats.

1.5.2.5 Throughout the centre of the Offshore Order Limits, mainly to the north and north east of the Morecambe Offshore Windfarm: Generation Assets, the *Amphiura filiformis*, *Kurtiella bidentata* and *Abra nitida* in circalittoral sandy mud (SS.SMu.CSaMu.AfilKurAnit) biotope was dominant. The communities associated with this biotope were characterised by echinoderms such as *Amphiura filiformis*, and bivalves including the characterising species *K. bidentata* and *A. nitida*, and also *Nucula nitidosa*, as well as polychaetes including *Scalibregma inflatum* and *P. baltica*.

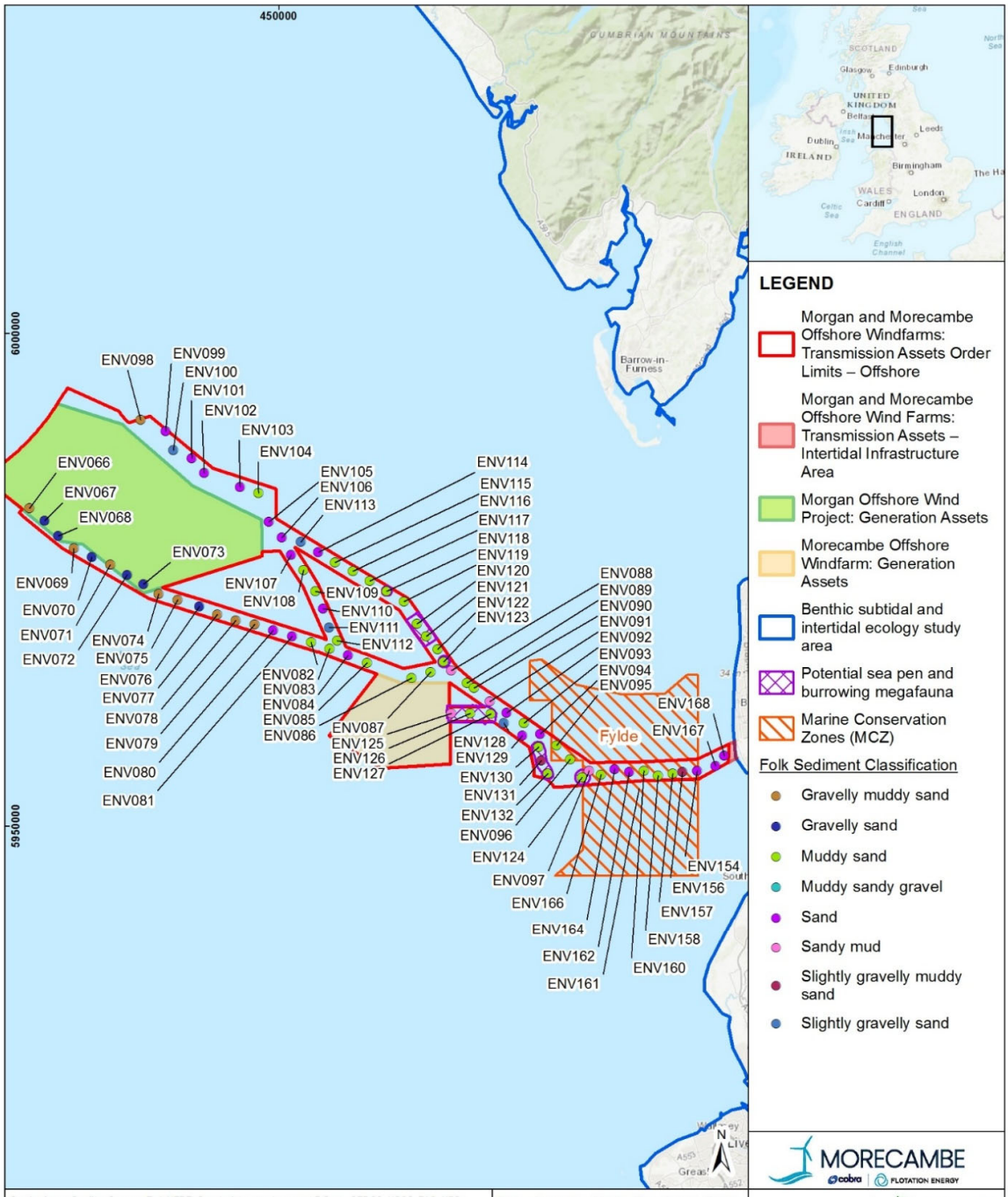
1.5.2.6 The infaunal communities graded into the *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSa.CMuSa.AalbNuc) biotope in the nearshore area, and the infralittoral fine sand (SS.SSa.IFiSa) biotope interspersed with SS.SSa.CMuSa.AalbNuc approaching the landfall.

Fylde MCZ

1.5.2.7 The Fylde MCZ is characterised by, and designated for, subtidal sand and subtidal mud habitats, with the Transmission Assets mainly overlapping the subtidal sand feature. Within the subtidal sand feature, Environment Agency and Natural England surveys in 2015 (Environment Agency and Natural England, 2015) identified the presence of the *Moerella* spp. with venerid

bivalves in infralittoral gravelly sand (SS.SCS.ICS.MoeVen) biotope and the *Glycera lapidum* in impoverished infralittoral mobile gravel and sand (SS.SCS.ICS.Glap) biotope. Further site-specific surveys for the Transmission Assets recorded the presence of the SS.SSa.CMuSa.AalbNuc biotope in the central section of the Fylde MCZ, and the SS.SSa.IFiSa biotope to the east.

1.5.2.8 The same Environment Agency and Natural England surveys (Environment Agency and Natural England, 2015) and site-specific surveys identified the SS.SMu.CSaMu.AfilKurAnit biotope across the west of the area of the Fylde MCZ overlapping with the Offshore Order Limits, and the *Echinocardium cordatum* and *Ensis* spp. in lower shore and shallow sublittoral slightly muddy fine sand (SS.SSa.IMuSa.EcorEns) biotope in close proximity to the Offshore Order Limits.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IRELAND
Birmingham
WALES
Cardiff
London
ENGLAND
LEGEND
Morgan and Morecambe Offshore Windfarms: Transmission Assets Order Limits – Offshore
Morgan and Morecambe Offshore Wind Farms: Transmission Assets – Intertidal Infrastructure Area
Morgan Offshore Wind Project: Generation Assets
Morecambe Offshore Windfarm: Generation Assets
Benthic subtidal and intertidal ecology study area
Potential sea pen and burrowing megafauna
Marine Conservation Zones (MCZ)
Folk Sediment Classification
Gravelly muddy sand
Gravelly sand
Muddy sand
Muddy sandy gravel
Sand
Sandy mud
Slightly gravelly muddy sand
Slightly gravelly sand
N
MORECAMBE
cobra
FLOTATION ENERGY
EnBW
bp
rps
A TETRA TECH COMPANY
Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Data Sources: Client, The Crown Estate, Marine Management Organisation, Marine Scotland, Natural Resources Wales
Project Name:
MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS
0 2.5 5 nm
0 5 10 km
Drawing Number:
EOR0823-ES-BEN-T008-07
Drawing Title:
FOLK SEDIMENT CLASSIFICATIONS FOR EACH BENTHIC GRAB SAMPLE WITHIN THE SURVEY AREA
Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N
Scale@220mmx160mm: 1:650,000
VER DATE DETAILS BY CHECK
00 08/02/24 First Issue MJ HM
07 22/08/24 FINAL MJ TT

