MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS

Environmental Statement

Volume 1, Chapter 3: Project description

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Glossary

Term	Meaning
400 kV grid connection cables	Cables that will connect the proposed onshore substations to the existing National Grid Penwortham substation.
400 kV grid connection cable corridor	The corridor within which the 400 kV grid connection cables will be located.
Applicants	Morgan Offshore Wind Limited (Morgan OWL) and Morecambe Offshore Windfarm Ltd (Morecambe OWL).
Biodiversity benefit	An approach to development that leaves biodiversity in a better state than before. Where a development has an impact on biodiversity, developers are encouraged to provide an increase in appropriate natural habitat and ecological features over and above that being affected. For the Transmission Assets, biodiversity benefit will be delivered within identified biodiversity benefit areas within the Onshore Order Limits. Further qualitative benefits to biodiversity are proposed via potential collaboration with stakeholders and local groups, contributing to existing plans and programmes, both within and outside the Order Limits.
Code of Construction Practice	A document detailing the overarching principles of construction, contractor protocols, construction-related environmental management measures, pollution prevention measures, the selection of appropriate construction techniques and monitoring processes.
Commitment	This term is used interchangeably with mitigation and enhancement measures. The purpose of commitments is to avoid, prevent, reduce or, if possible, offset significant adverse environmental effects. Primary and tertiary commitments are taken into account and embedded within the assessment set out in the ES.
Construction Traffic Management Plan	A document detailing the construction traffic routes for heavy goods vehicles and personnel travel, protocols for delivery of Abnormal Indivisible Loads to site, measures for road cleaning and sustainable site travel measures.
Design envelope	A description of the range of possible elements and parameters that make up the Transmission Assets options under consideration, as set out in detail in Volume 1, Chapter 3: Project Description. This envelope is used to define the Transmission Assets for EIA purposes when the exact engineering parameters are not yet known. This is also referred to as the Maximum Design Scenario or Rochdale Envelope approach.
Development Consent Order	An order made under the Planning Act 2008, as amended, granting development consent.
Direct pipe	A cable installation technique which involves the use of a mini (or micro) tunnel boring machine and a hydraulic (or other) thruster rig to directly install a steel pipe between two points.
Environmental Impact Assessment	The process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.

Term	Meaning
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process.
Evidence Plan Process	A voluntary consultation process with specialist stakeholders to agree the approach to, and information to support, the EIA and Habitats Regulations Assessment processes for certain topics.
Generation Assets	The generation assets associated with the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm include the offshore wind turbines, inter-array cables, offshore substation platforms and platform link (interconnector) cables to connect offshore substations.
Intertidal area	The area between Mean High Water Springs and Mean Low Water Springs.
Intertidal Infrastructure Area	The temporary and permanent areas between MLWS and MHWS.
Landfall	The area in which the offshore export cables make landfall (come on shore) and the transitional area between the offshore cabling and the onshore cabling. This term applies to the entire landfall area at Lytham St. Annes between Mean Low Water Springs and the transition joint bay inclusive of all construction works, including the offshore and onshore cable routes, intertidal working area and landfall compound(s).
Local Authority	A body empowered by law to exercise various statutory functions for a particular area of the United Kingdom. This includes County Councils, District Councils and County Borough Councils.
Local Highway Authority	A body responsible for the public highways in a particular area of England and Wales, as defined in the Highways Act 1980.
Main rivers	The term used to describe a watercourse designated as a Main River under the Water Resources Act 1991 and shown on the Main River Map. These are usually larger rivers or streams and are managed by the Environment Agency.
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 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.
Mean High Water Springs	The height of mean high water during spring tides in a year.
Mean Low Water Springs	The height of mean low water during spring tides in a year.
Micro-tunnel / micro-tunnelling	A tunnelling technique involving the use of a hydraulic (or other) jacking rig and a mini (or micro) tunnel boring machine to install a concrete tunnel between two points.
Mitigation measures	This term is used interchangeably with Commitments. The purpose of such measures is to avoid, prevent, reduce or, if possible, offset significant adverse environmental effects.
Morecambe Offshore Windfarm: Generation Assets	The offshore generation assets and associated activities for the Morecambe Offshore Windfarm.

Term	Meaning
Morecambe Offshore Windfarm: Transmission Assets	The offshore export cables, landfall, and onshore infrastructure required to connect the Morecambe Offshore Windfarm to the National Grid.
Morecambe OWL	Morecambe Offshore Windfarm Ltd is a joint venture between Zero-E Offshore Wind S.L.U. (Spain) (a Cobra group company) (Cobra) and Flotation Energy Ltd.
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	The offshore export cables, landfall, and onshore infrastructure for the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm. 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.
Morgan Offshore Wind Project: Generation Assets	The offshore generation assets and associated activities for the Morgan Offshore Wind Project.
Morgan Offshore Wind Project: Transmission Assets	The offshore export cables, landfall and onshore infrastructure required to connect the Morgan Offshore Wind Project to the National Grid.
Morgan OWL	Morgan Offshore Wind Limited is a joint venture between bp Alternative Energy Investments Ltd. and Energie Baden-Württemberg AG (EnBW).
National Grid Penwortham substation	The existing National Grid substation at Penwortham, Lancashire.
National Policy Statement(s)	The current national policy statements published by the Department for Energy and Net Zero in 2023 and adopted in 2024.
Offshore booster station	A fixed structure located along the offshore export cable route, containing electrical equipment to ensure bulk wind farm capacity can be fully transmitted to the onshore substations.
Offshore substation platform(s)	A fixed structure located within the wind farm sites, containing electrical equipment to aggregate the power from the wind turbine generators and convert it into a more suitable form for export to shore.
Offshore export cables	The cables which would bring electricity from the Generation Assets to the landfall.
Offshore export cable corridor	The corridor within which the offshore export cables will be located.
Offshore Permanent Infrastructure Area	The area within the Transmission Assets Offshore Order Limits (up to MLWS) where the permanent offshore electrical infrastructure (i.e. offshore export cables) will be located.
Offshore Order Limits	See Transmission Assets Order Limits: Offshore (below).
Offshore substation platform(s)	A fixed structure located within the wind farm sites, containing electrical equipment to aggregate the power from the wind turbine generators and convert it into a more suitable form for export to shore.
Onshore export cables	The cables which would bring electricity from the landfall to the onshore substations.
Onshore export cable corridor	The corridor within which the onshore export cables will be located.

Term	Meaning
Onshore Infrastructure Area	The area within the Transmission Assets Order Limits landward of MHWS. Comprising the offshore export cable corridor from MHWS to the transition joint bay, onshore export cable corridor, onshore substations and 400 kV grid connection cable corridor, and associated temporary and permanent infrastructure including temporary and permanent compound areas and accesses. Those parts of the Transmission Assets Order Limits proposed only for ecological mitigation and/or biodiversity benefit are excluded from this area.
Onshore Order Limits	See Transmission Assets Order Limits: Onshore (below).
Onshore substations	The onshore substations will include a substation for the Morgan Offshore Wind Project: Transmission Assets and a substation for the Morecambe Offshore Windfarm: Transmission Assets. These will each comprise a compound containing the electrical components for transforming the power supplied from the generation assets to 400 kV and to adjust the power quality and power factor, as required to meet the UK Grid Code for supply to the National Grid.
Preliminary Environmental Information Report	A report that provides preliminary environmental information in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. This is information that enables consultees to understand the likely significant environmental effects of a project, and which helps to inform consultation responses.
Renewable energy	Energy from a source that is not depleted when used, such as wind or solar power.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations due to the flow of water.
Substation	Part of an electrical transmission and distribution system. Substations transform voltage from high to low, or the reverse by means of electrical transformers.
The Secretary of State for Energy Security and Net Zero	The decision maker with regards to the application for development consent for the Transmission Assets.
Transmission Assets	See Morgan and Morecambe Offshore Wind Farms: Transmission Assets (above).
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.
Transmission Assets Order Limits: Onshore	The area within which all components of the Transmission Assets landward of Mean High Water Springs will be located, including areas required on a temporary basis during construction and/or decommissioning (such as construction compounds). Also referred to in this report as the Onshore Order Limits, for ease of reading.

Acronyms

Acronym	Meaning
AIS	Air Insulated Switchgear
AOD	Above Ordnance Datum
BCA	Bilateral Grid Connection Agreement
CoCP	Code of Construction Practice
CoT	Project Commitment
CBRA	Cable Burial Risk Assessment
CfD	Contracts for Difference
CMS	Construction Method Statement
CSIP	Cable Specification and Installation Plan
CTMP	Construction Traffic Management Plan
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
DESNZ	Department for Energy Security & Net Zero
dML	Deemed Marine Licence
EnBW	Energie Baden-Württemberg AG
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPP	Evidence Plan Process
ES	Environmental Statement
EWG	Expert Working Group
GIS	Gas Insulated Switchgear
HDD	Horizontal Directional Drilling
HGV	Heavy goods vehicle
HNDR	Holistic Network Design Review
HVAC	High Voltage Alternating Current
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IAQM	Institute of Air Quality Management
LAT	Lowest Astronomical Tide
MCA	Maritime and Coastguard Agency
MCZ	Marine Conservation Zone
MDS	Maximum Design Scenario

Acronym	Meaning
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MPS	Marine Policy Statement
MTBM	Mini (or micro) tunnel boring machine
NGESO	National Grid Electricity System Operator
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
O&M	Operation and Maintenance
OSP	Offshore Substation Platform
OTNR	Offshore Transmission Network Review
PDE	Project Design Envelope
PEIR	Preliminary Environmental Information Report
PPP	Pollution Prevention Plan
PRoW	Public rights of way
SAC	Special Areas of Conservation
SAR	Search and Rescue
SPA	Special Protection Area
SNCBs	Statutory Nature Conservation Bodies
SSSI	Sit of Special Scientific Interest
SWMP	Site Waste Management Plan
TEP	Technical Engagement Plan
TJB	Transition Joint Bay
UK	United Kingdom
UXO	Unexploded Ordnance
WSI	Written scheme of investigation

Units

Unit	Description
%	Percentage
dB	Decibels
Kg	Kilogram
kHz	Kilohertz
KJ	Kilojoules
km	Kilometres
km^2	Kilometres squared
kV	Kilovolt
m	Metres
m^2	Metres squared
m^3	Metres cubed
nm	Nautical mile
µPa	micropascal

3 Project description

3.1 Introduction

3.1.1.1 This Environmental Statement (ES) presents the preliminary findings of the Environmental Impact Assessment (EIA) process for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets (referred to hereafter as 'the Transmission Assets'). This chapter provides a description of the offshore and onshore components required for the construction, operation and maintenance, and decommissioning phases of the Transmission Assets. This chapter has been informed by current design information and by the understanding of the receiving environment, based on survey work undertaken to date.

3.1.1.2 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 Generation Assets are each subject to separate applications for development consent. Further details are provided in Volume 1, Chapter 1: Introduction.

3.1.1.3 The Transmission Assets will be located within the Transmission Assets Order Limits as shown on Figure 3.1 (see Volume 1: Figures). The offshore elements of the Transmission Assets are located in the east Irish Sea within English offshore waters (beyond 12 nm from the English coast) and inshore waters (within 12 nm from the English coast). The onshore elements of the Transmission Assets are located within the local authority areas of Fylde Council, Blackpool Council, South Ribble Borough Council, Preston City Council and Lancashire County Council.

3.1.1.4 The key components of the Transmission Assets for both the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm include:

- Offshore:
  - offshore export cables: these export cables will bring the electricity generated by the Generation Assets to the landfall for onward transmission.
- Landfall:
  - landfall site: this is where the offshore export cables are jointed to the onshore export cables via the transition joint bays (TJBs). This term applies to the entire area between Mean Low Water Springs (MLWS) and the TJBs.
- Onshore elements:
  - onshore export cables: these export cables will be jointed to the offshore export cables via the TJBs at the landfall site, and will bring the electricity generated by the Generation Assets to the onshore substations;

- onshore substations: the two electrically separate onshore substations will contain the components for transforming the power supplied via the onshore export cables up to 400 kV; and
- 400 kV grid connection cables: these export cables will bring the electricity generated by the Generation Assets from the two electrically separate onshore substations to the existing National Grid substation at Penwortham.
- environmental mitigation areas – temporary and/or permanent areas, including accesses identified to provide environmental mitigation only.
- biodiversity benefit areas - temporary and/or permanent areas, including accesses identified to provide biodiversity benefit only.

3.1.1.5 The Morgan and Morecambe offshore wind farms will be electrically separate, with aligned offshore export cable corridors to landfall and aligned onshore export cable corridors to separate onshore substations, and onward connections to the National Grid, at Penwortham, Lancashire. The offshore wind farms have sought to align the location of the transmission infrastructure needed to deliver the electricity generated to the National Grid at Penwortham wherever practicable, to minimise potential impacts to the environment and community.

3.1.1.6 The onshore export cables and the 400 kV grid connection cables will be completely buried underground for their entire length. No overhead pylons or lines will be installed as part of the Transmission Assets.

3.1.1.7 Further details on the temporary and permanent infrastructure required for the Transmission Assets is provided in **section 3.5**.

3.2 The Applicants

3.2.1.1 Morgan Offshore Wind Limited (Morgan OWL), a joint venture between bp Alternative Energy Investments Ltd. (bp) and Energie Baden-Württemberg AG (EnBW), is developing the Morgan Offshore Wind Project. The Morgan Offshore Wind Project is a proposed offshore wind farm in the east Irish Sea.

3.2.1.2 Morecambe Offshore Windfarm Ltd (Morecambe OWL), a joint venture between Zero-E Offshore Wind S.L.U. (Spain) (a Cobra group company) (Cobra) and Flotation Energy Ltd, is developing the Morecambe Offshore Windfarm, also located in the east Irish Sea.

3.2.1.3 Both the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm have been awarded licences during The Crown Estate's Offshore Wind Leasing Round 4 process. Each project is being proposed by separate joint venture partners and is electrically separate from the other.

3.3 Background

3.3.1.1 Both the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm were scoped into the 'Pathways to 2030' workstream under the Offshore Transmission Network Review (OTNR). The OTNR aims to

consider, simplify, and wherever possible facilitate a collaborative approach to offshore wind projects connecting to the National Grid.

3.3.1.2 Under the OTNR, NGESO (National Grid Energy System Operator) is responsible for assessing options to improve the coordination of offshore wind generation connections and transmission networks. NGESO undertook a Holistic Network Design Review (HNDR)and in July 2022, the UK Government published the 'Pathway to 2030 Holistic Network Design' documents, which set out the approach to connecting 50 GW of new offshore wind generation to the National Grid (NGESO, 2022). A key output of the HNDR process was the recommendation that the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm should work collaboratively in connecting the two offshore wind farms to the national grid electricity transmission network at Penwortham in Lancashire.

3.3.1.3 The Applicants, being in agreement with the output from the HNDR, are jointly seeking a single consent for the Transmission Assets comprising aligned offshore export cable corridors to landfall and aligned onshore export cable corridors to separate onshore substations, and from these substations an aligned onward connection to the National Grid at Penwortham, Lancashire. See Planning Statement (document reference J28) for further information.

3.3.1.4 Due to the output from the HNDR and the decision to jointly seek a single consent application for the Transmission Assets, the consents for the generation assets related to the offshore wind farms (i.e. wind turbine generators, offshore substation platforms and inter-connector/array cables) are being sought separately via the Generation Assets DCO applications (see **paragraph 3.3.1.5**).

3.3.1.5 Following a request from the Applicants and in order to deliver the OTNR output for coordination, the Secretary of State issued a direction under section 35 of the Planning Act 2008 on 4 October 2022 that the Transmission Assets should be treated as a 'development for which development consent is required'. The offshore wind farms have therefore been split into three separate DCO applications:

- The Morgan Offshore Wind Project: Generation Assets application ('Morgan Generation Assets');
- The Morecambe Offshore Windfarm: Generation Asset application ('Morecambe Generation Assets'); and
- The Morgan and Morecambe Offshore Wind Farms: Transmission Assets application (the application for which this ES relates).

3.3.1.6 The Generation Assets applications seek separate consents for the wind turbine generators (amongst other associated infrastructure) for the Morgan Offshore Wind Project and the Morecambe Offshore Wind farm. Both are located wholly in English waters, and as both will have a generation capacity of over 100 megawatts (MW), are considered Nationally Significant Infrastructure Projects (NSIPs) under the Planning Act 2008 in their own right.

3.3.1.7 Applications for development consent under the Planning Act 2008 for the Morgan and Morecambe Generation Assets have been made to the Secretary of State. It is anticipated that the determination of these applications will be made before the Transmission Assets application.

3.3.1.8 In addition to seeking development consent for the Transmission Assets, the Applicants are also seeking the necessary marine licences (two for the Morgan Offshore Wind Project: Transmission Assets and two for the Morecambe Offshore Windfarm: Transmission Assets) which are required for carrying out any licensable marine activity under the Marine and Coastal Access Act 2009. Marine licences can be deemed under the Development Consent Order (DCO) for licensable activities in English waters.

3.3.1.9 Further details of the relevant planning policy context, including the approach to consenting, are provided in Volume 1, Chapter 2: Policy and legislation context of this ES.