Figure 1.2: Folk sediment classifications for each benthic grab sample within the survey area

Fish and shellfish ecology

1.5.2.9 Species identified as likely to be found within the fish and shellfish ecology study area (which covers the east Irish Sea, extending from Mean High Water Springs west from the Mull of Galloway in Scotland to the west tip of Anglesey, following the territorial waters 12 nm limit of the Isle of Man, based on consultation with all relevant stakeholders) include the following.

- Demersal species – sandeel Ammodytidae spp., whiting *Merlangius merlangus*, lemon sole *Microstomus kitt*, ling *Molva molva*, plaice *Pleuronectes platessa*, cod *Gadus morhua*, and European hake *Merluccius merluccius*.
- Pelagic species – herring, mackerel *Scomber scombrus*, sprat *Sprattus sprattus*, and European sea bass *Dicentrarchus labrax*.
- Elasmobranch species – basking shark *Cetorhinus maximus*, lesser spotted dogfish *Scyliorhinus canicula*, tope shark *Galeorhinus galeus*, spurdog *Squalus acanthias*, common skate *Dipturus batis*, spotted ray *Raja montagui*, thornback ray *Raja clavata*, cuckoo ray *Leucoraja naevus* and angel shark *Squatina squatina*.
- Diadromous species – Atlantic salmon *Salmo salar*, European eel *Anguilla anguilla*, sea trout *Salmo trutta*, river lamprey *Lampetra fluviatilis*, sea lamprey *Petromyzon marinus*, allis shad *Alosa alosa*, twaite shad *Alosa fallax*, sparling/European smelt *Osmerus eperlanus*; and freshwater pearl mussel *Margaritifera margaritifera* (included here due to reliance on Atlantic salmon and sea trout at specific life stages).
- Shellfish species – king scallop *Pecten maximus*, queen scallop *Aequipecten opercularis*, European lobster *Homarus gammarus*, edible crab *Cancer pagurus*, velvet swimming crab *Necora puber*, squid *Loliginidae* spp. and *Ommastrephidae* spp., common whelk *Buccinum undatum*, and *Nephrops*.

1.5.2.10 The spawning and nursery habitats present in the fish and shellfish ecology study area are based on Ellis *et al*. (2012) and Coull *et al*. (1998), with the seasonality of each species covered in Volume 2, Annex 3.1: Fish and shellfish ecology technical report of the ES (document reference F2.3.1).

1.5.2.11 The Coull *et al*. (1998) and Northern Ireland Herring Larvae Survey datasets showed significant herring spawning areas to the west and north west of the fish and shellfish ecology study area, and to the north and north west of the Offshore Order Limits. The most suitable spawning grounds were located entirely outside of, but within 10 km of the north and north west of the Offshore Order Limits (Volume 2, Annex 3.1: Fish and shellfish ecology technical report of the ES (document reference F2.3.1)). The site-specific survey data showed that the majority of the stations sampled within the Offshore Order Limits were unsuitable for herring spawning (Gardline, 2023), according to classifications considering sediment composition derived from Reach *et al*. (2013), with only small patches of suitable habitat overlapping the north of the Offshore Order Limits.

1.5.2.12 Sandeel high and low intensity spawning grounds have been identified by Ellis *et al*. (2012) as being present throughout the fish and shellfish ecology study area. The site-specific benthic surveys and EMODnet seabed substrate data shows overall good alignment, showing that the majority of stations within the Offshore Order Limits represented unsuitable to marginal sandeel spawning habitat, based on the classifications derived from Latto *et al*. (2013).

1.5.2.13 Elasmobranch species occurring within the Irish Sea include the spotted and thornback ray. Thornback ray have important spawning grounds in the east Irish Sea around Anglesey, within the fish and shellfish ecology study area (Ellis *et al*., 2012), potentially overlapping the Offshore Order Limits. Other elasmobranch species, including the lesser spotted dogfish and cuckoo ray, are also found throughout the east Irish sea, with both preferring gravelly or coarse sandy substrates for feeding. Basking shark migrate north to south through the Irish and Celtic Seas in August to October while travelling between north Africa and Scotland to overwinter in the 50-200 m continental shelf depth range (Doherty *et al*., 2017).

1.5.2.14 High levels of commercial fishing of king scallop have been recorded within the wider fish and shellfish ecology study area (International Council for the Exploration of the Sea (ICES), 2020). Queen scallop are the target of two types of fisheries from Manx (Isle of Man) and UK vessels which are now managed by quotas since 2020 instead of total allowable catches. Both king and queen scallop fishing and spawning grounds partially overlap with the west of the Offshore Order Limits. Annual scallop surveys around the Isle of Man have highlighted an overall stable trend in densities of queen scallop between 2019 and 2021 with only two stations, located in managed areas (i.e., either with restricted access or closed) in the south west of the Isle of Man territorial waters but not overlapping with the Offshore Order Limits, that have recorded a large increase in abundances (Bloor and Jenkins, 2021).

Marine mammals

1.5.2.15 Seven marine mammal species are known to occur regularly in the region: harbour porpoise *Phocoena phocoena*, bottlenose dolphin *Tursiops truncatus*, short-beaked common dolphin *Delphinus delphis*, Risso's dolphin *Grampus griseus*, minke whale *Balaenoptera acutorostrata*, grey seal *Halichoerus grypus* and harbour seal *Phoca vitulina*. Other cetacean species are occasional or rare visitors.

1.5.2.16 Harbour porpoise occur throughout the Irish sea, including within the Offshore Order Limits, and data from the digital aerial surveys for the Generation Assets show that harbour porpoise were recorded in all survey months. Short-beaked common dolphin and Risso's dolphin are largely restricted to the south of the Irish sea, off the west coast of Wales, with low densities within the Offshore Order Limits. Sightings of bottlenose dolphin are highest in the Cardigan Bay Special Area of Conservation (SAC) compared to the rest of the Irish Sea and densities in the Offshore Order Limits are low.