3.3.1 Project funding

3.3.1.1 The Morgan Offshore Wind Project and the Morecambe Offshore Windfarm are being developed by two separate legal entities, each with different joint venture partners. They must be constructed and remain electrically separate from each other with separate Bilateral Grid Connection Agreements (BCAs) with the NGESO. Notwithstanding, each offshore wind farm project has its own individual requirements and constraints, for example, their project funding.

3.3.1.2 Whilst current planning legislation provides a mechanism for consenting two projects together within one DCO application, wider regulatory regimes do not allow the coordinated investment which would be required for the projects to commit to the delivery of joint construction through the project development phase. The key barriers are:

- the inability to submit shared, or dependent, Contract for Difference (CfD) bids into the same allocation round; and
- the lack of an appropriate mechanism for investment risk to be accommodated for developments with coordinated transmission assets i.e., an Anticipatory Investment model.

3.3.1.3 In order to accommodate the necessary flexibility to allow for the anticipated range of potential construction scenarios, the environmental impact assessment has identified and considered the maximum design construction scenario (see **section 3.9**) for each topic area to ensure that all likely significant effects have been considered.

Contracts for Difference

3.3.1.4 Offshore wind farms are typically developed with support from the existing Government led CfD scheme. CfDs are awarded through annual auctions under the Contracts for Difference (Allocation) Regulations 2014 (the CfD Regulations).

3.3.1.5 A CfD places contractual obligations including a suite of delivery milestones on the awarded developer to ensure the delivery of a project within the timeframes stipulated within the CfD bid. The structure of the delivery milestones in the CfD are designed to demonstrate commitment and progression of the project(s) by the respective developer to achieve generation by the dates stated in the CfD contract and thereby maintain access to the support awarded through the CfD scheme.

3.3.1.6 Under the current CfD regime, two projects with separate legal ownerships are not permitted to submit shared or dependent bids, as the CfD regime in the UK is fundamentally constructed to secure competition to drive down the cost of offshore wind and ensure timely delivery of offshore wind developments.

3.3.1.7 As the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm are being developed by two independent companies with entirely separate joint venture partners, should each project decide to seek funding under the CfD scheme, Morgan OWL and Morecambe OWL must submit separate bids into an allocation round with no guarantee that both bids will result in successful CfD awards. Furthermore, the projects may take independent commercial decisions in order to enter into different CfD rounds resulting in significantly different CfD contractual and delivery milestones. This prevents Morgan OWL and Morecambe OWL from making any commitment that the projects will be constructed concurrently, in part or as a whole.

3.3.1.8 It is therefore necessary to retain flexibility to develop the projects in line with the maximum design construction scenarios set out in **section 3.9**.

Anticipatory Investment

3.3.1.9 The CfD Regulations do not allow for shared or dependent bids, with no guarantee that Morgan OWL and Morecambe OWL would be awarded a CfD in the same allocation round, should they bid into the same CfD allocation round. This disincentivises offshore wind developers from taking on additional development risks which may put them at a competitive disadvantage due to factors such as cost and timescale. In particular, this creates a significant risk for offshore wind developers in making anticipatory investment in offshore transmission infrastructure to support the later connection of other offshore development(s).

3.3.1.10 As Morgan OWL and Morecambe OWL are owned by two different legal entities comprised of separate joint venture partnerships, joint construction of the transmission system would likely require pre-investment by one entity early and at risk. The substantial commercial risk of doing so without assurance that the other project will proceed with certainty is not acceptable and introduces an untenable risk to Morgan OWL and Morecambe OWL regardless of any potential benefits.

3.3.1.11 The Applicants acknowledge the ongoing work led by Ofgem to support the potential need for anticipatory investment mechanisms for coordinated transmission systems. As this regime remains unclear, the Applicants cannot accept the commercial risk of assuming concurrent construction underpinned by an unknown and undeveloped Anticipatory

Investment model and must retain flexibility to develop the projects separately in line with the maximum design scenarios that derive from the construction scenarios set out in **section 3.9.**

3.4 Project design envelope approach

3.4.1.1 At this stage of the EIA and consenting process, the detailed design for the Transmission Assets is not known. A maximum design envelope has been identified, within which the Applicants will undertake the authorised construction, operation and maintenance, and decommissioning activities.

3.4.1.2 It is often the case that where consent is applied for and obtained before detailed design has been undertaken, there may be design elements that are unknown to an applicant at the time of application. In such cases, a Project Design Envelope (PDE) approach (also known as the Rochdale Envelope approach) may be used. The PDE approach defines a design envelope and parameters within which the final design will sit. It allows flexibility for elements that are likely to require more detailed design subsequent to securing consent, such as specific siting and design of infrastructure and construction methods. It also allows the findings of the consultation process and feedback from statutory and non-statutory stakeholders to be considered during the design process, where appropriate.

3.4.1.3 The adoption of this approach allows meaningful EIA to take place by defining a 'maximum design scenario' on which to base the identification of likely environmental effects. The maximum design scenario is the scenario that would give rise to the greatest impact (and subsequent effect). For example, where several substation design options are under consideration, the assessment is based on the option predicted to have the largest magnitude of impact. This may be the option with the largest footprint, the greatest height or the largest area of disturbance during construction, which could vary depending on the topic under consideration. By identifying the maximum design scenario for any given impact, it can be concluded that the impact (and therefore the resulting effect) would be no greater for any other design scenario.

3.4.1.4 This approach is recognised in the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) (the Department for Energy Security and Net Zero (DESNZ), 2023a), the NPS for Renewable Energy Infrastructure (NPS EN-3) (DESNZ, 2023b) and the NPS for Electricity Networks Infrastructure (NPS EN-5) (DESNZ 2023c).

3.4.1.5 This chapter describes the PDE for the Transmission Assets, taking into account the policy set out in the NPSs and the advice in the Planning Inspectorate's Advice Note Nine (Planning Inspectorate, 2018). The PDE described within this chapter has been designed to:

- take into account site selection and design refinement work undertaken to date (see Volume 1, Chapter 4: Site selection and consideration of alternatives); and

- include sufficient flexibility to accommodate future stages of detailed design, including consideration of relevant best practice guidance and legislation, applicable at the time.

3.4.1.6 The design described within this chapter will continue to be refined, with the final design for the Transmission Assets selected after development consent has been granted, from within the parameters set out in this project description chapter of the ES and the DCO.

3.4.1.7 Each topic chapter of this ES sets out the assumptions made regarding the PDE, relevant to that chapter, and the maximum design scenario for each impact. The methodology for assessment for the Transmission Assets is set out in more detail in Volume 1, Chapter 5: Environmental assessment methodology of this ES (document reference F1.5).

3.5 Key Infrastructure and Parameters

3.5.1.1 Both Morgan OWL and Morecambe OWL are applying to install high voltage alternating current (HVAC) transmission infrastructure only.

3.5.1.2 The Transmission Assets Order Limits (Figure 3.1, Volume 1: Figures) represents the area within which all components of the Transmission Assets will be located, including areas required temporarily for construction and areas where permanent infrastructure will be located. The Transmission Assets Order Limits has been further divided to facilitate the EIA for assessment purposes:

- Offshore Order Limits: The area seaward of Mean Low Water Springs (MLWS) within which all components of the Transmission Assets will be located, including areas required on a temporary basis during construction and decommissioning.
- Onshore Order Limits: The area landward of Mean High Water Springs (MHWS) within which all components of the Transmission Assets will be located, including areas required on a temporary basis during construction, operation and maintenance, and decommissioning. This also includes areas proposed to be used for environment mitigation and biodiversity benefit (i.e. no electrical infrastructure is proposed within these areas).

3.5.1.3 The Transmission Assets Order Limits has also been divided into the following areas to facilitate the EIA for assessment purposes. The Works Numbers (Work Nos) referenced and through this chapter can be viewed in the Works Plans – Onshore and Intertidal (document reference B8) and Works Plans – Offshore (document reference B9):

- Offshore permanent infrastructure area (i.e. Work Nos. 1 & 2) - the area within the Offshore Order Limits (seaward of MLWS) where the permanent offshore electrical infrastructure (i.e. offshore export cables) will be located;
- Intertidal infrastructure area (Figure 3.2, Volume 1: Figures) - the temporary and permanent areas between MLWS and MHWS. This includes temporary working areas, and temporary and permanent accesses;

- Onshore infrastructure area (Figure 3.2, Volume 1: Figures) – comprising all temporary and permanent areas landward of MHWS required for the construction, and operation and maintenance of the electrical infrastructure:
- Landfall area (Figure 3.11, Volume 1: Figures) - from MLWS up to and including the TJBs plus associated temporary compounds and temporary and permanent accesses (see **section 3.14** for further details);
- Onshore export cable corridors – comprising the onshore export cable corridor, with associated temporary compounds, and temporary and permanent accesses;
- Onshore substations (Figure 3.17 and Figure 3.18, Volume 1: Figures) – where the permanent onshore electrical substation infrastructure and connections to the onshore export cables are proposed to be located, including temporary and permanent accesses;
- 400 kV grid connection cable corridors (Figure 3.8, Volume 1: Figures) – where the permanent 400 kV export cables will be located, including temporary construction compounds, and temporary and permanent accesses. The 400 kV export cables will connect the onshore substations to the National Grid substation at Penwortham;
- Environmental mitigation only area(s) (Figure 3.2, Volume 1: Figures) – temporary and/or permanent areas proposed for environmental mitigation, including temporary and permanent accesses for these areas. No electrical infrastructure is proposed within these areas. Further information on the potential measures proposed in these areas is provided in the Outline Ecological Management Plan (document reference J6)
- Biodiversity benefit only area(s) (Figure 3.2, Volume 1: Figures) – permanent areas within which biodiversity benefit measures are proposed, including temporary and permanent accesses for these areas. No electrical infrastructure is proposed within these areas. Further information on the potential measures proposed in these areas is provided in the Onshore Biodiversity Benefit Statement (document reference J11)

3.5.1.4 The onshore infrastructure area does not include the environmental mitigation and biodiversity benefit only areas, or the associated temporary and permanent accesses.

3.5.1.5 The onshore, intertidal and offshore infrastructure described above has been identified for both the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm. The location of all areas outlined above are presented in the Offshore and Onshore Location Plans (document references B1 – B3) and the Works Plans (document references B7 – B9).

3.5.1.6 Key parameters for the Transmission Assets are presented in **Table 3.1.**

Table 3.1: Key parameters for the Transmission Assets

Parameter	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Total
Offshore Infrastructure			
Maximum number of offshore export cables	4	2	6
Maximum length of offshore export cables (km) – per cable	100	42	N/A
Maximum length of offshore export cables (km) – all cables	400	84	484
Onshore Infrastructure			
Maximum number of onshore export cables	12 (4 circuits)	6 (2 circuits)	18 (6 circuits)
Maximum number of 400 kV grid connection cables	6 (2 circuits)	6 (2 circuits)	12 (4 circuits)
Maximum length of onshore export cables (km) – per circuit	17	17	N/A
Maximum number of onshore substations	1	1	2
Maximum length of 400 kV grid connection cables (km) – per circuit	13	13	N/A

3.6 Measures adopted as a part of the Transmission Assets (Commitments)

3.6.1.1 Through the EIA process a range of mitigation and monitoring measures have been identified, to avoid or reduce potential effects. All measures to be adopted by the Transmission Assets are called 'Commitments' (CoTs). The CoTs will be used to guide the final design and details for construction, operation and maintenance, and decommissioning phases.

3.6.1.2 As described in Volume 1, Chapter 5: Environmental Assessment Methodology of this ES (document reference F1.5), the Applicants have identified a range of mitigation measures both embedded (i.e. primary and tertiary) and secondary (see Volume 1, Annex 5.3: Commitments Register), as adapted from the Institute of Environmental Management and Assessment (IEMA, 2016).

3.6.1.3 The Transmission Assets commitments (mitigation) identified as being relevant to the Project Description chapter are summarised in **Table 3.2.**

Table 3.2: Measures (commitments) adopted as a part of the Transmission Assets relevant to the Project Description

Commitment (CoT) number	Measure adopted	How the measure will be secured
CoT02	The following features will be crossed by trenchless techniques, as set out in the Onshore Crossing Schedule submitted as part of the application for development consent: - A, B and Classified unnumbered roads (known as C roads) (including the Preston Western Distributor Road, A582 South Ribble Western Distributor Upgrade and M55 Heyhouses Link Road; excluding Leech Lane); - All Environment Agency Main Rivers, including: Moss Sluice, east of Midgeland Road along Pegs Lane; Savick Brook, south of A583; Wrea Brook southeast of Cartmell Lane; Dow Brook east of Lower Lane between the A584 and the A583; Middle Pool north of Lund Way; and - All Network Rail crossings, including along the line which runs between Blackpool North and Preston, south of Cartmell Lane; and at the Network Rail crossing along the line which runs to Blackpool North, south east of Squires Gate, parallel to the A584.	DCO Schedules 2A & 2B, Requirement 5(2) (Detailed design parameters onshore); DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT04	An Outline Pollution Prevention Plan (PPP) forms part of the Outline Code of Construction Practice submitted with the application for development consent. Detailed PPP(s) will be developed in accordance with the Outline PPP and includes details of emergency spill procedures. Good practice guidance detailed in the Environment Agency's Pollution Prevention Guidance notes (including Pollution Prevention Guidance notes 01, 05, 08 and 21) will be followed where appropriate, or the latest relevant available guidance.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT05	During construction of piled foundations, the following guidance will be used: Land Contamination Risk Management (LCRM) (July 2023) and Managing and reducing land contamination: guiding principles (GPLC), or latest relevant available guidance, where appropriate.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT08	Post-construction, the working area will be reinstated to pre-existing condition as far as reasonably practical in line with the DEFRA Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (PB13298), Institute of Quarrying (IQ) Good Practice Guide for Handling Soils in Mineral Workings (IQ, 2021) and British Society of Soil Science (BSSS) Working with Soil Guidance Note on Benefitting from Soil Management in Development and Construction (BSSS, 2022).	DCO Schedules 2A & 2B, Requirement 16 (Restoration of land temporarily used for construction); DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)

Commitment (CoT) number	Measure adopted	How the measure will be secured
CoT09	The Outline Code of Construction Practice (CoCP) has been submitted as part of the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP includes information about drainage during construction.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT10	Where trenchless techniques are proposed for Environment Agency Main Rivers, the following distances will be used: • 8 m from the bank of the Environment Agency Main River or landward toe of any associated flood defence structure; • 16 m from tidal Environment Agency Main Rivers or the landward toe of any flood defences, where the Main River is a sea defence structure; and • a minimum of 2 m vertical clearance will be maintained below the hard bed of all Environment Agency Main Rivers, including the landward toe of any associated flood defences. Final vertical clearance depths beneath Environment Agency Main Rivers will be identified during detailed design stage, in consultation with the Environment Agency, to ensure the export cables remain buried for the operational lifetime of the Transmission Assets.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT13	Where hedgerows and/or trees require removal, this will be undertaken prior to topsoil removal. Sections of hedgerows and trees which are removed will be replaced using like for like hedgerow species.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice); and Requirement 12 (Ecological Management Plan)
CoT14	Joint bays will be completely buried, with the land above reinstated. An inspection cover will be provided on the surface for link boxes for access during operation and maintenance phase.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice); and Requirement 16 (Restoration of land used temporarily for construction)
CoT16	All vegetation requiring removal will be undertaken outside of the bird breeding season. If this is not reasonably practicable, the vegetation requiring removal will be subject to a nesting bird check by a suitably qualified ecological clerk of works. If nesting birds are present, the vegetation will not be removed until the young have fledged or the nest failed.	DCO Schedules 2A & 2B, Requirement 12 (Ecological Management Plan); and Requirement 8 (Code of Construction Practice)

Commitment (CoT) number	Measure adopted	How the measure will be secured
CoT17	Where required, provision will be made for badger access in relevant construction areas, when work is not taking place in order to ensure normal movements as far as reasonably possible. Provision will be made to ensure avoiding the entrapment of any animals within relevant construction areas. Checks will be made prior to the start of any works to ensure no animals are trapped. Appropriate checks will be made as required by the ecological clerk of works.	DCO Schedules 2A & 2B, Requirement 12 (Ecological Management Plan); and Requirement 8 (Code of Construction Practice)
CoT18	Core working hours for the construction of the intertidal and onshore works will be as follows: • Monday to Saturday: 07:00 - 19:00 hours; and • up to one hour before and after core working hours for mobilisation ("mobilisation period") i.e. 06:00 to 20:00. Activities carried out during the mobilisation period will not generate significant noise levels (such as piling, or other such noisy activities). In circumstances outside of core working practices, specific works may have to be undertaken outside the core working hours. This will include, but is not limited to, works being undertaken within and/or adjacent to Blackpool Airport and cable installation at landfall and at the River Ribble. Advance notice of such works will be given to the relevant planning authority.	DCO Schedules 2A & 2B, Requirement 14 (Construction hours)
CoT20	All temporary working areas for the onshore export cable corridor, 400 kV grid connection cable corridor, temporary compounds, and the onshore substation sites will be clearly marked and secured with appropriate fencing. This will be done in accordance with the Outline Construction Fencing Plan, as part of the Outline CoCP and in accordance with Construction (Design and Management) Regulations 2015 requirements.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT22	Prior to the commencement of works, the contractor (or project appointed Land Agent) will undertake a record of condition, (which will accompany previously captured soil condition data, identifying and describing the physical and nutrient characteristics of the existing soil profiles). Such work will inform the reinstatement under CoT08.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT23	Temporary access points from the public highway will be installed to facilitate vehicular access into the onshore export cable corridor, 400 kV grid connection cable corridor and Onshore Substations, during construction, in accordance with the indicative outline highway access designs set out within Outline Highways Access Management Plan, prepared and submitted with the application for development consent.	DCO Schedules 2A & 2B, Requirement 10 (Highway accesses) and Requirement 14 (Construction hours)