1.5.2.17 Grey seal utilise extensive areas across Liverpool Bay, the east coast of Ireland and to the north west of the Isle of Man (Carter *et al*., 2022) including within the Offshore Order Limits. Important breeding sites have been recorded at several sites (none of which overlap with the Offshore Order Limits) in Wales (such as Ramsey Island and on Skomer and the adjacent Marloes Peninsula) and in north west England (Hilbre Island in the Dee Estuary and South Walney).

1.5.2.18 Harbour seal are widely distributed throughout the Northern Hemisphere but harbour seal presence in the vicinity of the Offshore Order Limits is very low with the main area of usage in the regional marine mammal study area along the east coast of Northern Ireland. The nearest designated haul out sites for harbour seal in the vicinity of the Transmission Assets marine mammal study area are Manx Marine Nature Reserves (Calf and Wart Bank, Langness, Ramsey and West Coast), and Murlough SAC, Strangford Lough SAC and The Maidens SAC.

1.5.2.19 Further detail on marine mammals is presented in Volume 2, Chapter 4: Marine mammals of the ES (document reference F2.4) and Volume 2, Annex 4.1: Marine mammals technical report of the ES (document reference F2.4.1).

Offshore ornithology

1.5.2.20 No site-specific surveys of the Offshore Order Limits have been undertaken. However, 24 monthly surveys were undertaken for the Generation Assets which fall within the Offshore Order Limits. Specifically, surveys were undertaken for the Morgan Offshore Wind Project: Generation Assets, between April 2021 and March 2023 and the Morecambe Offshore Windfarm: Generation Assets, between March 2021 and February 2023.

1.5.2.21 During the surveys of the Morgan Offshore Wind Project: Generation Assets, 17 species of seabird were recorded within the survey area encompassing the Morgan Offshore Wind Project: Generation Assets Array Area and a 10 km buffer, overlapping with the west of the Offshore Order Limits. Red-throated diver *Gavia stellata* and common scoter *Melanitta nigra*, two qualifying features of the Liverpool Bay Special Protection Area (SPA) were not recorded during these surveys. The species recorded in greatest abundance were common guillemot *Uria aalge*, black-legged kittiwake *Rissa tridactyla*, Manx shearwater *Puffinus puffinus*, Northern gannet *Morus bassanus*, razorbill *Alca torda* and European herring gull *Larus argentatus*.

1.5.2.22 During the surveys of the Morecambe Offshore Windfarm: Generation Assets, 22 species of seabird were recorded within the survey area encompassing the Morecambe Offshore Windfarm: Generation Assets Array Area and a 10 km buffer, overlapping with the centre of the Offshore Order Limits. The species recorded in greatest abundance were black-legged kittiwake, European herring gull, razorbill, and lesser black-backed gull *Larus fuscus*.

1.5.2.23 Further details for ornithology can be found in the Volume 2, Chapter 5: Offshore ornithology of the ES (document reference F2.5) and Volume 2,

Annex 5.1 Offshore ornithological baseline characterisation technical report of the ES (document reference F2.5.1).

Designated sites

1.5.2.24 The Offshore Order Limits overlap with the Fylde MCZ, the Ribble Estuary Site of Special Scientific Interest, the Ribble and Alt Estuaries SPA, the Liverpool Bay/Bae Lerpwl SPA and the Ribble and Alt Estuaries Ramsar. The closest SAC is the Shell Flat and Lune Deep SAC, located 5.72 km to the north of the Offshore Order Limits.

1.5.2.25 Further information and assessment of impacts to designated sites can be found in the Habitats Regulations Assessment Stage 2 Information to Support an Appropriate Assessment (document reference E2.1, E2.2 and E2.3) submitted alongside the ES which considers effects on sites within the national site network (SACs, SPAs and Ramsar sites) and the Stage 1 MCZ Assessment (document reference E4).

1.5.3 Human environment characteristics

1.5.3.1 This section provides a summary of the human environment of the Offshore Order Limits. Further detail can be found in Volume 2, Chapter 6: Commercial fisheries of the ES (document reference F2.6), Volume 2, Chapter 7: Shipping and navigation of the ES (document reference F2.7), Volume 2, Chapter 8: Marine archaeology of the ES (document reference F2.8) and Volume 2, Chapter 9: Other sea users of the ES, and their associated annexes (document reference F2.9).

Commercial fisheries

1.5.3.2 The Offshore Order Limits overlap the ICES rectangles 36E5, 36E6, 37E5 and 37E6, which comprise the commercial fisheries study area. Data from the MMO indicates that, over the period 2010 to 2021 within these ICES rectangles, shellfish was the most important species group in terms of landed weight and value for UK vessels, with the highest landings from ICES Rectangle 37E5. Landings of demersal and pelagic species were considerably lower than shellfish.

1.5.3.3 For UK vessels, the largest proportion of vessels was from the >10 m class; these vessels were predominantly from England, the Isle of Man, Northern Ireland, Scotland and Wales. The smaller UK vessels were predominantly from the Isle of Man and England, reflecting the closer proximity of home ports to this fleet, with relatively small recordings of landings for Welsh, Scottish and Northern Irish vessels.

1.5.3.4 Dredges accounted for 54% of total landings by UK vessels from the commercial fisheries study area. This indicates the importance of the queen and king scallop fisheries in the commercial fisheries study area, with a small overlap with the west of the Offshore Order Limits. Demersal trawl/seine (targeting demersal dwelling species) were also of notable importance in the commercial fisheries study area and consisted mostly of vessels >10 m in

length. Due to the distance from their home ports and the capabilities of the vessels, no non-UK vessels <10 m were active across the commercial fisheries study area and therefore they were not operating within the Offshore Order Limits.

Shipping and navigation

1.5.3.5 Within the shipping and navigation study area, defined as an area of 10 nm surrounding the Offshore Order Limits, there are 41 aids to navigation, of which 26 are associated with offshore wind farms to the north of the Offshore Order Limits, 12 are associated with the presence of oil and gas infrastructure, two within 3 nm of the shore within the Fylde MCZ, and one marking shallower water of Shell Flat. There are no adapted routing measures, no charted anchorages, no ports or harbours and no active spoil or disposal grounds within the shipping and navigation study area.

1.5.3.6 There were 593 cargo ship transits through the shipping and navigation study area during 2022, of which 225 passed through the Offshore Order Limits. These are mostly general cargo vessels of less than 100 m in length. On average, 15.2 ferry transits per day passed through the shipping and navigation study area, a total of 5,542 in 2022. Of these, 4,014 passed through the Offshore Order Limits, a rate of 11 per day. A total of 28 cruise ship transits were recorded passing through the shipping and navigation study area during 2022, of which 15 passed through the Offshore Order Limits. The majority of cruise ships in the Irish Sea are bound for Liverpool and pass outside of the shipping and navigation study area, principally between April and September.