Commitment (CoT) number	Measure adopted	How the measure will be secured
CoT24	Where practicable, during construction, access routes within the onshore export cable corridor and 400kV grid connection corridor (i.e. for example, the use of haul roads) will be used, to minimise potential impacts to the local road network.	DCO Schedules 2A & 2B, Requirement 9 (Traffic and Transport)
CoT25	Topsoil and subsoil will be stored in separate stockpiles and managed in line with the DEFRA Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (PB13298), Institute of Quarrying (IQ) Good Practice Guide for Handling Soils in Mineral Workings (IQ, 2021) and British Society of Soil Science (BSSS) Working with Soil Guidance Note on Benefitting from Soil Management in Development and Construction (BSSS, 2022). Any suspected or confirmed contaminated soils will be appropriately separated, contained and tested before removal (if required). This will be done in accordance with the Outline Soil Management Plan, as part of the Outline CoCP, prepared and submitted with the application for development consent.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT26	Detailed Site Waste Management Plan(s) (SWMPs) will be developed in accordance with the Outline Site Waste Management Plan and Outline CoCP prepared and submitted with the application for development consent, and in consideration of the latest relevant available guidance.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT27	All temporary compounds will be removed and sites will be reinstated when construction has been completed.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice); and DCO Schedules 2A & 2B, Requirement 16 (Restoration of land used temporarily for construction)

Commitment (CoT) number	Measure adopted	How the measure will be secured
CoT28	Construction site lighting will only operate when required and will be positioned and directed to avoid unnecessary illumination to residential properties, sensitive ecological receptors and footpath users, and minimise glare to users of adjoining public highways. Construction site lighting will be designed in accordance with latest relevant available guidance and legislation and the details of the location, height, design and luminance of lighting to be used will be detailed within the Outline Construction Artificial Light Emissions Management Plan, as part of the Outline CoCP. The design of construction site lighting will accord with the details provided in the Outline Code of Construction Practice (CoT35) and Outline Ecological Management Plan (CoT76).	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice); and DCO Schedules 2A & 2B, Requirement 12 (Ecological management plan)
CoT29	Appropriate Personal Protective Equipment will be used and relevant good working practices applied to avoid potential risk to human health including from any potential ground contamination, in line with relevant available guidance.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice);
CoT30	An Outline Contaminated Land and Groundwater Discovery Strategy, as part of the Outline CoCP has been submitted with the application for development consent to identify any suspected areas of contamination and any remedial measures which may be required. Detailed strategies will identify the construction protocol for discovery of any currently unknown contamination and any remedial measures that may be required.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT31	Ponds identified during the route planning and site selection process have been avoided where possible. During construction any newly identified ponds will be avoided through micro-siting of the onshore export cable corridor and 400 kV grid connection cable corridor where reasonably practicable.	DCO Schedules 2A & 2B, Requirement 12 (Ecological Management Plan)

Commitment (CoT) number	Measure adopted	How the measure will be secured
CoT32	An Outline Public Rights of Way (PRoW) Management Plan has been prepared as part of the Outline CoCP in order to minimise the disturbance to PRoWs, where practicable. Where practically possible the impact will be temporary and PRoWs will be reinstated as soon as reasonably practicable. An Outline Open Space Management Plan has been appended to the Outline PRoW Management Plan, which includes measures to minimise potential impacts to the users of Lytham St Annes beach and Blackpool Road Recreation Ground. Detailed PRoW Management Plans will include details of temporary and permanent diversions, closures, gated crossings and signage to be provided during construction and details to reinstate all PRoWs potentially affected during construction.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT33	An Outline Dust Management Plan (DMP) has been prepared as part of the Outline CoCP and submitted as part of the application for development consent. Detailed CoCP(s) will be developed in accordance with the Outline CoCP. The measures in the detailed DMP(s) will accord with guidance set out by the Institute of Air Quality guidance Management (IAQM, 2024) where appropriate and practicable, and will include measures for monitoring and reporting dust levels, and dust suppression and mitigation measures during construction and operation.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT34	Based on noise modelling results, where construction noise has the potential to cause significant adverse effects, mufflers and acoustic barriers will be used, where practicable, where HDD (or other trenchless techniques) is being undertaken.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice); and DCO Schedules 2A & 2B, Requirement 18 (Control of noise during operational stage)

Commitment (CoT) number	Measure adopted	How the measure will be secured
CoT35	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP will include measures to maintain and address: • flood protection and control measures; • water environment and drainage; • pollution prevention; • geology and ground conditions; • ecology and nature conservation (including protected species and invasive species); • historic environment; • soil management; • traffic and transport; • noise management measures; • air quality and dust management; • landscape and visual; • recreation; and • - bentonite breakout.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT36	Onshore Decommissioning Plan(s) will be developed prior to decommissioning. Onshore Decommissioning Plan(s) will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan(s) will be in line with the latest relevant available guidance.	DCO Schedules 2A & 2B, Requirement 22 (Onshore decommissioning)
CoT37	Vehicle movements associated with operation and planned maintenance of the onshore infrastructure will operate only during the daytime and evening periods (i.e. 07:00 – 19:00). Vehicle movements may however be subject to unscheduled events outside these hours.	DCO Schedules 2A & 2B, Requirement 9 (Traffic and Transport)

Commitment (CoT) number	Measure adopted	How the measure will be secured
CoT38	An Outline Construction Traffic Management Plan (CTMP) has been prepared and submitted with the application for development consent. CTMP(s) will be developed in accordance with the outline CTMP prior to construction. The detailed CTMP(s) will set out measures to include: 1. managing the numbers and routing of HGVs during the construction phase; 2. managing the movement of construction worker traffic during the construction phase; 3. details of measures to manage the safe passage of HGV traffic via the local highway network; 4. details of localised road improvements if and where these may be necessary to facilitate safe use of the existing road network; and 5. appointment of a Construction Traffic Management Plan Co-ordinator and Transport Working Group.	DCO Schedules 2A & 2B, Requirement 9 (Traffic and Transport)
CoT39	Fences, walls, ditches and drainage outfalls will be retained at the landfall and along the onshore export cable corridor and 400 kV grid connection cable corridor, where possible. Where it is not reasonably practicable to retain them, any damage will be repaired and reinstated as soon as reasonably practical. The Environment Agency must be notified if damage occurs to any Environment Agency main river or related flood infrastructure.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT40	An Onshore and Intertidal Written Scheme of Investigation(s) (WSI) will be developed in line with the Outline Onshore and Intertidal WSI. The Onshore and Intertidal WSI(s) will provide details on the surveys and archaeological mitigation in advance for each stage of the Transmission Assets any ground breaking works and during construction.	DCO Schedules 2A & 2B, Requirement 11 (Onshore archaeology)
CoT41	Where the onshore export cable corridor or 400 kV grid connection cable corridor crosses sites of particular sensitivity (e.g. embanked Environment Agency surface watercourses, Sites of Special Scientific Interest or groundwater inner Source Protection Zones) hydrogeological risk assessment(s) will be undertaken where practicable to inform a site-specific crossing method statement(s) which will also be agreed with the relevant authorities prior to construction.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)

Commitment (CoT) number	Measure adopted	How the measure will be secured
CoT43	The Project Description (Volume 1, Chapter 3 of the Environmental Statement) sets out that the installation of the offshore export cables under Lytham St Annes SSSI and the St Annes Old Links Golf Course will be undertaken by direct pipe trenchless installation technique. The exit pits associated with the direct pipe installation will be at least 100 m seaward of the western boundary of the SSSI.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT44	The Project Description (Volume 1, Chapter 3: Project description of the ES (document reference F1.3) sets out that the installation of the onshore export cable corridor at Lytham St Annes SSSI and the St Anne's Old Links Golf Course will be undertaken by HDD (or other trenchless techniques), for example, direct pipe.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
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 licencing 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 Windfarm Transmission Assets), Part 2 - Condition 18(1)(e) (Pre-construction plans and documentation)
CoT46	Aids to navigation (marking and lighting) will be deployed in accordance with international maritime regulations and the latest relevant available standard industry guidance as advised by Trinity House and MCA. This will include a buoyed construction area around cable laying operations, cable repairs and during cable maintenance.	DCO Schedules 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2, Condition 15 (Aids to navigation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Windfarm Transmission Assets), Part 2 – Condition 15 (Aids to navigation)

Commitment (CoT) number	Measure adopted	How the measure will be secured
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 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 Windfarm 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), 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 Windfarm Transmission Assets), Part 2 - Condition 18(1)(e) (Pre-construction plans and documentation)
CoT51	Crossing and proximity agreements, as set out in the Offshore Crossing Schedule submitted as part of the application for development consent, will be sought with known existing pipeline and cables operators.	DCO Schedule 18
CoT54	An Outline Offshore Cable Specification and Installation Plan (CSIP) includes for cable burial to be the preferred option for cable protection, where practicable. 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 Windfarm Transmission Assets), Part 2 - Condition 18(1)(e) (Pre-construction plans and documentation)

Commitment (CoT) number	Measure adopted	How the measure will be secured
CoT55	Offshore Decommissioning Programme(s) will be developed prior to decommissioning and will include information on the consideration of recycling of materials, where practicable, and if opportunities are available.	DCO Schedule 2A Requirement 21 (Offshore decommissioning) and DCO Schedule 2B Requirement 21 (Offshore decommissioning)
CoT59	The United Kingdom Hydrographic Office will be notified of both the commencement, progress and completion of offshore construction works to allow marking of all installed infrastructure on nautical charts.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition14 (8-10) (Notifications and inspections) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Windfarm Transmission Assets), Part 2 - Condition14 (8-10) (Notifications and inspections)
CoT65	Offshore Environmental Management Plan(s) (EMPs) will be developed and will include details of: • a marine pollution contingency plan to address the risks, methods and procedures to deal with any spills and collision incidents during construction and operation of the authorised scheme for activities carried out below MHWS; • a chemical risk review to include information regarding how and when chemicals are to be used, stored and transported in accordance with recognised best practice guidance; • waste management and disposal arrangements; • the appointment and responsibilities of a fisheries liaison officer; • a fisheries liaison and coexistence plan (which accords with the outline fisheries liaison and co-existence plan) to ensure relevant fishing fleets are notified of commencement of licensed activities pursuant to condition and to address the interaction of the licensed activities with fishing activities; • measures to minimise disturbance to marine mammals and rafting birds from vessels; and • - measures to minimise the potential spread of invasive non-native species, including adherence to IMO ballast water management guidelines.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets), Part 2 - Condition18(1)(f) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Windfarm Transmission Assets), Part 2 - Condition18(1)(f) (Pre-construction plans and documentation)

Commitment (CoT) number	Measure adopted	How the measure will be secured
CoT66	A Safety Zone Statement has been submitted as part of the application for development consent. Advisory exclusion zones of 500 m will be applied during construction and maintenance. Where defined by risk assessment, guard vessels will also be used to ensure adherence with Safety Zones or advisory passing distances to mitigate impacts which pose a risk to surface navigation.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(f)(iv) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Windfarm Transmission Assets), Part 2 - Condition18(1)(f)(iv) (Pre-construction plans and documentation)
CoT76	Detailed Ecological Management Plan(s) (EMP) will be developed in accordance with the Outline Ecological Management Plan (OEMP). The Outline Ecological Management Plan has been prepared and submitted as part of the application for development consent and includes but is not limited to pre-construction, construction and post-construction mitigation measures relating to habitats and protected or notable species, species mitigation licences and the role of the Ecological Clerk of Works (ECoW) where relevant. The Outline Ecological Management Plan also includes a Breeding Bird Protection Plan which will set out mitigation measures such as vegetation clearance in winter (e.g., hedgerows), pre-construction breeding bird survey, appropriate protection zones upon confirmation of nest building/breeding taking place of key protected or sensitive species. In addition to the Breeding Bird Protection Plan, the OEMP sets out species-specific mitigation plans for Important Ecological Features identified as part of the assessment. Detailed Ecological Management Plan(s) will include details of any long term mitigation and management measures relevant to onshore ecology and nature conservation and in relation to onshore and intertidal ornithology. This will include the management of ecological mitigation areas. The Detailed EMPs will be developed in consultation with the relevant statutory advisors and regulators.	DCO Schedules 2A & 2B, Requirement 12 (Ecological Management Plan)

Commitment (CoT) number	Measure adopted	How the measure will be secured
CoT79	An Outline Construction Noise and Vibration Management Plan has been prepared as part of the Outline CoCP submitted as part of the application for development consent. It includes measures to mitigate noise from construction activities associated with the Transmission Assets. Detailed Construction Noise and Vibration Management Plan(s) will be developed in accordance with Detailed CoCPs. Bespoke method statement(s) will be developed to ensure suitable noise limits can be met on specific sensitive noise receptors.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice); and Requirement 18 (Control of noise during operational stage)
CoT82	Where trenchless techniques are proposed for crossing ordinary watercourses, the entry and exit pits will be set back a minimum of 8 m from the bank of the watercourse. These crossings are detailed in the Onshore Crossing Schedule. Where required, geomorphological surveys will be undertaken on ordinary watercourses that may be crossed by trenched techniques. These will be used to inform detailed designs prior to construction.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice); DCO Schedule 10
CoT84	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. In order to manage impacts to field drainage, the outline CoCP stipulates field drainage plans will be developed in consultation with the relevant landowners. If required, additional field drainage will be installed to ensure the existing drainage of the land is maintained during and after construction.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT85	An Outline Code of Construction Practice (CoCP) will be prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP will include that temporary haul road(s) will be installed using permeable gravel aggregate with a geotextile or other type of protective matting, or plastic or metal plates or grating, where required.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT86	An Outline Code of Construction Practice (CoCP) will be prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. Where required, trenched techniques may be used for minor ditches or smaller watercourses that are frequently dry. In these cases, measures will be implemented to protect water quality and flow and these will be detailed within the Outline CoCP.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)

Commitment (CoT) number	Measure adopted	How the measure will be secured
CoT89	No demolition of any building will be undertaken in connection with the construction of the Transmission Assets. This is in accordance with the Outline Code of Construction Practice (CoCP) and detailed CoCPs.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT90	The Project Description (Volume 1, Chapter 3 of the Environmental Statement) sets out that the installation of the 400kV Grid Connection Cable Corridor beneath the River Ribble will be undertaken by direct pipe or micro tunnel trenchless installation techniques.	DCO Schedules 2A & 2B, Requirement 5(3)(Detailed design parameters onshore); and Requirement 8 (Code of Construction Practice)
CoT102	Where sections of PRoWs are required to be closed during the construction of the onshore export cable corridor and 400 kV grid connection cable corridor, they will not be closed for any longer than three months at any one time, or for six months in total over the whole construction period. Where closures are required for longer periods due to unforeseen circumstances encountered during construction, Lancashire County Council will be informed in writing. This will be in accordance with the Outline PRoW Plan that has been prepared, as part of the Outline CoCP and submitted as part of the application for development consent.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT103	Where suspected contamination is present and piling is proposed, where required a detailed piling risk assessment will be developed prior to the commencement of construction. Consultation with the Environment Agency will be sought.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT108	The Outline Cable Specification and Installation Plan (CSIP) submitted as part of the application for development consent, includes for all external cable protection used within the Fylde MCZ to be designed to be removable on decommissioning. 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 Windfarm Transmission Assets), Part 2 - Condition18(1)(e) (Pre-construction plans and documentation)
CoT109	The requirement for removal of cable protection within the Fylde MCZ will be agreed with stakeholders and regulators at the time of decommissioning. Removal of cable protection will be in accordance with the Offshore Decommissioning Programme(s).	DCO Schedule 2A Requirement 21 (Offshore decommissioning) and & DCO Schedule 2B Requirement 21 (Offshore decommissioning)

Commitment (CoT) number	Measure adopted	How the measure will be secured
CoT110	Construction activities associated with the offshore cable pull in for the Morgan Offshore Wind Project and Morecambe Offshore Windfarm Limited will be undertaken in accordance with the Outline Offshore Cable Specification and Installation Plan (CSIP). This will include a timing restriction on all cable pull activities at landfall on Lytham St Annes beach between November and March (inclusive), unless otherwise agreed with the MMO, in consultation with Natural England. 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 Windfarm Transmission Assets), Part 2 - Condition18(1)(e) (Pre-construction plans and documentation)
CoT111	Development of, and adherence to, an offshore Environmental Management Plan(s) which will include Measures to minimise disturbance to marine mammals and rafting birds from vessels. The Measures to minimise disturbance to marine mammals and rafting birds from vessels includes a timing restriction on all offshore export cable installation activities between November and March (inclusive). within the original boundary of the Liverpool Bay/Bae Lerpwl SPA (as designated in 2010), including a 2 km buffer, unless otherwise agreed with the MMO, in consultation with Natural England.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 – Condition 18(1)(f) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Windfarm Transmission Assets), Part 2 – 18(1)(f) (Pre-construction plans and documentation)
CoT112	Advance warning will be provided via Notice to Mariners to ensure that the appropriate authorities are informed of offshore construction, operation and maintenance, and decommissioning activities. Copies of all notices must be provided to the MMO, MCA and UKHO as well as other interested parties, as appropriate.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 – Condition 14(8-9) (Notifications and inspections) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Windfarm Transmission Assets), Part 2 - Condition 14(8-9) (Notifications and inspections)
CoT123	The Project Description (Volume 1, Chapter 3 of the Environmental Statement) sets out that the installation of the Onshore Export Cable Corridor at Blackpool Road Recreation Ground will be undertaken by HDD (or other trenchless techniques). This trenchless technique installation is anticipated to last a maximum of 5 months of total active construction within the grounds. Appropriate exclusion fencing between the entry and exit pits will only be erected for a maximum of 2 months within the 5 months of active construction to mitigate potential impacts to users.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice); DCO Schedules 2A & 2B, Requirement 5 (Detailed design parameters onshore)

Commitment (CoT) number	Measure adopted	How the measure will be secured
CoT125	The Project Description (Volume 1, Chapter 3 of the Environmental Statement) sets out that the siting and number of compounds associated with the construction activities at the landfall have been sited, where practicable, to avoid key constraints, including the Ribble and Alt Estuaries SPA and the Lytham St. Annes Dunes SSSI, to reduce disturbance upon roosting waders.	DCO Schedule 1 (Authorised Development)
CoT129	No construction activities at landfall on Lytham St Annes beach will be undertaken by the Morgan Offshore Wind Project and Morecambe Offshore Windfarm Limited between November and March (inclusive). This is to mitigate disturbance to roosting wader features of Ribble and Alt Estuary SPA and Ramsar site. This is detailed within the Outline Ecological Management Plan.	DCO Schedules 2A & 2B, Requirement 12 (Ecological Management Plan)
CoT130	No clearance of unexploded ordnance (UXO) will be undertaken within Liverpool Bay/Bae Lerpwl SPA between November and March (inclusive).	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 – Condition 18(1)(f) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 – 18(1)(f) (Pre-construction plans and documentation)

3.7 Key project design and Order Limit changes from PEIR to DCO

As a result of stakeholder feedback and ongoing design evolution, a number of changes were made to the Transmission Assets PDE between publication of the Preliminary Environmental Information Report (PEIR) for statutory consultation under the Planning Act 2008 and the PDE reported in this ES for the DCO submission.

3.7.1 Offshore design changes

3.7.1.1 A key aspect of the offshore design changes since PEIR is that no sea-surface piercing infrastructure is proposed for the Transmission Assets application, and for the offshore infrastructure consent is only sought for the construction, operation and maintenance and decommissioning of the offshore export cables. The key offshore changes since the PEIR was published are set out below:

- Removal of the offshore substation platforms (OSPs) and interconnector cables – at PEIR this infrastructure was proposed to

be included the Generation Assets applications, as well as the Transmission Assets proposals. Since PEIR both Applicants have removed the OSPs and interconnectors from the Transmission Assets final application, to simplify the assessment and remove any confusion by the authorisation of these elements in more than one consent and any 'double counting' of this infrastructure in the cumulative effects assessments. The OSPs and interconnectors are now only included in each of the respective Generation Assets applications.

- Removal of the Morgan Offshore Booster Station – proposals for a Morgan Offshore Booster Station have been removed from the Morgan Offshore Wind Project. No offshore booster station is contained with the Morgan Generation Assets either.
- Reductions to sandwave clearance –
  - Morgan OWL – reduction from 60% to 9% sandwave clearance across its offshore export cable corridors, with a commitment to a maximum of 5% sandwave clearance within the Fylde Marine Conservation Zone (MCZ) (CoT47) (see **section 3.12.3**).
  - Morecambe OWL – reduction from 30% to 9% sandwave clearance across its offshore export cable corridors, with a commitment to a maximum of 5% sandwave clearance within the Fylde Marine Conservation Zone (MCZ) (CoT47) (see **section 3.12.3**).
- Reductions to cable protection –
  - Morgan OWL – reduction from 20% to 10% cable protection across its offshore export cables, with a commitment to limit this allowance within the Fylde MCZ to a maximum of 3% of the total length of the cables within the Fylde MCZ (excluding cable crossings) (see **section 3.12.6** for further details on all commitments).
  - Morecambe OWL – reduction from 15% to 10% cable protection across its offshore export cables, with a commitment to limit this allowance within the Fylde MCZ to a maximum of 3% of the total length of the cables within the Fylde MCZ (excluding cable crossings) (see **section 3.12.6** for further details on all commitments).

3.7.1.2 Additionally, cable crossing parameters within the Fylde MCZ have been reduced since PEIR and are provided in **section 3.12.6.**

3.7.1.3 Changes to the Offshore Order Limits have also been made since PEIR to align with the Generation Assets applications. These are shown on Figure 3.3, Volume 1: Figures, and include:

- Reduction in the north-west corner, adjacent to the Morgan Offshore Wind Project: Generation Assets array area – to mitigate potential impacts on shipping and navigation (see Volume 2: Chapter 7 Shipping and Navigation for further information, document reference F2.7);

- Reduction in the western array area to align with the Morecambe Offshore Windfarm: Generation Assets array area.

3.7.2 Onshore and intertidal design changes

3.7.2.1 Following statutory consultation on the PEIR, a number of changes have been made to the onshore and intertidal areas as a result of design evolution and feedback received. A targeted statutory consultation pursuant to section 42 of the Planning Act 2008 was undertaken in relation to these changes, which were outside of the PEIR red line boundary. A summary of the changes are as follows:

- five amendments to the onshore export cable corridor route;
- 11 amendments to temporary access tracks;
- 23 amendments to the operation access routes; and
- two amendments to temporary construction compounds.

3.7.2.2 See Figure 3.4, Volume 1: Figures for a summary of these changes. For further details on temporary access tracks, and operational access route for the onshore export cable corridor, see **section 3.15**. Further information on the targeted consultation can be found in the Consultation Report (document reference E1).

3.7.2.3 Separate to those made outside of the PEIR red line boundary, a number of other key changes were made between publication of the PEIR and DCO submission; which included but was not limited to those listed below.

Landfall

3.7.2.4 Substantial reductions to the Order Limits have been made to the north of the PEIR boundary at landfall, including removal of part of the dunes, south of Squires Gate Lane, between the beach and Clifton Drive North (see Figure 3.5, Volume 1: Figures). This change was made as a part of the design evolution process.

3.7.2.5 Temporary beach access has been retained from Squires Gate Lane to launch small vessels to support landfall construction activities, and part of the Lytham St Annes dunes remain within the Order Limits, with a commitment to direct pipe trenchless technique installation of the offshore export cables (CoT44, **Table 3.2**). HDD is no longer proposed for the construction at the landfall, to mitigation potential impacts to ornithological receptors (Volume 3, Chapter 4: Onshore and intertidal ornithology, document reference F3.4) and beach users, as direct pipe installation would result in significantly reduced active construction durations on the beach. Use of direct pipe is also likely to result in a lower risk of 'frack-outs' and lower levels of noise and vibration. A temporary construction compound has been retained east off Clifton Drive North to support the landfall construction activities.

3.7.2.6 A large area within and adjacent to Blackpool Airport has also been removed, with the retention of an operational access off Squires Gate Lane (A5230). The development and refinement of the onshore export

cable installation techniques, informed by consultation with Blackpool Airport, resulted the majority of the northern area, including most of the area north of the main runway being removed, to mitigate potential effects.

3.7.2.7 South of the PEIR red line boundary a section of the dunes, north of the St Annes North Beach car park have been removed, along with a large section of the adjacent beach (see Figure 3.5, Volume 1: Figures). A temporary working compound has been retained at the North Beach car park, with on foot (pedestrian) only access from the car park along the beach to the landfall working area on the beach to the north.

3.7.2.8 Similarly, a central section within the Order Limits has been removed in order to maintain greater distance from residential receptors in the area, and to remove as much of the Lytham St Annes dunes SSSI as possible. East of this, much of the St Annes Old Links Golf Club has been removed. An area has been retained for the direct pipe trenchless technique installation of the offshore export cables (CoT44, **Table 3.2**) along with a pedestrian only access to be used temporarily during construction only.

3.7.2.9 See **section 3.14** for further information on landfall installation.

Onshore export cable corridors

3.7.2.10 East of the TJBs (i.e. Work Nos 10A/10B), a number of changes have been made and have been grouped according to sections of the route moving east from the TJBs to the onshore substations (see Figure 3.6, Volume 1: Figures):

- Removal of the option to install the onshore export cables within or along roads (see Inset 3, Figure 3.6, Volume 1: Figures) – at PEIR the Transmission Assets including proposals to install the onshore export cables within Blackpool Road North, Leach Lane, Kilnhouse Lane, and part of Queensway (B5261). These proposals have now been removed from the final application to mitigation potential effects, including disruption to local residents and the community. The Transmission Assets will not be installing onshore export cables within the roads, however, the option to install the onshore export cables across a northern section of Leach Lane using open cut techniques has been retained (CoT02, **Table 3.2**).
- Reduction in overall temporary and permanent widths of the onshore export cable corridor –
  - Temporary working onshore export cable corridor (Figure 3.6 – Volume 1: Figures) reduced from 120m to 100m i.e. 62m Morgan and 38m for Morecambe; and
  - Permanent onshore export cable corridor – reduced from 80m to 70m i.e. 45m Morgan and 25m for Morecambe.
- Reduction in the area at Blackpool Airport (see Inset 1, Figure 3.6, Volume 1: Figures) – a large reduction has been made to the Order Limits at Blackpool Airport to the north, including a section north of the runway, south of Heyhouses. An area at the eastern end of the main runway has been retained (Work No. 13A13B) to accommodate

potential trenchless installation (i.e. HDD or other trenchless technique, or direct pipe trenchless installation) under the end of the runway and/or potential trenchless installation or open cut, parallel south of the main runway to Queensway (B5261).

- Refinements to proposals at Blackpool Road Recreation Ground (see Inset 3, Figure 3.6, Volume 1: Figures). The area within the recreation ground has been reduced since PEIR, and a commitment made to trenchless technique installation to minimise the duration of works and impact on the recreation grounds. (CoT123, **Table 3.2**). Further details on the proposed activities within the recreation grounds can be found in **section 3.15.4**.
- Removal of the southern onshore export cable option (Option 2, south) (see Inset 2, Figure 3.6, Volume 1: Figures) – At PEIR two options were included in the Lytham Moss and Higher Balham area. In response to section 42 feedback, the southern option which passed through to the south of Higher Balham has been removed, to mitigate potential impacts related to ornithology on the Farmland Conservation Area (see Volume 3, Chapter 4: Onshore and intertidal ornithology, document reference F3.4).

3.7.2.11 A range of other changes have taken place since PEIR. Further information on changes related to route planning and site selection can be found summarised in Volume 1, Chapter 4: Site Selection and consideration of alternatives (document reference F1.4), with further detail provided in Volume 1, Annex 4.1 – 4.3 of the ES (document reference F1.4.1, F1.4.2, and F1.4.3).

Morgan onshore substation

3.7.2.12 At PEIR the Morgan preferred onshore substation site was presented within the larger 'onshore substation consultation area'. The Transmission Assets consulted on its proposals on the location of the preferred Morgan onshore substation site, within the overall onshore substations consultation area. Following consultation with landowners and on receiving feedback the Morgan onshore substation has been moved further east, creating greater distance from residential receptors, including from Hall Cross and Freckleton (see Figure 3.7, Volume 1: Figures). An area in this vicinity, separate to the Morgan onshore substation permanent site, has been retained for environmental mitigation, landscaping and biodiversity benefit (Work No. 49A) for the Morgan onshore substation.

3.7.2.13 In addition to the route planning and site selection changes a number of key design parameters have also changed:

- Onshore substation technology – Morgan OWL has now made a commitment to gas insulated switchgear (GIS) technology only to reduce the overall permanent infrastructure area for the substation site. Air insulated switchgear (AIS) will no longer be used.
- Onshore substation area (temporary and permanent) –

  - The total permanent area for the onshore substation has increased from 125 000 m^2 to 164 000 m^2. An area has also been included in the total permanent area for the substation, to the east (adjacent to Dow Brook), to provide space for landscaping, environmental mitigation and biodiversity benefit. The additional area included since the PEIR was published are predominantly for the provision of landscaping and mitigation, including areas for drainage and water attenuation.
  - Temporary access track width – has increased from 15m to 20m.
  - Inclusion of area to underground and undertake works to a low voltage (LV) line – within the temporary compound area, to provide more efficient use of this space. The LV line also intersects with the proposed permanent access track for the Morgan onshore substation, and therefore all or part of the LV line within the Order Limits may need to be undergrounded to facilitate operational access.

- Onshore substation temporary and permanent accesses – a number of indicative temporary and permanent access points were presented at PEIR. The final proposed temporary and permanent access is being taken from Kirkham Bypass (A583), in part, to separate the construction and operational traffic for each of the onshore substations, as well as facilitating a safe access point from the public highway.
- Onshore substation maximum height of main buildings – has been reduced from 20 m to 15 m.

Morecambe onshore substation

3.7.2.14 At PEIR two potential options were presented for the Morecambe onshore substation, Option 1 (north) and Option 2 (south). Following consultation, feedback was analysed and considered alongside a range of environmental and engineering constraints, including consideration of amendments to the location of the Morgan onshore substation. The decision was then taken that Option 2 (South) was the preferred location for Morecambe onshore substation. These key changes can be found on Figure 3.7, Volume 1: Figures and are summarised below.

3.7.2.15 Following the site selection process the following key project refinements were made;

- Temporary and permanent were selected. The permanent operational access will be taken from Lower Lane, to the west of the preferred substation location. The temporary access for construction will be from the A584, which is to the south of the preferred substation location. Permanent rights will be retained over this access to facilitate HGV and AIL deliveries.
- The location of the temporary compounds presented at PEIR for Option 2 (south) were reorientated and optimised to align to the temporary access from the A584.

3.7.2.16 In addition to the above the following key parameter changes were made;

- The total permanent footprint has reduced from 60,000 m2 to 59,500 m2.
- Onshore substation maximum height of main buildings - has been reduced from 20m to 13m.
- Temporary access track width has increased from 15m to 20m.

3.7.2.17 Morecambe OWL are retaining the option for both GIS and AIS substation technologies in the application. Morecambe continue to engage with the supply chain with regard to the availability of each technology and Morecambe's design requirements.

400kV grid connection cable corridor (including connection to the national grid)

3.7.2.18 At PEIR a wide corridor 'search area' for the 400kV grid connection cable corridor was included because of the uncertainties around the final proposed onshore substation sites and location at which the River Ribble would be crossed.

3.7.2.19 Since PEIR further route planning and site selection work has been undertaken and the 400kV grid connection cable corridor has been significantly refined, including identification temporary and permanent accesses, and temporary construction compounds (see Figure 3.8, Volume 1: Figures), and the location of the River Ribble crossing. Some access refinements resulted in changes outside of the PEIR red line boundary, and therefore were subject to the 2024 targeted consultation outlined in **paragraphs 3.7.1.3 - 3.7.2.2**.

3.7.2.20 Substantial refinements have also been made to the area proposed to be used to facilitate connection to the national grid. Temporary and permanent accesses, and temporary construction compounds have now been identified (see Figure 3.8, Volume 1: Figures). Some flexibility has been retained adjacent to the existing National Grid substation at Penwortham, to accommodate uncertainties around the specific details and locations of connections the existing National Grid substation, which will ultimately be determined by National Grid Electricity Transmission.

3.7.2.21 In addition to the route planning and site selection changes a number of key design parameters have also changed:

- Reduction in the temporary 400kV grid connection cable corridor width (not including the River Ribble crossing) – from 96 m to 76 m. i.e. 38m for Morgan, and 38m for Morecambe;
- Increase in the permanent 400kV grid connection cable corridor width (not including the River Ribble crossing) – from 46 m to 50 m. i.e. 25m for Morgan, and 25m for Morecambe;
- River Ribble crossing – the area has now been identified (see Figure 3.8 and Inset 4 – Figure 3.19, Volume 1: Figures) with an approximately 150 m temporary working width, and 50 m permanent width. The proposals for installing a conventional underground cable tunnel trenchless installation technique, with tunnel headhouses, has

now been removed from proposals. The final application does include direct pipe, micro-tunnel trenchless installation techniques within the design envelope.

Reductions to the potential biodiversity net gain, enhancement and/ or mitigation areas

3.7.2.22 The areas to be retained for the final application can be categorised as Environment mitigation only areas, and Biodiversity Benefit only areas (as set out above in **paragraph 3.5.1.3**). Substantial reductions in these areas have been made (see Figure 3.9, Volume 1: Figures) since the 'Potential biodiversity net gain, enhancement and/or mitigation areas were presented at PEIR. Further information proposals within these final areas can be found in the Outline Ecological Management Plan (document reference J6).

3.8 Consultation

3.8.1 Scoping

3.8.1.1 On 28 October 2022, the Applicants submitted a Scoping Report to the Planning Inspectorate, which described the approach to the assessment of any likely significant effects for the construction, operation and maintenance, and decommissioning phases of the Transmission Assets.

3.8.1.2 Following consultation with the appropriate statutory bodies, the Planning Inspectorate (on behalf of the Secretary of State) provided a Scoping Opinion on 8 December 2022.