Marine archaeology

1.5.3.7 Geophysical data collected for the Transmission Assets recorded 61 anomalies of potential archaeological interest. Of these, three were classified as high potential anomalies, four as medium potential anomalies and 54 as low potential anomalies. One high potential anomaly was confirmed as a named wreck within the UKHO records, while the other two high potential anomalies were a potential wreck and an unidentified wreck. Full details of the medium and low potential anomalies identified in the Offshore Order Limits can be found in Volume 2, Chapter 8: Marine archaeology of the ES (document reference F2.8). Sites identified as high or medium potential will be avoided due to the implementation of Archaeological Exclusion Zones included as measures adopted as part of the Transmission Assets (CoT63, **Table 1.5**) and are marked on the offshore historic environment plan (document reference B17).

Other sea users

1.5.3.8 In terms of recreational sailing and motor cruising, the data from the Royal Yachting Association is limited to inshore waters, but Automated Identification System data tracks show that recreational vessels transit through offshore waters within the local other sea users study area, defined

as a 1 km buffer around the Offshore Order Limits, mainly travelling between Liverpool and the Isle of Man. Recreational activity in inshore and coastal waters in areas overlapping the Offshore Order Limits is of a low intensity, with most recreational vessels found predominantly along the coast, particularly along the entrance to Liverpool Bay, and around Holyhead, Douglas, and Rhyl. Also, inshore water sports such as kayaking and canoeing may occur within the inshore and coastal areas of the Offshore Order Limits. There are no recreational diving sites within the regional other sea users study area, defined as one tidal excursion surrounding the Offshore Order Limits.

1.5.3.9 Sea fishing trips operate from the Isle of Man (Manx Sea Fishing, 2023) and Fleetwood, Lancashire (Blue Mink Boat Charters, 2018), amongst other ports along the coasts of the east Irish Sea and are assumed to be operating across the local other sea users study area, overlapping with the Offshore Order Limits.

1.5.3.10 There are a number of proposed and operational offshore wind farms in the east Irish Sea. Of these, two overlap directly with the Offshore Order Limits. These are the Morgan Offshore Wind Project: Generation Assets, and the Morecambe Offshore Windfarm: Generation Assets, both of which are associated with the production of electricity transported via the Transmission Assets to the national grid. Management of potential activity overlap with the Offshore Order Limits will be through notification of commencement, progress and completion of offshore work to the UK Hydrographic Office (CoT59) to ensure all infrastructure is marked on nautical maps.

1.5.3.11 There are five active cables (the Isle of Man/UK Interconnector, LANIS 1, Sirius South, Havhingsten and Hibernia Atlantic Seg C) which intersect the local other sea users study area, and all of which directly overlap with the Offshore Order Limits. The management of these cables in relation to the Offshore Order Limits will be through relevant crossing and proximity agreements, as set out in CoT51, **Table 1.5**.

1.5.3.12 Licences for the exploration and extraction of oil and gas on the United Kingdom Continental Shelf have been offered since 1964 and are granted by the North Sea Transition Authority (NSTA). These licences are granted for identified geographical UKHO areas (blocks and sub-blocks) in consecutive rounds. Six currently licenced blocks overlap with the local other sea users study area (blocks 110/2a, 110/2b, 110/3a, 110/7a, 110/8a and 1109c, all of which at least partially overlap with the centre or east of the Offshore Order Limits).

1.5.3.13 The NSTA launched the 33rd Oil and Gas Licensing Round in October 2022 but as of April 2024, no further applications for licences for blocks in the Irish Sea have been made. There are also two exploration licences located within the local other sea users study area (P153 held by Spirit Energy, which overlaps with the Offshore Order Limits, and P251 held by Harbour Energy, to the south of but not overlapping with the Offshore Order Limits) and one overlapping the regional other sea users study area (P1483, held by Spirit Energy, to the north of, and not overlapping with, the Offshore Order Limits).

1.5.3.14 There are seven existing oil and gas platforms and 29 associated pipelines in the vicinity of the Transmission Assets. Of these, five platforms are associated with the South Morecambe cluster, operated by Spirit Energy, with these all expected to be decommissioned between 2027 and 2031, as part of the development of the Morecambe Net Zero Cluster, a Carbon Capture and Storage operation. The Millom West Platform and the Calder platform are also located within the local other sea users study area, with the Millom West Platform in the process of being decommissioned, with the wells suspended and plugged and abandoned in 2024, and the Calder platform estimated to end production within two years either side of 2027, followed by decommissioning including well suspension and plugging and abandonment. The decommissioning activities will occur in close proximity to the Offshore Order Limits.

1.5.3.15 There is one closed marine disposal site, the Preston disposal site, within the regional other sea users study area, which was used for dredge spoil dumping, but this does not overlap with the Offshore Order Limits. There are no marine aggregate extraction areas within the regional other sea users study area.

1.5.3.16 There are four recreational bathing sites identified within the regional other sea users study area. These are, north to south:

- Blackpool Central;
- Blackpool South;
- St Annes North (the only one of these sites to overlap with the Offshore Order Limits); and
- St Annes.

1.6 Characteristics of material to be disposed

1.6.1.1 Information on the physical and chemical characteristics of the material to be disposed is presented in the following sections with more detailed information presented in the documents outlined in **Table 1.7**.

1.6.1.2 Information on the biological characteristics of the material to be disposed is as outlined above in **section 1.5.2** is therefore not repeated in this section.

Table 1.7: Relevant ES chapters and annexes for each data type

Data type	Relevant ES document
Contaminant analysis	Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES (document reference F2.2) Volume 2, Annex 2.1: Benthic subtidal and intertidal ecology technical report of the ES (document reference F2.2.1) Stage 1 MCZ Assessment (document reference E4)
Seabed geology	Volume 2, Chapter 1: Physical processes of the ES (document reference F2.1) Volume 2, Annex 2.1: Benthic subtidal and intertidal ecology technical report of the ES (document reference F2.1.1)

Data type	Relevant ES document
Biotopes and benthic fauna	Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES (document reference F2.2) Volume 2, Annex 2.1: Benthic subtidal and intertidal ecology technical report of the ES (document reference F2.2.1) Stage 1 MCZ Assessment (document reference E4)
Fish and shellfish spawning and nursery areas	Volume 2, Chapter 3: Fish and shellfish ecology of the ES (document reference F2.3) Volume 2, Annex 3.1: Fish and shellfish ecology technical report of the ES (document reference F2.3.1)

1.6.2 Physical characteristics

1.6.2.1 Subtidal sediments recorded across the Offshore Order Limits were predominantly classified as sand and muddy sand, with areas of mud and sandy mud, mixed sediment, and coarse sediment, listed in decreasing order of occurrence. This broadly aligned with the desktop data, which indicated the Offshore Order Limits were dominated by deep circalittoral coarse sediment, offshore circalittoral sand, circalittoral mixed sediment and offshore circalittoral mud, which is characteristic of the wider Irish Sea (EMODnet, 2021).