3.8.1.3 Key comments relating to the project description raised during the scoping are set out in **Table 3.3**, together with details of how these comments have been addressed within the ES.

3.8.2 Evidence Plan Process

3.8.2.1 An Evidence Plan Process (EPP) was developed for the Transmission Assets, seeking to ensure engagement with the relevant aspects of the EIA process throughout the pre-application phase. The development and monitoring of the Evidence Plan and its subsequent progress was undertaken by the EPP Steering Group. The Steering Group comprises the Planning Inspectorate, the Applicants, the Marine Management Organisation (MMO), Natural England, Historic England, the Environment Agency and the Local Planning Authorities as the key regulatory and bodies. As part of the EPP, Expert Working Groups (EWGs) were set up to discuss relevant design changes with the relevant stakeholders.

3.8.2.2 Further details are set out in the Consultation Report (document reference E1) and the Technical Engagement Plan (TEP) (document reference E5).

3.8.3 PEIR and Section 42 responses

3.8.3.1 The preliminary findings of the EIA process were published in the PEIR in October 2023. The PEIR was prepared with the aim of providing a basis for formal consultation under the Planning Act 2008. This included consultation with statutory bodies under section 42 of the Planning Act 2008.

3.8.3.2 The Transmission Assets held a statutory consultation from 12 October to 23 November 2023, followed by a targeted consultation from 23 February to 24 March 2024 (see **section 3.8** for further details). Key comments raised during the statutory consultations are set out in **Table 3.3**, together with details of how these comments have been addressed within the ES.

3.8.4 Summary of consultation responses received

3.8.4.1 Key comments raised during the scoping, EPP and subsequent statutory consultation phases specific to this Project Description are set out in **Table 3.3**, together with details of how these comments have been addressed within this chapter and the wider ES.

Table 3.3: Summary of key consultation comments raised during consultation activities undertaken for design process

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
December 2022	Planning Inspectorate – Scoping Opinion	It is understood from the Scoping Report that the worst-case assessment will identify the MDS for any given parameter depending on the environmental matter being considered. It is understood that the PDE will capture all MDS options. The Inspectorate advises that flexibility in design should only be sought where absolutely necessary, in the interests of a proportionate ES based on the most realistic and refined PDE possible. The ES should assess the worst case that could potentially be built out in accordance with the Authorised Development of the Development Consent Order (DCO) being applied for.	The approach the project design envelope and maximum design scenario approach has been set out in **section 3.4** based on guidance presented in the NPSs and Advice Note Nine Planning Inspectorate, 2018. This chapter of the ES sets out the design parameters for each element of the Transmission Assets. The construction scenarios used as basis for identifying the worst-case scenarios for each of the environmental assessments, is set out in **section 3.9**. Each topic chapter in Volumes 2, 3 and 4 of this ES sets out the MDS for that topic.
December 2022	Planning Inspectorate – Scoping Opinion	The ES should provide further detail on the proposed seabed preparation activities and identify the worse-case scenario assessed in relation to seabed disturbance. The need for dredging, quantities of material and likely disposal location should be identified, and likely significant effects assessed in the ES.	The proposed sea bed preparatory activities are described in **section 3.11** and assessed in the relevant topic chapters in Volume 2 of the ES.
December 2022	Planning Inspectorate – Scoping Opinion	Two substation designs are included in the proposed design envelope (air insulated versus gas insulated), with implications for size, form and appearance. The Inspectorate advises that flexibility in design should only be sought where absolutely necessary. In the interests of a proportionate ES, such optionality should ideally be resolved prior to the point of application.	Gas Insulated Switchgear (GIS) and Air Insulated Switchgear (AIS) substation design options remain under consideration at this stage for the Morecambe onshore substation. For the Morgan onshore substation, GIS technology has been selected. See **section 3.7.2** for further details.
December 2022	Planning Inspectorate – Scoping Opinion	The Scoping Report states that the Transmission Assets are likely to be installed over a period of up to four years for Morgan Offshore Wind Project and up	Details of the programme and construction scenarios are set out in **section 3.9**. Each topic chapter of the ES has set out

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		to three years for Morecambe Offshore Windfarm. To what degree the construction activities will occur concurrently is not explained. The ES should ensure that the realistic worst case construction period is assessed for the Transmission Assets as a whole. Additionally, the construction phasing should be detailed enough to establish which construction activities will be done collaboratively and simultaneously or at separate times.	the MDS for that topic which includes consideration of the 'worst-case' construction scenario.
December 2022	Planning Inspectorate – Scoping Opinion	The ES should detail the type, number and frequency of vessel movements required to construct and operate the Transmission Assets. If these are unknown, then the ES should explain the assumptions that have been made about vessel movements to inform the assessment.	Details of the vessel requirements and movements are set out in **sections 3.12.7, 3.14.5, and 3.19.1.**
December 2022	Planning Inspectorate – Scoping Opinion	The Applicants should make effort to identify the location of the port and maintenance base in the ES, where possible, and assess any likely significant effects associated with port use. If locations cannot be confirmed, the ES should explain the assumptions and worst-case scenario which have informed the assessment.	The final selection of the port facilities required to construct and operate the Morecambe Offshore Windfarm, the Morgan Offshore Wind Project and the Transmission Assets has not yet been determined with the selection of port facilities to be confirmed post-consent. Where relevant assumptions have been made around port, for example Volume 4, Chapter 2: Socio-economics (document reference F4.2).
24 May 2023	Stena Line Stakeholder meeting	The main concern raised with respect to the Transmission Assets was the potential for the booster station to be placed as an isolated structure causing deviation and allision risk, rather than being located adjacent to the Morecambe Offshore Windfarm: Generation Assets.	The Morgan Offshore Booster Station was removed from the Transmission Assets design following PEIR to avoid possible impacts on the Liverpool Bay SPA, Fylde MCZ, navigation, and existing oil and gas platforms. Further details are provided in **section 3.7.1.**
31 May 2023	Trinity House Stakeholder meeting	It was highlighted that the Morgan Offshore Wind Project offshore booster station has potential to impact existing commercial routes, for example the dredger routes to/from Liverpool.	The Morgan Offshore Booster Station was removed from the Transmission Assets design following PIER to avoid possible impacts on the Liverpool Bay SPA, Fylde MCZ, navigation, and existing oil and gas platforms. Further details are provided in **section 3.7.1.**

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
31 May 2023	MCA Stakeholder meeting	If the Morgan Offshore Wind Project offshore booster station is to be located within 1 nm of the Morecambe Offshore Windfarm: Generation Assets, it must align with the turbine layout.	The Morgan Offshore Booster Station was removed from the Transmission Assets design following PIER to avoid possible impacts on the Liverpool Bay SPA, Fylde MCZ, navigation, and existing oil and gas platforms. Further details are provided in **section 3.7.1.**
5 June 2023	Oil and gas operators (collectively) Stakeholder meeting	The Morgan Offshore Wind Project offshore booster station has potential to be located such that the Calder platform is put into a 'shadow zone' for the early radar detection monitoring system which monitors allision risks. Micro-siting of the Morgan Offshore Wind Project offshore booster station location to minimise impact to nearby oil and gas platforms/wells should be considered.	The Morgan Offshore Booster Station was removed from the Transmission Assets design following PIER to avoid possible impacts on the Liverpool Bay SPA, Fylde MCZ, navigation, and existing oil and gas platforms. Further details are provided in **section 3.7.1.**
23 November 2023	Spirit Energy, Harbour Energy Statutory consultation	Comments relating to the location of the Morgan Offshore Wind Project offshore booster station and effects on oil and gas activity.	The Morgan Offshore Booster Station was removed from the Transmission Assets design following PIER to avoid possible impacts on the Liverpool Bay SPA, Fylde MCZ, navigation, and existing oil and gas platforms. Further details are provided in **section 3.7.1.**
November 2023	Natural England – S42 Response	Natural England indicated that the Maximum Design Scenario's (MDS) for sandwave clearance and other seabed preparation activities (within and outside of protected areas) is large. While we support the use of sandwave levelling as a form of mitigation measure to reduce the likelihood of using cable protection; there is a considerable amount of sandwave clearance and seabed preparation footprint proposed. We encourage refinement of the MDS for application.	The Applicants have refined and reduced the amounts of sandwave clearance from 60% across the offshore export cable corridor to 5% within the Fylde MCZ and 9% over the rest of the route. Further details on sandwave clearance are provided in **section 3.12.3** with supporting information for sandwave clearance in the Fylde MCZ within the Cable Specification Installation Plan (document reference J15).
November 2023	Natural England – S42 Response	Natural England recommended further implementation of the mitigation hierarchy to avoid,	The cable protection parameters have been reduced for the Morgan Offshore Wind Project from 20% to 10% across the

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		reduce and mitigate amounts of cable protection, especially within the Fylde MCZ.	overall route with 3% contingency for cable protection in the Fylde MCZ. The cable protection parameters have been reduced for the Morecambe Offshore Windfarm from 15% to 10% across the overall route with 3% contingency for cable protection in the Fylde MCZ. Further details on cable protection are provided in **3.12.6.**
	Natural England – Section 42	From experience on other windfarms HDD can fail on occasion, the applicants should ensure that the worst case scenario at landfall takes this into consideration. This should consider impacts on Lytham St. Annes Dunes SSSI with sufficient baseline collected to assess impact post construction and identify remedial measures where needed.	At PEIR, the landfall installation methodology was by Horizonal Directional Drilling (HDD) or equivalent trenchless techniques. For the DCO application, the Applicants have selected the direct pipe trenchless technique. Direct pipe results in a shorter installation duration and less interaction with the beach (up to two weeks of beach works per cable) which minimises disruption to public access and environmental impacts upon designated features of the Ribble and Alt Estuary Special Protection Area (SPA), Ribble and Alt Estuary Ramsar site, Ribble Estuary SSSI, and Lytham St Annes Dunes SSSI. Further details are provided in **section 3.14.**
	Natural England – Section 42	Natural England seeks confirmation that the proposed HDD works beneath the Ribble Estuary will take place 'bank to bank' (i.e., no works will take place in the water, and entry and exit points for drilling will be terrestrially), thereby mitigating the potential impacts on MCZ Smelt. We also note that the assessment presents no contingency / alternative measures should HDD not be used or fails. The submitted ES should confirm how HDD works will operate to confirm whether there will indeed be potential impacts on Smelt, a feature of the Ribble Estuary MCZ. We also advise the developer should consider impacts of alternate methods should HDD not be feasible or fail.	The Ribble Estuary crossing will be undertaken by direct pipe or micro tunnel trenchless installation techniques, and the works will be bank to bank (i.e. no works will take place in the water) (CoT90 within the Commitments Register in Volume 1, Annex 5.3) with further details in **section 3.15.8**. There will be no potential for impacts to the smelt feature of the Ribble Estuary MCZ which could undermine the conservation objectives.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
November 2023	Natural England – S42 Response	Natural England recommended a commitment to remove cable protection from the 'nearshore' and Fylde MCZ as part of decommissioning with any cable protection used designed to be removeable.	The Applicants have committed to ensuring that all external cable protection used within the Fylde MCZ will be designed to be removable on decommissioning with the requirement for removal agreed with stakeholders and regulators at the time of decommissioning (CoT108 and CoT09 within the Commitments Register in Volume 1, Annex 5.3). Further details are provided in **section 3.12.6.**
November 2023	Natural England – S42 Response	Natural England recommended boulder clearance methodology and location of boulder deposition should be clearly stated within the ES along with further details for micro-siting of cables if applicable.	Boulder clearance methodology is included in **section 3.12.3** with boulders to be moved to the side (side cast), away from the immediate location of the cable infrastructure. As described in Volume 1, Annex 4.2: Selection and refinement of offshore infrastructure, a micrositing allowance of 500 m has been added to the cable corridors for mircrositing of cables around seabed features, including boulders.
November 2023	Natural England – Section 42	We note that there is a possibility that all or part of the Offshore Service Platforms (OSPs) could be classed as part of the Generation Assets or the Transmission Assets. We advise that this optionality should ideally be resolved prior to the application and assessed within the relevant ES. The applicant to clarify which aspect of the proposed project the OSPs fall under (i.e. Generation or Transmission Assets), this should then be refined and assessed within the relevant ES.	As detailed in **section 3.7.1**, the six OSPs included in the Transmission Assets PEIR were removed from the Transmission Assets design. The OSPs are now solely included in the Morgan Offshore Wind Project: Generation Assets DCO and the Morecambe Offshore Windfarm: Generation Assets DCO.
November 2023	Natural England – Section 42	We advise that the Morgan Offshore Booster Station should be located in the area which will have the least impact on Fylde MCZ. where feasible, and the rationale for the chosen location presented in the submitted ES.	The Morgan Offshore Booster Station was removed from the Transmission Assets design following PIER to avoid possible impacts on the Liverpool Bay SPA, Fylde MCZ, navigation, and existing oil and gas platforms. Further details are provided in **section 3.7.1.**
November 2023	Natural England – Section 42	The parameters for cable crossings have not been defined in this Chapter, NE acknowledges the developer needs to confirm crossings with the asset	Further details on the potential for crossing of existing assets is provided in **Table 3.8** with up to 51 potential crossings required**.** An offshore crossing schedule is provided in Volume

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		owner. However, when this information is known, please provide further information on MDS parameters for cable crossing (i.e. indicative number of crossings, specific locations, overlap with MPAs etc) and methodology in line with best practise guidance	1, Annex 3.1 which details existing infrastructure within the Offshore Order Limits.
November 2023	MMO and Cefas – Section 42	MMO advises that further details of the offshore punchout location and any released fluids is required	Further details on the landfall installation are provided in **section 3.14**, noting that the Applicants will be using the direct pipe trenchless technique between the TJBs and beach.
November 2023	Spirit Energy	Of the two proposed Morgan Booster Station sites, the site proposed to the East of the Morecambe Wind Farm could introduce less impact risk on the Spirit Energy Production UK Limited ("Spirit") infrastructure and the aviation and operational interactions between South Morecambe, DP6 and Calder platforms, however both proposed locations introduce risks given proximity to Spirit's existing operations which will need to be understood and considered.	The Morgan Offshore Booster Station was removed from the Transmission Assets design following PIER to avoid possible impacts on the Liverpool Bay SPA, Fylde MCZ, navigation, and existing oil and gas platforms. Further details are provided in **section 3.7.1.**
November 2023	Natural England – Section 42	Natural England advises that either further information is provided to demonstrate the extent of deep peat in the area of the cable route, or that the proposed developments are amended to avoid any work within these particular areas.	Soil surveys have been completed, the results of which are provided in Volume 3, Annex 6.2 of the ES (document reference F3.6.2). The surveys show that the nature of the soils and the agricultural land classification grades within the survey areas was predominantly consistent with what would be expected based on the published soil survey information available. However, within the areas where peaty soil horizons might have been expected to be identified it was notable that there has been wastage of peat within the agricultural areas that have been surveyed, with a mixture of organic and mineral topsoils now identified largely within these areas. Peaty soils within the survey area were identified only in small lower lying hollows, for example immediately adjacent to the

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
			east and west of Huck Lane where the Altcar series was identified.
November 2023	Natural England – Section 42	No detail has been provided for what is happening at the Fairhaven site. Please provide further detail for this area in the submitted ES.	Information on the measures proposed at the Fairhaven site have been provided in Volume 3, Chapter 4: Onshore and intertidal ornithology (document reference F3.4), with further in information on the mitigation proposed provided in Outline Ecological Management Plan (document reference J6).
November 2023	Freckleton Parish Council	The project description presented at PEIR lacked maturity, commensurate with presentation for approval. The reason for dismissal of possible alternative was unclear at PEIR.	This chapter provides the relevant design information for the construction, operation and maintenance and decommissioning of the Transmission Assets based on the maximum design scenario approach. The project design envelope or maximum design scenario approach is set out in **section 3.4**. The route planning and site selection process is set out in Volume 1, Chapter 4: Site selection and consideration of alternatives.
November 2023	Fylde Council	Wherever the substations are located, it is essential that the technology used minimises the size of the structures required, and/or delivers the structures in a disaggregated form to minimise their visual impact in the landscape.	The maximum design parameters for the onshore substations are presented in **section 3.15.7**, and key changes to changes to parameters since PEIR have been summarised in **section 3.7**. The potential landscape and visual impacts related to the onshore substations are presented in Volume 3, Chapter 10: Landscape and visual resources (document reference F3.10), and design principles for the onshore substations have been provided in Outline Design Principles (document reference J3).
November 2023	South Ribble Council	The council raised concerns that upgrading electricity works at Penwortham Substation would interfere with electricity provision from the existing substation or would not be sufficient for the purpose required and may draw from existing supplies.	The scope of the Transmission Assets application includes the required works to connect each of the offshore wind farms to the National Grid Electricity Transmission (NGET) substation at Penwortham. These connection works are not expected to result in any disruption to the electricity transmission network. Further information on these national grid connection works related to this application is provided in **section 3.16**.

3.9 Programme and construction scenarios

3.9.1 Programme

3.9.1.1 At this stage, the timing of construction activities set out within this ES is indicative. At the time of writing, both the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm intend to be fully operational by 2030 at the earliest.

3.9.1.2 For the purposes of assessment, it is anticipated earliest construction start date for the Transmission Assets (i.e., both Morgan Offshore Wind Project: Transmission Assets and Morecambe Offshore Windfarm: Transmission Assets) is 2027.

3.9.2 Construction scenarios

3.9.2.1 Notwithstanding, as there are a range of milestones and gates a project would need to pass through before commencing construction (see **section 3.3.1**), a range of construction scenarios have been identified as the exact timings for construction for each of the offshore wind farms is still unknown. For example, they could be built at the same time (i.e. concurrently); separately (i.e. back-to-back, or with some years of separation); or with some overlap. These construction scenarios form part of the basis for the maximum design scenarios for the EIA.

3.9.2.2 For the purposes of EIA, the impact assessments for the Transmission Assets consider the following construction scenarios in determining the worst-case scenario for each respective topic in relation to the Transmission Assets project-alone assessments.

- **In Isolation Construction Scenario**:
  - Either construction of the Morgan Offshore Wind Project: Transmission Assets only (i.e. where the Morecambe Offshore Windfarm does not proceed to construction);
  - Or construction of the Morecambe Offshore Windfarm: Transmission Assets only (i.e. where the Morgan Offshore Wind Project does not proceed to construction).
- **Concurrent Construction Scenario**:
  - construction of the Morgan Offshore Wind Project: Transmission Assets and the Morecambe Offshore Windfarm: Transmission Assets at the same time.
- **Sequential Construction Scenario**:
  - where the Morgan Offshore Wind Project: Transmission Assets are constructed first and the Morecambe Offshore Windfarm: Transmission Assets are constructed second, or vice versa. This may include:
    - Immediate sequential construction of the Transmission Assets with no gap between the completion of construction of the transmission assets for the first project and commencement of construction for the second project; or

- Sequential construction with a gap of up to a maximum of four years between completion of construction of the transmission assets for the first project and commencement of construction for the second project.

3.9.2.3 Further information on the construction scenarios is provided in Rule 9 – ES assessment of Construction Scenarios (document reference AS-070). Further information on EIA methodology including in relation to the cumulative effects assessment is provided in Volume 1, Chapter 5: Environmental assessment methodology of the ES (document reference F1.5).

3.9.2.4 The overall construction programme durations are presented in **Table 3.4**.

Table 3.4: Overall construction durations

Duration (months)				
Element of the Transmission Assets	**Morgan Only**	**Morecambe Only**	**Concurrent**	**Sequential**
Offshore export cables				
Offshore export cable site preparation and installation	21	9	21	30
Landfall				
Landfall – MLWS to the TJBs, including associated temporary infrastructure	36	30	36	66
Onshore export cables				
Onshore export cable corridor	36	30	36	66
Onshore substations				
Onshore substation construction (excluding enabling works)	30	24	30	54
400 kV grid connection cables				
400 kV grid connection cable corridor	36	30	36	66

3.9.2.5 The overall construction durations in **Table 3.4** for each element of the Transmission Assets should be read in conjunction with the indicative construction programmes for the Transmission assets, as set out in **Plate 3.1** – **Plate 3.3**. These plates set out the construction activities (alongside pre-construction and/or onshore site preparation) relative to the construction activities for each element of the Transmission Assets.

Isolation

Morgan OWL ONLY (built in isolation)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Onshore Substation Site Preparation and Enabling Activities																
Onshore Substation Construction																
Onshore Export Cable Corridor Site Preparation Activities																
Onshore Export Cable Corridor & 400kV grid connection cable corridor construction																
Landfall Construction																
Offshore Site Preparation Activities																
Offshore Export Cable Corridor Construction																

Isolation

Morecambe OWL ONLY (built in isolation)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Onshore Substation Site Preparation and Enabling Activities																
Onshore Substation Construction																
Onshore Export Cable Corridor Site Preparation Activities																
Onshore Export Cable Corridor & 400kV grid connection cable corridor construction																
Landfall Construction																
Offshore Site Preparation Activities																
Offshore Export Cable Corridor Construction																

Plate 3.1: In Isolation Construction Scenario indicative construction programme for the Morgan Offshore Wind Project: Transmission Assets and Morecambe Offshore Windfarm: Transmission Assets

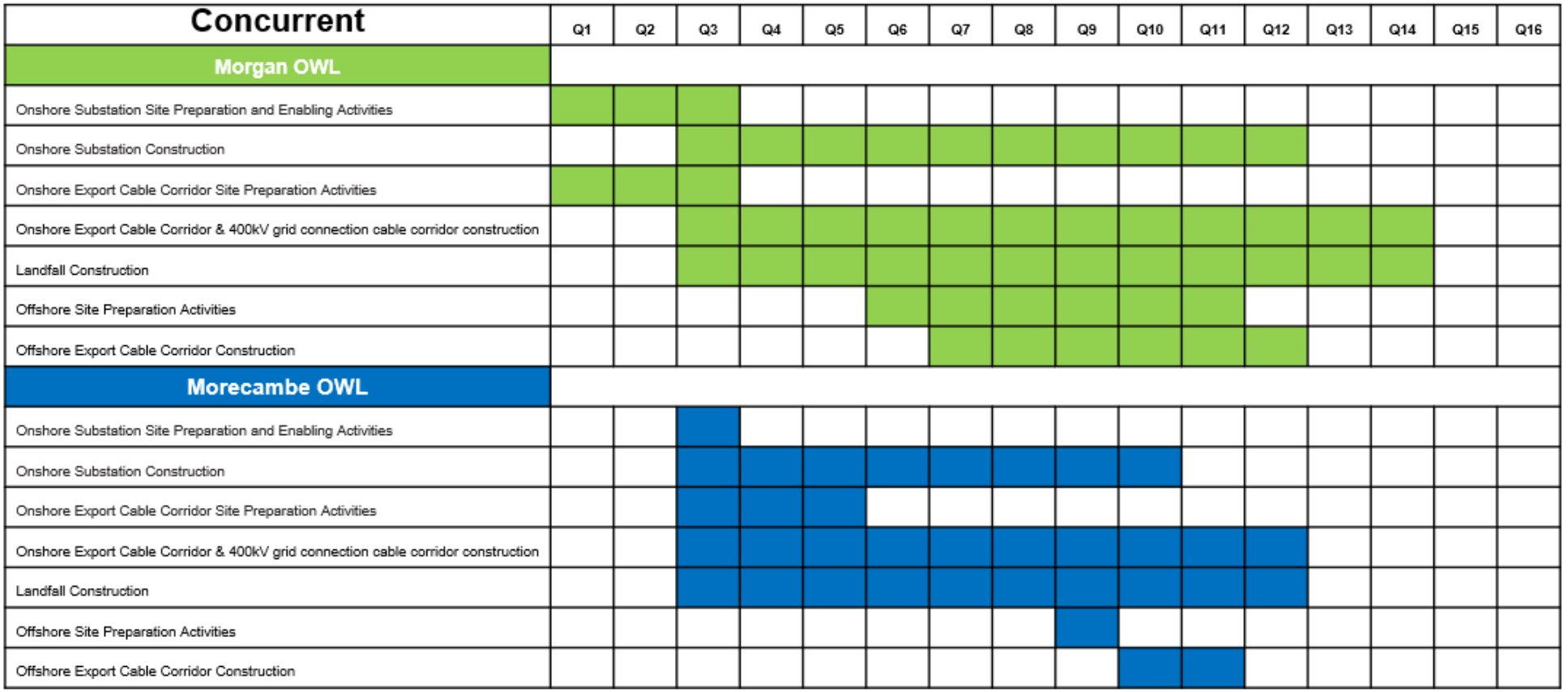


Plate 3.2: Concurrent Construction Scenario indicative construction programme for the Morgan Offshore Wind Project: Transmission Assets and Morecambe Offshore Windfarm: Transmission Assets

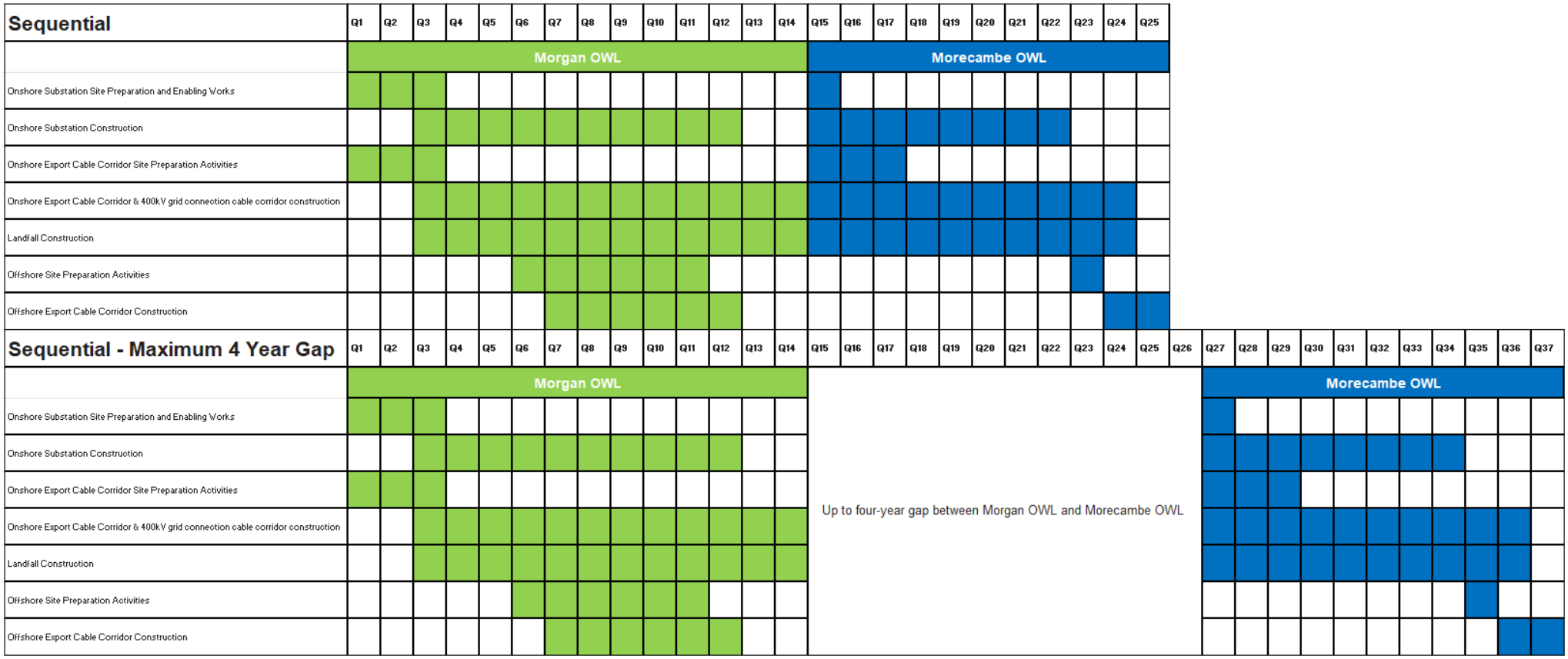


Plate 3.3: Sequential Construction Scenario indicative construction programme for the Morgan Offshore Wind Project: Transmission Assets and Morecambe Offshore Windfarm, including gap of up to four years

3.10 Approach to works areas

3.10.1.1 As described in **section 3.3**, the Transmission Assets application is seeking consent for the transmission assets associated with two electrically separate offshore wind farms within a single DCO. The route planning and site selection process has sought to align the siting of the infrastructure for the Morgan Offshore Wind Project: Transmission Assets and Morecambe Offshore Windfarm: Transmission Assets Act through the alignment of the offshore and onshore export cable corridor routes (and associate working areas), where this has been practicable. The degree to which it has been possible to align siting of infrastructure for each offshore wind farm varies depending on factors such as the design parameters and site-specific environmental or engineering constraints. See Volume 1, Chapter 4: Site Selection and Consideration of alternatives (document reference F1.4), for details on the site selection and consideration of alternatives.

3.10.1 The 'centreline' approach

3.10.1.1 Where it has been possible, the onshore and offshore works plans (document references B7 – B9) have adopted a 'centreline' approach whereby a specific corridor is identified for each wind farm's infrastructure. The 'centreline' is not located in the centre of the route, but instead delineates and separates the areas required for each project in accordance with the maximum design parameters set out within this Project Description. Where a centreline or separate works areas (for example, at the onshore substations) have been identified, this provides certainty over the areas within which each offshore wind farm proposes to, and would have ability to, install its infrastructure.

3.10.2 'Overlapping' works areas

3.10.2.1 Across the Order Limits, there are multiple 'overlapping' works areas (see Figures 3.10 – 3.13, Volume 1: Figures). At these locations, it has not been possible to delineate separate work areas (i.e. a 'centreline') for each offshore wind farm at this stage of the infrastructure design process. As such, within these overlapping work areas, both Morgan OWL and Morecambe OWL currently have the ability to carry out their authorised development.

3.10.2.2 Prior to construction commencement, the offshore wind farms would identify separate distinct work areas within these overlapping work areas, where possible, for their construction and subsequent operation and maintenance, and decommissioning. The relevant activities would then be undertaken in accordance with the maximum design parameters set out in this chapter for each offshore wind farm.

Overlapping permanent works areas

3.10.2.3 The overlapping permanent working areas (i.e., those that may be used by both Morgan OWL and Morecambe OWL) are as follows:

- Offshore (i.e. seaward of MLWS) overlapping permanent work areas:
  - Work Nos 2A/2B, see Figure 3.10: Volume 1 Figures – up to the first alter-course seaward of MLWS, to allow for micro-siting of the offshore export cables to the landfall. Delineation of separate permanent works areas is subject to refinement post-consent informed by further survey and detailed design activities (see paragraph **3.10.2.2** for further details).
- Intertidal (i.e., between MLWS and MHWS) overlapping permanent work areas:
  - Work Nos 4A/4B, see Figure 3.10 and Figure 3.11: Volume 1 Figures – in order to facilitate alternative trenchless technique installation (i.e. direct pipe) between the intertidal and TJBs (Work no 10A/10B) where adequate separation is required between the Morgan OWL and Morecambe OWL offshore export cables. Delineation of a centreline within Work Nos 4A/4B is subject to detailed design for the offshore export cables themselves, which will take into consideration factors including, but not limited to, ground conditions, and the required cable separation between cable circuits for each of the Applicants, as well as between each of the Applicants' assets. Factors such as these affect the final cable design along with construction methodology, such as the availability of vessels which may affect the distances over which the cables can be pulled-in and therefore the final location of the offshore export cables for each of the offshore wind farms. Uncertainties around installation will be a factor in whether the offshore export cables are installed further north or south as shown by the separate sections of Work Nos 6A/6B on Figure 3.11, Volume 1: Figures.
- Onshore (i.e., landward of MHWS) overlapping permanent work areas:
  - Work Nos 5A/5B; 6A/6B; 8A/8B; 9A/9B; 10A/10B, see Figure 3.11, Volume 1: Figures: - to allow for micro-siting of the onshore export cables to the TJBs, which is subject to the same as yet undetermined factors as for Work No. 4A/4B, as set out above. It should be noted that the northern and southern areas within Work No. 6A/6B do not represent 'either/or' options. Each Applicant may seek to install its offshore export cables anywhere within the corridors or separate alignments of Work No. 6A/6B (e.g. both Applicants may choose the northern alignment, both Applicants may choose the southern alignment, or the Applicants could choose to install cables in both the northern and southern alignments).
  - Work No. 11A/11B; 12A12B; 15A/15B; 51A/51B; 52A/52B; 53A/53B; 54A/54B) (Figure 3.11, Volume 1: Figures) for the installation of up to four onshore export cable circuits – to allow for the micro siting of the onshore export cables which are subject to refinement post-consent including further surveys

(e.g. to understand ground conditions) and detailed design and construction methodology.

  - Work No. 13A/13B; 16A/16B (Figure 3.11, Volume 1: Figures) for the installation of up to 6 onshore export cable circuits - to allow for the micro siting of the onshore export cables which are subject to refinement post-consent including further surveys (e.g. to understand ground conditions), and detailed design and construction methodology.
  - Work Nos 30A/30B; 31A/31B; 32A/32B; 33A/33B 37A/37B south of the River Ribble (see Onshore Work Plans submitted with the application, document reference B8) - to allow for the 400kV export cables for each offshore wind farm to cross the other, subject to the final confirmed connection into the National Grid substation. Here a centreline has been provided between Works Nos 30A/30B and 31A/31B based on the current assumed alignment for Morgan OWL and Morecambe OWL. However, should the projects need to cross each other, allowance has been made for this to be accommodated within these overlapping works areas.

- Overlapping environmental mitigation areas [Work Nos 35A/35B, 49A/49B on the Works Plan – Onshore Intertidal (document reference: B8) (Figure 3.12, Volume 1: Figures). Further information on the proposed environmental mitigation is provided in the Outline Ecological Management Plan (document reference J6).
  - Work Nos 49A/49B (Fairhaven Saltmarsh) – As only one project (i.e. Morgan OWL or Morecambe OWL) will be undertaken activities on the beach at any one time, the entire area will be used as mitigation for the duration that activities are taking place on the beach during the overwintering months; and
  - Work Nos 35A/35B – Two overlapping works areas for 35A/35B have been identified. One area has been identified in relation ornithological mitigation (close to Lytham Moss) and the other in relation to Otter (close to Lea Marsh).
- Overlapping operational accesses – Along the length of the onshore export cable corridor, 400kV grid connection cable corridor, and permanent environmental mitigation and biodiversity benefit only areas, various operational accesses have been identified which may be used by both Applicants. As set out in **section 3.19.2,** operation and maintenance activities are low level and infrequent and so use of these for both offshore wind farms is considered manageable by the Applicants.