Fylde MCZ

1.6.2.2 The Fylde MCZ is characterised primarily of subtidal sand sediments with subtidal mud sediments to the north and west. Within the Fylde MCZ, the Offshore Order Limits overlaps almost entirely with subtidal sand sediment, with two stations of subtidal mud recorded in the west, near the west boundary of the Fylde MCZ.

1.6.2.3 Full details of the characteristics of sediments within the Offshore Order Limits, including within the area of overlap with the Fylde MCZ, are presented in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES (document reference F2.2) and the Stage 1 MCZ Assessment (document reference E4).

1.6.3 Chemical characteristics

1.6.3.1 As part of the subtidal survey, sediment samples were taken for the purpose of sediment chemistry analysis. Sediment hydrocarbon, metals, total organic carbon, organotins and polychlorinated biphenyl (PCB) analyses were carried out by SOCOTEC, a laboratory validated by the MMO for sediment analysis to inform marine licence applications.

1.6.3.2 The concentrations of the heavy metals, polycyclic aromatic hydrocarbons (PAHs) and PCBs were compared to the corresponding Cefas Action Level 1 (AL1) and Action Level 2 (AL2) and the Canadian Threshold Effect Level (TEL) and Probable Effect Level (PEL). In summary, no contaminants were found to exceed Cefas AL2 or the Canadian PEL, and most contaminants were also below Cefas AL1 and the Canadian TEL (**Figure 1.3**).

1.6.3.3 For metals, no stations exceeded the relevant Cefas AL1 or Canadian TELs and PELs for cadmium, chromium, copper, lead, or zinc. Concentrations of nickel at a single station located offshore in the north west of the Transmission Assets Order Limits and immediately east of the Morgan Offshore Wind Project: Generation Assets (ENV105; 20.6 mg/kg) marginally exceeded the Cefas AL1 of 20 mg/kg but were well below the Cefas AL2 (**Figure 1.3**). Sediments at seven sites, mostly within the central section of the Offshore Order Limits, exceeded the Canadian TEL for mercury but all were below the Cefas AL1 (**Figure 1.3**). The most prevalent metal contaminant recorded in the sediments was arsenic, which was present in concentrations exceeding the Canadian TEL at 17 sites but did not exceed Cefas AL1 or Canadian PEL at any station.

1.6.3.4 Concentrations of organotins were below the limit of detection at all stations.

1.6.3.5 On the whole, levels of PAHs recorded in the sediment were low. Total PAH concentrations per station ranged from 0.024 mg/kg at ENV099 to 1.111 mg/kg at ENV125 (located within the centre of the Offshore Order Limits, directly east of the Morecambe Offshore Windfarm: Generation Assets). Within the central and nearshore parts of the Offshore Order Limits (i.e. to the east and south east of the Morecambe Offshore Windfarm: Generation Assets), sediment analysis at five sites (ENV088, ENV096, ENV097, ENV121 and ENV125) indicated levels of dibenzo[a,h]anthracene above the Canadian TEL (but below the Canadian PEL). The greatest concentration was recorded at ENV097 (located at the west boundary of the Fylde MCZ), with this site also displaying levels of acenaphthylene contamination above the Canadian TEL. One site, ENV125, recorded concentrations above the Canadian TEL (but below the Canadian PEL) for acenaphthene, acenaphthylene, and dibenzo[a,h]anthracene.

1.6.3.6 Levels of all individual PAHs were below the Cefas AL1 for individual PAHs (i.e. 0.1 mg/kg). The Cefas AL1 for dibenzo[ah]anthracene is lower at 0.01 mg/kg but concentrations in all samples were below this more conservative threshold with the exception of a single station ENV097 where levels of dibenzo[ah]anthracene (0.0164 mg/kg) marginally exceeded this threshold. Concentrations of individual PAHs were also well below their respective Effects Range Low (ERL) values. The total PAHs per station were also below the ERL threshold for total PAHs of 4 mg/kg indicating that toxic effects to fauna by PAHs are unlikely.

1.6.3.7 Detectable levels of PCB were recorded in sediments at 13 out of the 39 stations sampled for sediment chemistry, the majority of which were in the nearshore area approaching the landfall. However, levels of PCBs, for all samples, were found to be below all available Cefas AL1s. The levels of the total ICES-7 PCBs were below the relevant Cefas AL1 threshold (0.01 mg/kg) at all stations, and total PCBs were below the Cefas AL1 (0.02 mg/kg) and Cefas AL2 (0.2 mg/kg) at all stations.

1.6.3.8 The full results of this sediment chemistry analysis are detailed in Volume 2, Annex 2.1: Benthic subtidal and intertidal ecology technical report of the ES (document reference F2.2.1).

Fylde MCZ

1.6.3.9 Within the Fylde MCZ, six stations were sampled for metals, and none exceeded Cefas AL1 or AL2 for any metal (**Figure 1.3**). Four of the six stations sampled within the Fylde MCZ marginally exceeded the Canadian TEL for arsenic, however they were below the Canadian PEL. Additionally, one sample station within Fylde MCZ exceeded the Canadian TEL for mercury however was below the Canadian PEL.

1.6.3.10 Two of the sample stations within the Fylde MCZ exceeded the Canadian TEL for the PAH dibenzo[a,h]anthracene but were below the Canadian PEL. Additionally, one sample station exceeded the Canadian TEL for the PAH acenaphthylene but was below the Canadian PEL. Levels of all individual PAHs were below the Cefas AL1 for individual PAHs (i.e. 0.1 mg/kg). Levels of PCBs all samples, were found to be below all available Cefas AL1s and no sample stations within the Fylde MCZ exceeded Cefas AL1 for the sum of ICES7 PCBs. Total PCBs were below the Cefas AL1 (0.02 mg/kg) and Cefas AL2 (0.2 mg/kg) at all stations within the Fylde MCZ. Concentrations of organotins were below the limit of detection at all stations.