3.10.2.4 Within the overlapping permanent work areas, a decision on the separate areas required by Morgan OWL and Morecambe OWL will be agreed between the Applicants post-consent. Delineation within these areas is subject to further survey and detailed design, as well as ongoing engagement with key stakeholders (including National Grid regarding the connection to Penwortham) for the relevant permanent overlapping work areas.

Overlapping temporary works areas

3.10.2.5 There are various temporary overlap areas across the Transmission Assets Order Limits. For example, temporary works areas across the route can overlap with permanent works areas for the other project (e.g. temporary construction accesses for one project overlap with the permanent onshore export cable corridor for the other developer. Other examples include temporary works areas which overlap with temporary works areas for the other developer. For full details of all overlap areas, refer to the Works Plans (document references: B7 – B9).

3.10.2.6 Specific examples of temporary overlap areas are as follows:

- Offshore and Intertidal beach working (Figure 3.10, Volume 1: Figures) (i.e., seaward of MHWS)
  - Work Nos 3A/3B – temporary Work Nos 3A/3B overlap with a section of Work No 1A and 1B to facilitate temporary construction and maintenance activities (e.g. vessel anchoring, jacking up of vessels and temporary deposits) associated with the installation and repair/ reburial of the offshore export cables;
- Landfall including the intertidal temporary compounds for beach working (Figure 3.11, Volume 1: Figures) (i.e., MLWS and TJBs, including associated infrastructure areas)
  - overlapping temporary works areas (e.g. Work Nos 18A/18B; 19A/19B) – to facilitate the temporary construction activities associated with the beach works, where only one project will be able to undertake construction activities at the beach, at any one time;
- Onshore – National Grid connection works (Figure 3.13, Volume 1: Figures) -
  - Overlapping temporary works areas remain south of the River Ribble – this includes temporary access, temporary working areas, and temporary construction compounds. These temporary works overlap due to uncertainties around connection to the National Grid substation which will be decided by National Grid. It is expected that the temporary works areas in this location will largely be separated and defined prior to construction. However, discrete areas of temporary overlap may remain for construction, for example the temporary access from the south off the A59.

3.10.2.7 Delineation within the relevant ‘overlapping’ temporary working areas for each wind farm will be identified and agreed between the Applicants, where necessary, post-consent. However, it is intended that some ‘overlapping’ temporary working areas may remain through construction and in some cases the operation and maintenance phases. These overlapping working areas will be managed between Morgan OWL and Morecambe OWL, and any Contractor(s), where relevant. Examples of these are as follows:

- Offshore (Figure 3.10, Volume 1: Figures) (i.e., seaward of MLWS)

  - The co-location of the export cables beside each other means that the delineation between the Transmission Assets for Morgan OWL and Morecambe OWL is approximately 200 m (Work Nos 1A/1B). In the nearshore area (Work Nos. 2A/2B), the separation between the offshore export cables reduces from 200 m to potentially as close as 20 m in order to make landfall. Due to the proximity of the cables, the Applicants would require overlapping temporary works areas (Work Nos. 3A/3B) to remain during operation to facilitate the maintenance activities (e.g. vessel anchoring) associated with the offshore export cables.

- Landfall and Intertidal (Figure 3.11, Volume 1: Figures) (i.e., between MLWS and MHWS)
  - In the intertidal area (Work Nos. 4A/4B), the separation between the offshore export cables reduces from 200m and could potentially become as close as 20 m in order to allow for the direct pipe installation and transition of offshore export cables to the TJBs. Due to the proximity of the cables, the Applicants would require overlapping permanent access areas (e.g. across Work Nos 4A/4B and 5A/5B) to facilitate the operation and maintenance activities (i.e. cable repair and reburial) associated with the offshore export cables within the intertidal area.

3.11 Pre-construction and/or site preparation activities

3.11.1 Offshore pre-construction and/or site preparation activities

3.11.1.1 The indicative offshore activities that may be carried out during the pre-construction phase includes the following, in accordance with the definition of 'offshore site preparation works' as defined by the draft DCO and deemed marine licences (document reference C1):

- Pre-construction geophysical, geotechnical surveys, unexploded ordnance surveys (**section 3.12.2**); and
- Site preparation activities (**section 3.12.3**):
  - Unexploded Ordnance (UXO) clearance;
  - Boulder removal/placement and out of service cable removal;
  - Sandwave clearance and removal, including;
    - Dredging and pre-clearance activities; and
    - Seabed excavation; and
  - Pre-lay grapnel run (PLGR).

3.11.2 Onshore pre-construction and/or site preparation activities

3.11.2.1 The indicative onshore activities that may be carried out during the pre-construction phase includes the following, in accordance with the

definition of 'onshore site preparation works' as defined in the draft DCO (document reference C1):

- Site clearance;
- Demolition;
- Early planting of landscaping works
- Archaeological investigations;
- Environmental surveys;
- Environmental mitigation;
- Biodiversity benefit works;
- Removal of hedgerows and trees;
- Surveys and investigations for the purpose of assessing ground conditions;
- Remedial work in respect of any contamination or other adverse ground conditions;
- Diversion and laying of utilities and services;
- Site security works;
- The erection of any temporary means of enclosure;
- The erection of temporary hard standing;
- Remedial work in respect of contamination or other adverse ground conditions;
- Diversion and laying of utilities and services;
- The erection of welfare facilities and compounds for welfare facilities;
- Creation of site accesses;
- Onshore substation preparatory ground works; and
- Temporary display of site notices or advertisements.

3.12 Offshore elements of the Transmission Assets

3.12.1 Introduction

3.12.1.1 As set out in **paragraph 3.1.1.4**, the permanent offshore infrastructure for the Transmission Assets includes the offshore export cables between the Generation Assets and the landfall. Consent for other transmission infrastructure for both Morgan OWL and Morecambe OWL (i.e. offshore substation platforms and interconnector cables between the platforms) is sought within the applications for the Generation Assets only (see **section 3.7**).

3.12.1.2 The offshore export cables and all installation activity will be located within the landfall and Offshore Order Limits as shown on Figure 3.1 and Figure 3.2 (see Volume 1: Figures).

3.12.1.3 This section sets out the design parameters and the proposed installation and construction assessed within this ES for each of these components. The operation and maintenance and decommissioning parameters for the offshore export cables are set out within **sections 3.19.1** and **3.20.1**, respectively.

3.12.1.4 The location and siting of the offshore export cables has been informed by a route planning and site selection process, which is set out in Volume 1, Chapter 4: Site selection and consideration of alternatives of this ES (document reference F1.3,). This process has considered a wide range of environmental constraints as well as technical and commercial factors.

3.12.2 Pre-construction geophysical and geotechnical surveys

3.12.2.1 Pre-construction geophysical and geotechnical surveys will be undertaken to provide detailed information on seabed conditions and morphology and to identify the presence/absence of any potential obstructions or hazards. Pre-construction geophysical and geotechnical surveys would be conducted within, and in the vicinity of, the footprints of the proposed offshore export cable corridor. Geophysical survey works will be carried out to provide detailed unexploded ordnance, bedform and boulder mapping, bathymetry, a topographical overview of the seabed, and an indication of subsoil-layers.

3.12.2.2 The geophysical surveys are anticipated to include the following activities which are commonly undertaken as best practice to inform offshore export cable activities. The list provided below is indicative:

- Multi-beam echo-sounder (MBES)
  - 200 to 500 kHz
  - 180 to 240 dB re 1 µPa
- Sidescan Sonar (SSS)
  - 200 to 700 kHz
  - 216 to 228 dB re 1µPa
- Single Beam Echosounder (SBES)
  - 200 to 400 kHz
  - 180 to 240 dB re 1µPa
- Sub-Bottom Profilers (SBP)
  - 0.2-14 kHz chirp, 200-240 chirp dB re 1 µPa
  - 2-7 kHz pinger, 200-235 pinger dB re 1 µPa
- Ultra High Resolution Seismic (UHRS)
  - 0.05-4 kHz
  - 170-200 dB re 1 µPa
- Magnetometer.

3.12.2.3 The geotechnical surveys are anticipated to include the following activities which are commonly undertaken as best practice for offshore export cables:

- Cone penetration tests (CPTs); and
- Vibrocores.

3.12.3 Site preparation activities

3.12.3.1 Site preparation activities include:

- Unexploded Ordnance (UXO) clearance;
- Boulder removal/placement and out of service cable removal;
- Sandwave clearance and removal which may include;
  - Dredging and pre-clearance activities;
  - Seabed excavation; and
- Pre-lay grapnel run (PLGR).

3.12.3.2 Further details on each site preparation activity are provided below.

Unexploded ordnance clearance

3.12.3.3 It is possible that UXO may be encountered during the construction of the offshore export cables. This poses a health and safety risk where it coincides with the planned location of infrastructure and associated vessel activity and therefore it is necessary to survey for, and manage, potential UXO. In order to identify UXO, detailed surveys of the location where infrastructure will be located are required. This work cannot be conducted before an application for development consent is submitted because the detailed design work needed to confirm the location of infrastructure is reliant upon pre-construction surveys.

3.12.3.4 Potential UXO identified during the pre-construction site investigation surveys will be investigated to determine whether they are confirmed as UXO. If they are classified as UXO, they will either be cleared or avoided. UXO may be avoided through micro-siting of infrastructure or cleared through *in-situ* clearance or recovery of the UXO for disposal at an alternate location. The method of clearance will depend on factors such as the condition of the UXO and will be subject to the UXO clearance contractors' safety assessment.

3.12.3.5 There are a number of methodologies that may be used to clear UXO, including detonation of the UXO using an explosive counter-charge placed next to the UXO on the seabed (referred to as a 'high order' technique) or methods that neutralise the UXO to be safe without detonation (referred to as 'low order' techniques). These low order techniques include 'deflagration' which involves the use of a small charge to 'burn out' the explosive material without detonation.

3.12.3.6 The Applicants have committed to the use of low order UXO clearance only. High order UXO clearance will not be authorised within the draft Development Consent Order. If UXO clearance with the use high order

techniques is required, the Applicants will apply for this under separate marine licence applications, post-consent.

3.12.3.7 The surveys for identification of potential UXO must be undertaken within approximately one year before the commencement of offshore export cable construction as there is potential for hydrodynamics to uncover further UXO over time. It is not therefore possible to specify at this stage the exact number of UXO which may require detonation.

3.12.3.8 Based on pre-application surveys and desk top studies, a conservative estimate of up to 25 UXO are assumed to require clearance (22 for Morgan OWL and 3 for Morecambe OWL). UXO clearance is likely to include a range of UXO sizes with the net explosive quantity (NEQ) ranging between 25 kg to 907 kg with 130 kg being the most likely.

3.12.3.9 Prior to any UXO removal or detonation, method statement(s) for UXO clearance will be submitted for approval by the Marine Management Organisation (MMO). This will provide confirmation of the UXO identified for clearance and confirmation that clearance does not coincide with archaeology/sensitive seabed features. The method statement(s) for low order unexploded ordnance clearance are secured via Condition 20 (1)(a) of the draft marine licences within schedules 14 and 15 of the draft DCO (document reference C1) and will be submitted prior to construction, once UXO surveys (**paragraph 3.12.3.7**) are complete.

Boulder clearance and out of service cables

3.12.3.10 Boulder clearance is commonly required during site preparation for installation of offshore infrastructure. Micrositing of cables around all boulders would be onerous and impractical. Boulders pose a risk of damage and exposure to cables, as well as an obstruction risk to the cable installation equipment. Therefore, any boulders identified as likely to impact installation will need to be moved to the side (side cast), away from the immediate location of the cable infrastructure. There are two key methods of clearing boulders: boulder plough and boulder grab. Where a high density of boulders is seen, the expectation is that a plough will be required to clear the cable installation corridor. Where medium and low densities of boulders are present, a subsea grab is expected to be employed. Pre-application surveys have identified that boulder clearance may be required in the vicinity of the offshore export cables. Boulder clearance will occur within the footprint of other installation activities (see **paragraphs 3.12.3.12 - 3.12.3.14** below). The corridor width for boulder clearance is less than is required for sandwave clearance and therefore boulder clearance represents repeat disturbance to the seabed, as opposed to representing a different disturbance area. Therefore, the boulder clearance footprint is not presented to prevent double counting of the seabed footprint parameters.

3.12.3.11 If the final location of the offshore infrastructure crosses any existing out of service cables these will be removed. Any cable removal will be undertaken in consultation with the asset owner and in accordance with the International Cable Protection Committee guidelines (2011). Cables will be retrieved to a vessel deck, where one end will be cut, pulled past

the crossing point and then cut again before being pulled to the surface and removed from site by the vessel.

Sandwave clearance and removal for cables

3.12.3.12 In some areas within the offshore export cable corridors, existing sandwaves and similar bedforms may require removal before cables are installed via techniques such as dredging or controlled flow excavation. Many of the cable installation tools require a stable, flat seabed surface. In addition, cables must be buried to a depth where they can be expected to stay buried for the operational lifetime of the Transmission Assets. Sandwaves are generally mobile in nature and therefore the offshore export cables must be buried sufficiently so that they remain protected and to reduce the risk potential damage to the offshore export cables where sediment may become mobile. This can only be achieved by sufficiently lowering the tops of the mobile sandwaves before installation takes place. This allows the offshore export cables to be buried at greater depth, therefore allowing mobile sediment and bedforms to pass over the export cables without the cables becoming exposed.

3.12.3.13 The results of initial surveys (multi-beam echo sounder, side scan sonar, magnetometer, sub-bottom profiler, geotechnical and environmental surveys) have been used to provide an initial analyse of the bathymetry, soils and seabed features to inform the MDS for sandwave clearance as presented in the Cable Burial Risk Assessment that accompanies the application (document reference J14). It is estimated that up to 9% of the cable route may require sandwave clearance with sandwaves more prevalent in the westerly extent of the Offshore Order Limits, in and around the Morgan Offshore Wind Project: Generation Assets, as detailed in the Cable Burial Risk Assessment that accompanies the application (document reference J14). Initial surveys indicate that the Fylde MCZ is largely featureless with some minor extent of ripples and pitted seabed with limited wave height (further details are provided in the Outline Cable Specification and Installation Plan (CSIP), document reference J15, and the Outline Cable Burial Risk Assessment (CBRA), document reference J14). Currently, it is not anticipated that exhaustive seabed levelling or sandwave clearance would be required within the Fylde MCZ, with an estimate that up to 5% of the export cables within the MCZ may require sandwave clearance (CoT 47, **Table 3.2**). The maximum design parameters for sandwave clearance and seabed preparation are summarised in **Table 3.5**.

3.12.3.14 It is expected that material subject to seabed preparation activities will be released in the vicinity of where it was removed. An outline Dredging and disposal – site characterisation plan (document reference J22) presents further detail on the disposal of seabed preparation material.

Table 3.5: Design envelope - sandwave clearance and seabed preparation

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Total
Sandwave clearance: offshore export cable (m3)	1,080,000	346,800	1,426,800
Sandwave clearance outwith the Fylde MCZ (m3)	907,200	249,600	1,156,800
Sandwave clearance within the Fylde MCZ (m3)	172,800	97,200	270,000

Pre-lay grapnel runs

3.12.3.15 Pre-Lay Grapnel Runs will be required for the final cable routes to clear any remaining obstacles, such as discarded fishing gear, using a vessel equipped with a series of grapnels, chains, and / or recovery winch. The Pre-Lay Grapnel Run activities will take account of and adhere to any archaeological mitigation as detailed in the Outline Offshore Written Scheme of Investigation for archaeology (document reference J17).

3.12.3.16 Pre-lay grapnel runs will occur within the footprint of other installation activities (see **paragraphs 3.12.3.12 - 3.12.3.14**) and represents repeat disturbance to the seabed, as opposed to representing a different disturbance area. Therefore, the pre-lay grapnel run footprints are not presented to prevent double counting of the seabed footprint parameters.

3.12.4 Offshore Order Limits and permanent infrastructure

3.12.4.1 Where possible the offshore export cable corridors have been aligned for Morgan OWL and Morecambe OWL. In places, it has not been possible to align the offshore export cable corridors, as, for example, the offshore export cables diverge where they exit the Generation Assets (see Figure 3.1, Volume 1: Figures).

3.12.4.2 For the Morgan Offshore Wind Project: Transmission Assets, there are three potential routes from which the offshore export cables could exit the Morgan Offshore Wind Project: Generation Assets. Morgan OWL expects only to use one of these potential routes for construction and installation. The identification of the final offshore export cable corridor route is subject of further pre-construction surveys and studies. Morgan OWL has sought to reduce the overall area within the Offshore Order Limits for micro-siting the offshore export cables by removing areas of known constraints, where typically a wider area or funnel would be taking through to post-consent. The removal of these constraints has resulted in the identification of these three potential routes (see Volume 1: Chapter 4 Site Selection and Consideration of Alternatives for further information) (document reference F1.4).

3.12.4.3 The Morgan OWL offshore export cable corridor routes then generally travels south and east around existing infrastructure in the East Irish Sea (e.g. oil and gas platforms) and join with the offshore export cable

corridors associated with Morecambe Offshore Windfarm: Transmission Assets to the east of the Morecambe Offshore Windfarm: Generation Assets (See Figure 3.1, Volume 1: Figures). From this location, the offshore export cable corridors have been aligned beside each other in separate work areas, where delineation of routes is currently possible.