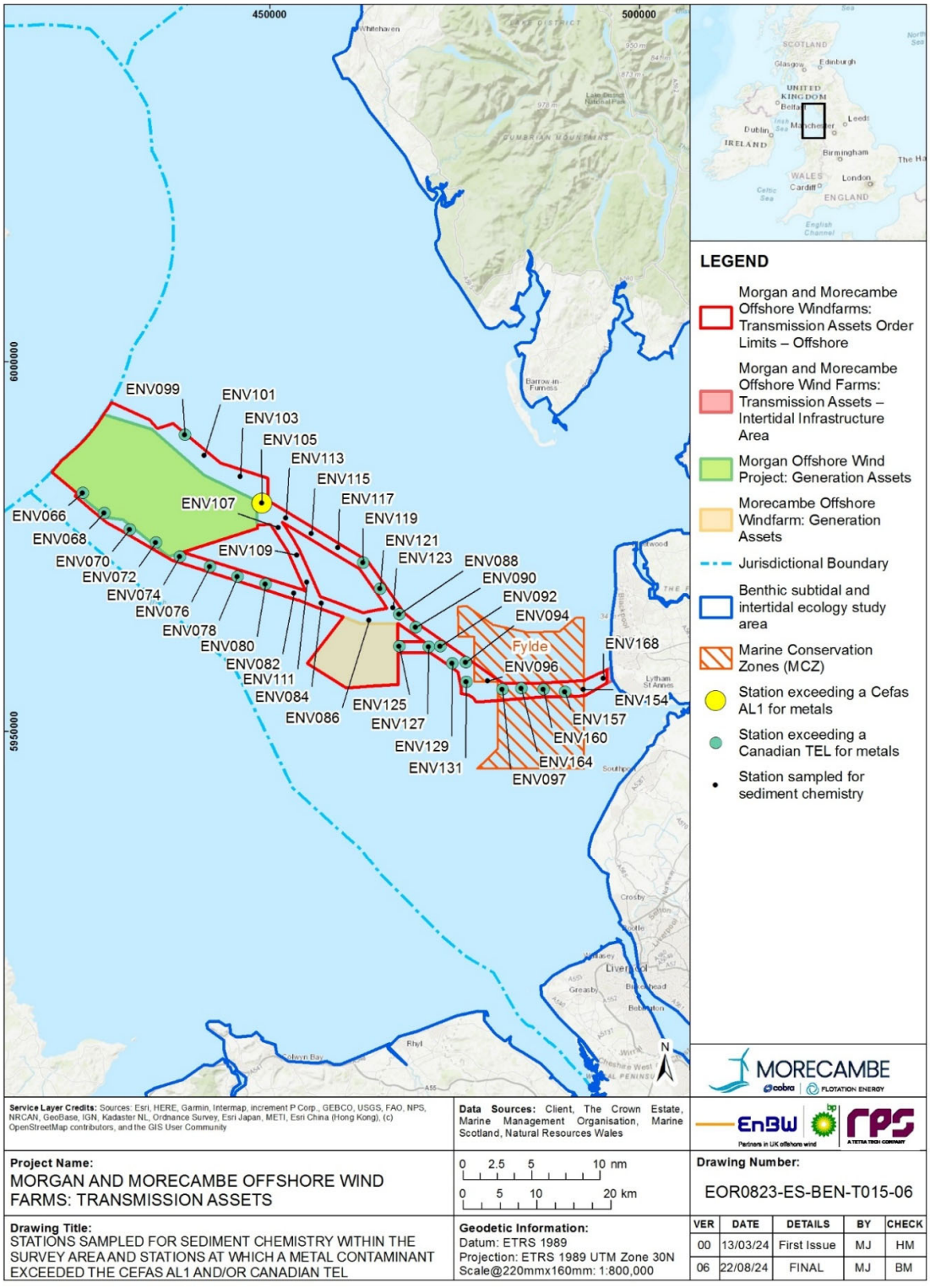

Figure 1.3: Stations sampled for sediment chemistry within the Transmission Assets benthic subtidal and intertidal ecology study area and stations at which a contaminant exceeded the Cefas AL1 and/or Canadian TEL

1.7 Assessment of potential adverse effects

1.7.1 Physical environment

1.7.1.1 The following section of this Dredging and disposal – site characterisation plan provides an overview of the key findings for the Transmission Assets, as reported in the ES, which are relevant to the disposal of dredged material *in situ* within the Transmission Assets disposal site. The impact of increased SSCs and seabed disturbance has been assessed in the context of dredging and disposal activities for physical processes, with all effects concluded to be negligible (**Table 1.8**).

1.7.1.2 It should be noted that marine processes are not in themselves receptors in the majority of cases when carrying out an impact assessment, but changes to these processes may have an impact on other sensitive receptors (Lambkin *et al*., 2009). The receptor groups for the potential impact pathways considered within Volume 2, Chapter 1: Physical processes of the ES (document reference F2.1) lie principally in other offshore EIA topics, namely:

- Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES (document reference F2.2);
- Volume 2, Chapter 3: Fish and shellfish ecology of the ES (document reference F2.3);
- Volume 2, Chapter 4: Marine mammals of the ES (document reference F2.4);
- Volume 2, Chapter 5: Offshore ornithology of the ES (document reference F2.5);
- Volume 2, Chapter 8: Marine archaeology of the ES (document reference F2.8); and
- Volume 2, Chapter 9: Other sea users of the ES (document reference F2.9).

1.7.1.3 In such instances, a significance of effect has not been assigned within the assessment, see Volume 2, Chapter 1: Physical processes of the ES (document reference F2.1) for further information on the physical pathways.

1.7.2 Biological and human environment

1.7.2.1 Volume 2 of the ES for the Transmission Assets (document reference F2) provides detailed impact assessments related to disposal activities on a number of sensitive biological and human environment receptors, including physical processes, benthic habitats, fish and shellfish habitats, marine mammals, offshore ornithology, commercial fisheries, marine archaeology, shipping and navigation and other sea users.

1.7.2.2 For all of these assessments, the effects defined within Volume 2, Chapter 1: Physical processes of the ES (document reference F2.1) have been interpreted with regard to their subsequent impact on various receptors. The sensitivity of various receptors to these effects (increased SSC, sediment

deposition and potential loss of seabed habitats) has been determined based on relevant literature and an assessment of the significance of any impacts undertaken.

1.7.2.3 **Table 1.8** below provides a summary of the key impacts on physical, biological and human receptors assessed within the ES. The relevant section of the ES, where further details of these impact assessments are presented, is also provided.

Table 1.8: Summary of impacts to the disposal of spoil within the Transmission Assets disposal site

C: Construction phase, O: Operation and maintenance phase, D: Decommissioning phase

Potential impact	Relevant section of the ES	Magnitude of impact	Sensitivity of receptor	Significance of effect (residual significance)
Physical processes				
Increase in suspended sediments due to construction, operation and maintenance and/or decommissioning related activities, and the potential impact to physical features.	Volume 2, Chapter 1: Physical processes of the ES (document reference F2.1) (Project assessment – section 1.10.2; Cumulative assessment – section 1.12.2)	C: Low O: Low D: Low	Low	C: Negligible O: Negligible D: Negligible
Benthic ecology				
Temporary habitat loss/disturbance	Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES (document reference F2.2) (Project assessment – section 2.11.2; Cumulative assessment – section 2.13.2)	**Subtidal habitat Important Ecological Features (IEFs)** C: Low O: Low D: Low **Fylde MCZ IEFs** C: Low O: Low D: Low	**Subtidal habitat IEFs** Medium **Fylde MCZ IEFs** Medium	**Subtidal habitat IEFs** C: Minor adverse O: Minor adverse D: Minor adverse **Fylde MCZ IEFs** C: Minor adverse O: Minor adverse D: Minor adverse
Increased SSC and associated deposition	Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES (document reference F2.2)	**Subtidal habitat IEFs** C: Low O: Negligible D: Low	**Subtidal habitat IEFs** Negligible to medium **Shell Flat and Lune Deep SAC IEFs**	**Subtidal habitat IEFs** C: Negligible to minor adverse O: Negligible adverse

Potential impact	Relevant section of the ES	Magnitude of impact	Sensitivity of receptor	Significance of effect (residual significance)
	(Project assessment – section 2.11.3; Cumulative assessment – section 2.13.3)	**Shell Flat and Lune Deep SAC IEFs** C: Negligible O: Negligible D: Negligible **Fylde MCZ IEFs** C: Low O: Negligible D: Low **West of Walney MCZ IEFs** C: Negligible O: Negligible D: Negligible **West of Copeland MCZ IEFs** C: Negligible O: Negligible D: Negligible	Low **Fylde MCZ IEFs** Negligible to medium **West of Walney MCZ IEFs** Negligible **West of Copeland MCZ IEFs** Negligible to medium	D: Negligible to minor adverse **Shell Flat and Lune Deep SAC IEFs** C: Negligible adverse O: Negligible adverse D: Negligible adverse **Fylde MCZ IEFs** C: Negligible to minor adverse O: Negligible adverse D: Negligible to minor adverse **West of Walney MCZ IEFs** C: Negligible adverse O: Negligible adverse D: Negligible adverse **West of Copeland MCZ IEFs** C: Negligible adverse O: Negligible adverse D: Negligible adverse
Disturbance/remobilisation of sediment-bound contaminants	Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES (document reference F2.2)	**Subtidal habitat IEFs** C, O, D: Negligible	**Subtidal habitat IEFs** Low to medium	**Subtidal habitat IEFs** Negligible to minor adverse

Potential impact	Relevant section of the ES	Magnitude of impact	Sensitivity of receptor	Significance of effect (residual significance)
	(Project assessment – section 2.11.4; Cumulative assessment – not applicable)	**Shell Flat and Lune Deep SAC IEFs** C, O, D: Negligible **Fylde MCZ IEFs** C, O, D: Negligible **West of Walney MCZ IEFs** C, O, D: Negligible **West of Copeland MCZ IEFs** C, O, D: Negligible	**Shell Flat and Lune Deep SAC IEFs** Low **Fylde MCZ IEFs** Low **West of Walney MCZ IEFs** Low to medium **West of Copeland MCZ IEFs** Low	**Shell Flat and Lune Deep SAC IEFs** Negligible adverse **Fylde MCZ IEFs** Negligible adverse **West of Walney MCZ IEFs** Negligible to minor adverse **West of Copeland MCZ IEFs** Negligible adverse
Fish and shellfish ecology				
Temporary habitat loss/disturbance	Volume 2, Chapter 3: Fish and shellfish ecology of the ES (document reference F2.3) (Project assessment – section 3.11.2; Cumulative assessment – section 3.13.2)	C: Negligible to low O: Negligible to low D: Negligible to low	**Marine IEFs** C: Low to high O: Low to high D: Low to high **Diadromous IEFs** C: Negligible O: Negligible D: Negligible	**Marine IEFs** C: Minor adverse O: Minor adverse D: Minor adverse **Diadromous IEFs** C: Negligible adverse O: Negligible adverse D: Negligible adverse
Increased SSCs and associated sediment deposition	Volume 2, Chapter 3: Fish and shellfish ecology of the ES (document reference F2.3)	C: Low O: Negligible D: Low	**Marine IEFs** C: Low to medium O: Low to medium D: Low to medium	**Marine IEFs** C: Minor adverse O: Negligible to minor adverse

Potential impact	Relevant section of the ES	Magnitude of impact	Sensitivity of receptor	Significance of effect (residual significance)
	(Project assessment – section 3.11.5; Cumulative assessment – section 3.13.5)		**Diadromous IEFs** C: Low O: Low D: Low	D: Minor adverse **Diadromous IEFs** C: Negligible adverse O: Negligible adverse D: Negligible adverse
Marine mammals				
Effects on marine mammals due to changes in prey availability	Volume 2, Chapter 4: Marine mammals of the ES (document reference F2.4) (Project assessment – section 4.11.5; Cumulative assessment – section 4.13.5)	Harbour porpoise: Low Bottlenose dolphin: Low Short-beaked common dolphin: Low Risso's dolphin: Low Minke whale: Low Grey seal: Low Harbour seal: Low	Harbour porpoise: Low Bottlenose dolphin: Low Short-beaked common dolphin: Low Risso's dolphin: Low Minke whale: Medium Grey seal: Low Harbour seal: Low	Harbour porpoise: Minor adverse Bottlenose dolphin: Minor adverse Short-beaked common dolphin: Minor adverse Risso's dolphin: Minor adverse Minke whale: Minor adverse Grey seal: Minor adverse Harbour seal: Minor adverse
Offshore ornithology				
Temporary habitat loss/disturbance and increased SSCs	Volume 2, Chapter 5: Offshore ornithology of the ES (document reference F2.5)	All receptors C: Negligible O: Negligible D: Negligible	All phases Scaup: High Eider High Common scoter: High	All phases: Scaup: Minor adverse Eider Minor adverse Common scoter: Minor adverse

Potential impact	Relevant section of the ES	Magnitude of impact	Sensitivity of receptor	Significance of effect (residual significance)
	(Project assessment – section 5.11.4; Cumulative assessment – section 5.13.4)		Red-breasted merganser: High Kittiwake: Negligible Black-headed gull: Negligible Little gull: Negligible Common gull: Negligible Great black-backed gull: Negligible Herring gull: Negligible Lesser black-backed gull: Negligible Guillemot Negligible Razorbill: Negligible Puffin: Negligible Red-throated diver: High Fulmar: Negligible Manx shearwater Negligible Gannet: Negligible Cormorant: Negligible	Red-breasted merganser: Minor adverse Kittiwake: Negligible Black-headed gull: Negligible Little gull: Negligible Common gull: Negligible Great black-backed gull: Negligible Herring gull: Negligible Lesser black-backed gull: Negligible Guillemot Negligible Razorbill: Negligible Puffin: Negligible Red-throated diver: Minor adverse Fulmar: Negligible Manx shearwater Negligible Gannet: Negligible Cormorant: Minor adverse
Commercial fisheries				
Potential impacts on commercially important fish and shellfish resources	Volume 2, Chapter 6: Commercial fisheries of the ES (document reference F2.6)	As in Temporary habitat loss/disturbance and Increased SSCs and	As in Temporary habitat loss/disturbance and Increased SSCs and	As in Temporary habitat loss/disturbance and Increased SSCs and

Potential impact	Relevant section of the ES	Magnitude of impact	Sensitivity of receptor	Significance of effect (residual significance)
	(Project assessment – section 6.11.5; Cumulative assessment – section 6.13.4)	associated sediment deposition for fish and shellfish ecology.	associated sediment deposition for fish and shellfish ecology.	associated sediment deposition for fish and shellfish ecology.
Marine archaeology				
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	Volume 2: Chapter 8: Marine archaeology of the ES (document reference F2.8) (Project assessment – section 8.11.2; Cumulative assessment – section 8.13.2)	C: Low O: Low D: Low	C: High O: High D: High	C: Minor adverse O: Minor adverse D: Minor adverse
Alteration of sediment transport regimes	Volume 2: Chapter 8: Marine archaeology of the ES (document reference F2.8) (Project assessment – section 8.11.4; Cumulative assessment – section 8.13.4)	O: Negligible	O: High	O: Minor adverse
Other sea users				
Increased Suspended Sediment Concentrations and associated deposition affecting recreational diving sites and designated bathing water sites.	Chapter 9: Other sea users of the ES (document reference F2.9) (Project assessment – section 9.11.3; Cumulative assessment – not applicable)	C: Negligible O: Negligible D: Negligible	C: Low O: Low D: Low	C: Negligible adverse O: Negligible adverse D: Negligible adverse
Reduction or restriction of oil and gas activities (including surveys, decommissioning and CCS).	Chapter 9: Other sea users of the ES (document reference F2.9)	C: Low O: Negligible	C: Medium O: Medium	C: Minor adverse O: Negligible adverse

Potential impact	Relevant section of the ES	Magnitude of impact	Sensitivity of receptor	Significance of effect (residual significance)
	(Project assessment – section 9.11.5; Cumulative assessment – section 9.13.2)	D: Low	D: Medium	D: Minor adverse

Fylde MCZ

1.7.2.4 Based on the findings of the Stage 1 MCZ Assessment (document reference E4), it can be concluded that temporary habitat disturbance, increases in SSCs and associated deposition, and the potential remobilisation of sediment-bound contaminants will not lead to a significant risk of hindering the achievement of the overall conservation objective of maintaining the subtidal sand and subtidal mud protected features of the Fylde MCZ.

1.8 Monitoring

1.8.1.1 Based on the findings of the impact assessments presented in the ES, and summarised within this document, long-term impacts from the disposal of spoil and dredged material within the Offshore Order Limits are not anticipated. This is due to the limited increase in seabed level, the low levels of contamination in sediments and the temporary nature of any sediment plumes generated.

1.8.1.2 In light of the above, and that impact assessments presented in the ES (also see **Table 1.8**), concluded no likely significant effects to physical processes, biological or human receptors, no monitoring specific to disposal is proposed for the Transmission Assets disposal site.

1.9 Summary

1.9.1.1 This document represents the Dredging and disposal - site characterisation plan for the Transmission Assets and is required by the MMO to allow consideration of the potential impacts of disposal within the site. The document forms the proposal for the licensing of a disposal site within the Offshore Order Limits for material arising from seabed preparation by sandwave clearance.

1.9.1.2 Noting that all the information required for a site characterisation to support a disposal licence application is contained within the ES, this document takes the form of a 'framework' document that provides a summary of the key points of relevance to site characterisation and refers to more detailed information and data presented within the relevant sections of the ES at this stage.

1.9.1.3 The source of material proposed to be disposed of within the Offshore Order Limits will be sediment dredged from the upper layer of the existing seabed via suction hopper dredges or similar (noting that within the Fylde MCZ, a Controlled Flow Excavator will be the only method used for sandwave clearance) as part of seabed preparation works ahead of cable installation. Within the Transmission Assets disposal site, up to ~~1,426,800~~1,161,600 m^3 of material (~~1,080,000~~1,003,200 m^3 from the Morgan offshore export cables, and ~~346,800~~158,400 m^3 from the Morecambe offshore export cables) will be disposed of *in situ*. Of this total spoil, up to ~~249,600~~124,800 m^3 of material (~~192,000~~96,000 m^3 from the Morgan offshore export cables, and ~~57,600~~28,800 m^3 from the Morecambe offshore export cables) may arise as

a result of sandwave clearance via Controlled Flow Excavator within the Fylde MCZ. It is important to note that spoil generated within the Fylde MCZ will be returned to the seabed within the immediate vicinity and only within the portion of the Transmission Assets Order Limits overlapping the Fylde MCZ to ensure that material is not lost from the system.

1.9.1.4 The deposition of sediment from the sandwave clearance is predicted to only result in short term, spatially discrete impacts. The low levels of contamination in the seabed material to be disposed of *in situ* (as outlined in **section 1.6.3**) has shown that contamination of surrounding sediments will be highly unlikely. Furthermore, sandwave clearance is an important tool to facilitate the successful burial of cables and to minimise the requirements for external cable protection.

1.9.1.5 The impacts of disposal via the return of spoil material to the water column is outlined within this document and fully assessed in relevant chapters of the ES, specifically Volume 2, Chapter 1: Physical processes of the ES (document reference F2.1), and Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the ES (document reference F2.2). No effects of moderate or major adverse significance (i.e. those that are significant in EIA terms) have been identified in relation to sediment disposal, with only negligible to minor adverse effects predicted on relevant receptors.

1.9.1.6 In conclusion, based on the proposals for disposal within the Transmission Assets disposal site, the nature of the material to be disposed of, the receiving environment and the predictions of the ES on the impact of these activities on physical, biological and human receptors, no significant adverse impacts are predicted and disposal *in situ* is the most viable option.

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