3.12.4.4 In other areas, such as the nearshore (Work No 2A/2B) and landfall (Work No 4A/4B), the works areas currently overlap (see Figure 3.10, Volume 1: Figures). Further details on overlapping work areas are provided in **section 3.10.2**.

3.12.4.5 The Offshore Order Limits are shown on Figure 3.1 (see Volume 1, Figures) with the separate work areas shown on the Works Plans – Offshore (document reference: B9).

3.12.4.6 Up to six offshore export cables will be required (up to four for the Morgan Offshore Wind Project and up to two for the Morecambe Offshore Windfarm). Each offshore export cable will be installed in a separate trench with a typical separation distance of approximately 200 m between export cables. As it is not preferable, only in very shallow water and for a limited distance would the separation distance reduce [Work No. 2A/2B as shown on Figure 3.10, Volume 1: Figures] to as close as 20 m as the cables converge to the direct pipe exit pit locations on the beach at Lytham St Annes (see **section 3.13** for further details on landfall).

3.12.4.7 The Offshore Order Limits are designed to provide sufficient space for up to six cable trenches (including the potential need to micro-site the offshore export cables around seabed features which will be confirmed during the pre-construction stage, e.g. UXO, large boulders, unknown wrecks) (Work Nos 1A/1B and 2A/2B), as well as temporary works such as anchoring and any future operation and maintenance activities such as cable reburial or repairs (Work Nos 1A/1B and Work Nos 3A/3B).

3.12.4.8 The Applicants require flexibility in type, location, depth of burial and protection measures for the offshore export cables to ensure that anticipated physical and technical constraints and changes in available technology can be accommodated.

3.12.4.9 In the nearshore area (Work Nos. 2A/2B on Figure 3.10, Volume 1: Figures) as the offshore export cables near landfall, the export cable corridor alignment requires greater flexibility as the alignment and positioning of the offshore export cables corridors upon approach to landfall requires further post-consent design and surveys. As such, Work Nos. 2A/2B cannot be delineated into separate corridor areas for the Morgan Offshore Wind Project: Transmission Assets and Morecambe Offshore Windfarm: Transmission Assets at this time, and consent is sought for Transmission Assets to be located anywhere within this overlapping works area. Flexibility is required here as the final direct pipe alignment and routing can only be defined after the completion of pre-construction geophysical and geotechnical surveys of the area, which will be fed in to detailed design studies

3.12.4.10 From where the offshore export cable corridors meet (i.e. where the Morgan Offshore Wind Project: Transmission Assets and Morecambe Offshore Windfarm: Transmission Assets become aligned in adjacent

offshore export cable corridors to the east of the Morecambe Offshore Windfarm: Generation Assets), overlapping temporary work area are required (Work Nos 3A/3B as shown on Figure 3.10, Volume 1: Figures). The overlapping temporary work area allow for vessels to carry out offshore intrusive and non-intrusive activities relating to the offshore export cable installation within each other's offshore export cable corridor works areas, subject to co-ordination and communication between the Applicants. These activities could include such things as anchoring of vessels, jacking up of vessels, and temporary deposits.

3.12.4.11 The design envelope for the offshore export cables is detailed in **Table 3.6**.

Table 3.6: Design envelope - offshore export cables construction

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Number of offshore export cables	4	2	6
HVAC/HVDC	HVAC	HVAC	HVAC
External cable diameter (mm)	350	350	350
Length per cable (km)	100	42	N/A
Total length of offshore export cables (km)	400	84	484
Burial techniques	Trenching; plough, jetting, mechanical cutting		
Cable burial depth (m)	3	3	3
Minimum burial depth (m)	0.5	0.5	0.5
Indicative Trench width (m)	3	3	3
Width of seabed disturbance from installation tools (m)	20	20	20
Footprint of seabed disturbance – total (km^2)	8.0	1.7	9.7

3.12.5 Offshore export cable construction and installation

3.12.5.1 The offshore export cables will be buried below the seabed wherever practicable (CoT 54, **Table 3.2**) and protected with cable protection (further details in **section 3.12.6**) where adequate burial is not achievable. The offshore export cables would be buried using a range of techniques, such as trenching, plough, jetting or mechanical cutting, as set out in **Table 3.6**.

Trenching; plough, jetting or mechanical cutting techniques, open the seabed and the cable is laid within the trench. Pre-trenching or post-lay burial methods may be used, or alternatively the approach of simultaneous lay and burial using a tool towed behind the installation vessel may be used. The trench width on the seabed will be subject to the selected trenching technique used, and the local ground conditions encountered along the offshore cable corridor route and therefore is shown in Table 3.6 as indicative. The offshore export cables are then brought ashore to the landfall as described in **section 3.14.5**.

3.12.5.2 An Outline Cable Specification and Installation Plan (CSIP) (document reference J15) and Cable Burial Risk Assessment (CBRA) (document reference J14) are provided with the application for construction activities within the Fylde MCZ; however, the detailed installation methods including the selection of cable burial techniques will be defined post-consent taking into account further pre-construction survey results (see **sections 3.11.1 and 3.12.2**) and human considerations such as trawling and vessel anchors (CoT 45, **Table 3.2).** Typically, the offshore export cables will be buried between 0.5 to 3 m (**Table 3.6**) with a target burial depth of 1 m, dependent upon the outcome of the detailed CBRAs which will be informed by pre-construction geotechnical surveys. Additionally, offshore construction method statements will be required prior to commencement of construction (CoT49, **Table 3.2**). These methods statements will be produced to ensure that the desired burial requirements are achieved.

3.12.5.3 The Applicants may also need to undertake seabed preparation works prior to installation of export cables in order to level sandwaves and clear boulders on offshore export cable routes. This is discussed in **section 3.12.3.**

3.12.6 Cable protection

3.12.6.1 Where offshore export cables cannot be buried sufficiently due to ground conditions, external cable protection measures, as set out in **Table 3.7**, will be required. Up to 10% of the total offshore export cable length may require cable protection (i.e. 'whole route' in **Table 3.7)**. However, within the Fylde MCZ, cable protection will only be used where deemed to be essential (CoT47, **Table 3.2**). Cable protection within the Fylde MCZ is limited to 3% of the offshore export cable length within the Fylde MCZ (CoT 47, **Table 3.2**). In addition, any external cable protection used within the Fylde MCZ will be designed to be removable at decommissioning stage (CoT108 and CoT109, **Table 3.2**). To support the removability, rock dump as cable protection for both ground conditions and cable crossings will not be used within the Fylde MCZ. This approach aligns with Natural England's 'Scour and Cable Protection Decommissioning Study (2022), which identifies rock dump as the least recoverable types of protection. **Table 3.7** provides the maximum design parameters for cable protection due to ground conditions within the Fylde MCZ, outside of the Fylde MCZ, and for the 'whole route' calculations for both within and outside the Fylde MCZ.

Table 3.7: Design envelope - cable protection due to ground conditions

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Offshore export cables, cable protection due to ground conditions			
Height of cable protection (m)	2	2	2
Width of cable protection per cable (m)	10	10	10
Offshore export cable corridor with cable protection coverage (%), **whole route.**	10%	10%	10%
Total cable protection footprint for offshore export cable corridor (m), **whole route.**	400,000	84,000	484,000
Total cable protection volume for offshore export cable corridor (m3), **whole route.**	400,000	68,640	468,650
Offshore export cables, cable protection due to ground conditions, within Fylde MCZ			
Cable protection type (ground conditions) within Fylde MCZ	Rock bags, mattresses, articulated pipe		
Length of offshore export cable (per cable) within Fylde MCZ (km) (m)	16 km (16,000 m)	12 km (12,000 m)	N/A
Total length of offshore export cables within Fylde MCZ (m)	64,000	24,000	88,000
Proportion of offshore export cables with cable protection (%), within Fylde MCZ	3%	3%	3%
Length of offshore export cables requiring cable protection (m), within Fylde MCZ	1,920	720	2,640
Total cable protection footprint for offshore export cables (m2), within Fylde MCZ	19,200	7,200	26,400
Total cable protection volume for offshore export cables (m3), within Fylde MCZ	19,200	7,200	26,400
Offshore export cables, cable protection due to ground conditions, outside of Fylde MCZ			
Cable protection type (ground conditions) outside the Flyde MCZ	Rock dump/bags, rock armour, mattresses, articulated pipe		
Length of offshore export cable (per cable) outside of Fylde MCZ	84 km (84,000 m)	30 km (30,000 m)	N/A

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Total length of offshore export cables outside Fylde MCZ (m)	336,000	60,000	396,000
Length of offshore export cables requiring cable protection (m) outside of Fylde MCZ	38,080	7,680	45,760
Total cable protection footprint for offshore export cables outside Fylde MCZ (m2)	380,800	76,800	457,600
Total cable protection volume for offshore export cables outside Fylde MCZ (m3)	380,800	61,440	442,240

3.12.6.2 The offshore export cable corridor crosses a number of existing assets, including telecoms cables and oil and gas pipelines in the Irish Sea. It is impossible to bury the cables at these crossings, so to protect the existing assets and the offshore export cables, cable protection will be used, as set out in **Table 3.8.** Separate parameters for crossing within the Fylde MCZ and outside of the MCZ are provided as well as over the 'whole route' calculations for both within and outside the Fylde MCZ. The design of these crossings will be confirmed in agreement with the asset owners (CoT51, **Table 3.2**).

Table 3.8: Design envelope - cable protection due to asset crossings

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Offshore export cables, cable protection due to asset crossings			
Total area of crossings (m2), whole route	65,500	27,000	92,500
Total volume of crossing protection material (m3), whole route	90,100	37,800	127,900
Offshore export cables, cable protection due to asset crossing, outside of Fylde MCZ			
Cable crossing protection type outside the Fylde MCZ	Mattresses, frond mattresses, rock dump/bags		
Number of individual cable crossings outside of Fylde MCZ	41	6	47
Length of crossings (m) outside of Fylde MCZ	50	150	N/A
Width of crossings (m) outside of Fylde MCZ, per cable	30	30	N/A

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Height of crossing (m) outside of Fylde MCZ	2.8	2.8	2.8
Total area of crossings (m2), outside of Fylde MCZ	61,500	27,000	88,500
Total volume of crossing protection material (m3), outside of Fylde MCZ	86,100	37,800	123,900
Offshore export cables, cable protection due to asset crossing, within Fylde MCZ			
Cable crossing protection type within Fylde MCZ	Mattresses, frond mattresses, rock bags		
Number of individual cable crossings, within Fylde MCZ	4	0	4
Length of crossings (m) within Fylde MCZ, per cable	50	N/A	N/A
Width of crossings (m), within Fylde MCZ, per cable	20	N/A	N/A
Height of crossings (m) within Fylde MCZ, per cable	2	N/A	N/A
Total area of crossings (m^2), within Fylde MCZ	4,000	N/A	4,000
Total volume of crossing cable protection material (m3), within Fylde MCZ	4,000	-	4,000

3.12.6.3 The offshore export cable installation methodology and potential cable protection measures will be finalised at the final design stage (post-consent), informed by environmental and pre-construction site investigation survey results. The offshore export cable installation methodology, as well as the burial depth and any requirement for protection measures, will be defined by a detailed cable burial risk assessment undertaken post-consent. An initial outline Cable Burial Risk Assessment is provided with the application (document reference J14).

3.12.6.4 The total amounts of cable protection required, for both ground conditions and asset crossings, together, are given in **Table 3.9** for the 'whole route', as well as the calculations for within the Fylde MCZ and outside the Fylde MCZ.

Table 3.9: Design envelope – total cable protection, including ground conditions and asset crossings

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Offshore export cables cable protection due to ground conditions plus asset crossings			
otal area of cable protection (m2), **whole route**	465,500	111,000	576,500
Total area of cable protection (m2), **outside the Fylde MCZ**	442,300	103,800	546,100
Total area of cable protection (m2), **within Fylde MCZ**	23,200	7,200	30,400
Total volume of cable protection (m3), **whole route**	490,100	106,440	596,540
Total volume of cable protection (m3), **outside the Fylde MCZ**	466,900	99,240	566,140
Total volume of cable protection (m3), **within Fylde MCZ**	23,200	7,200	30,400

3.12.7 Vessel requirements

3.12.7.1 Some of the offshore elements of the Transmission Assets are likely to be fabricated offsite at manufacturing sites in the UK and/or abroad.

3.12.7.2 The offshore construction phase will therefore be supported by various vessels including tug/anchor handles, cable lay installation and support vessels including jack-up vessels, guard vessels, survey vessels, seabed preparation vessels, crew transfer vessels, and cable protection installation vessels. Helicopters may also be used during the construction phase to transfer equipment and personnel to vessels that contain heli-decks.

3.12.7.3 **Table 3.10** sets out the vessel numbers for the construction phase of the Transmission Assets for each type of vessel, on site at any one time. The maximum installation vessels movements in **Table 3.10** have been provided for the entire construction period.

Table 3.10: Design envelope - vessel requirements during construction phase on site at any one time

Vessel requirements	Morgan Offshore Wind Project		Morecambe Offshore Windfarm		Maximum design parameter	
	Maximum number of vessels	Maximum return trips	Maximum number of vessels	Maximum return trips	Maximum number of vessels	Maximum return trips
Cable lay and support vessels	6	40	4	8	10	48
Tug/anchor handlers	2	8	1	4	3	12
Guard vessels	1	18	1	12	2	30
Survey vessels	2	4	1	2	3	6
Seabed preparation vessels	4	16	2	4	6	20
Crew transfer vessels	2	120	1	28	3	148
Cable protection installation vessels	2	20	1	2	3	22
Helicopters	1	20	0	0	1	20

3.12.8 Aids to navigation, colour, marking and lighting

3.12.8.1 The Transmission Assets will be designed and constructed in accordance with relevant guidance from the following, including guidance in relation to search and rescue (SAR) and emergency response:

- Trinity House (2016) Provision and Maintenance of Local Aids to Navigation Marking Offshore Renewable Energy Installations.
- Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) (2021) Recommendation G1162 on the Marking of Man-Made Offshore Structures.
- Maritime and Coastguard Agency (MCA) (2024) Offshore Renewable Energy Installations: Requirements, guidance and operational considerations for SAR and Emergency Response.

3.12.8.2 Appropriate marking, lighting and aids to navigation will be employed during the construction, operation and maintenance, and decommissioning phases, as appropriate to ensure the safety of all parties.

3.12.8.3 The location of all the offshore export cables will be communicated to the UK Hydrographic Office so that they can be incorporated into Admiralty Charts and the Notice to Mariners procedures (CoT 112, **Table 3.2**). These locations will also be provided to the Defence Geographic Centre.

3.12.9 Safety zones

3.12.9.1 During construction, operations and maintenance, and decommissioning, some restrictions on vessel movements within the Offshore Order Limits will be required to protect the health and safety of all users of the sea.

3.12.9.2 The Applicants will apply for a 500 m safety zone around all vessels installing the offshore export cables during construction, including at the intertidal area, to minimise the duration for which the offshore export cable corridors will be closed to other vessels (CoT61, **Table 3.2**).

3.12.9.3 During the operation and maintenance phase, the Applicants may apply for a 500 m safety zone for infrastructure undergoing major maintenance works.

3.12.9.4 Further information regarding the safety zones that the Applicants intend to apply for post-consent are outlined in the Safety Zone Statement (document reference J33) that accompanies the application.

3.13 Landfall and onshore construction working hours

3.13.1.1 Core working hours (CoT18, **Table 3.2**) for the construction of the landfall and onshore elements of the Transmission Assets will be:

- Monday to Saturday: 07:00 - 19:00 hours; and
- up to one hour before and after core working hours for mobilisation (“mobilisation period”), i.e. 06:00 to 20:00.

3.13.1.2 Specific activities may need to be undertaken outside the core working hours. For example, during cable landing and cable pull-in activities at the landfall, it is likely there will be a need to undertake these activities outside of core working hours to make use of the available tidal windows and to ensure the cable is protected at all times prior to burial and re-instatement. Equally, this could apply to other specific activities such as for the maintenance of dewatering pumps; activities related to the completion of concrete works at the onshore substations; or at specific locations, such works associated with Blackpool Airport and the River Ribble crossing. Vehicle movements may therefore also be subject to unscheduled events outside of these core working hours. Notice of such works will be given to the relevant planning authority 48 hours prior.

3.13.1.3 The instances where 24-hour working may be required would relate to specific activities (e.g. duct/ tunnel/ sheath installation and cable pull-ins) at specific locations of the onshore and landfall route (e.g. where there may be more constraints, such as challenging ground conditions or working conditions). 24-hour working would not be employed for routine construction activities.

3.14 Landfall (including intertidal area)

3.14.1 Overview

3.14.1.1 The offshore export cables make landfall along the north west coast of England to the north of Lytham St. Annes adjacent to Blackpool Airport, Lancashire (see Figure 3.11, Volume 1: Figures). The landfall area comprises the area within the Transmission Assets Order Limits between MLWS and the TJBs, inclusive (i.e., Work Nos 4A/4B, 5A/5B, 6A/6B, 7A/7B, 8A/8B, 9A/9B, 10A/10B, 14A/14B, 18A/8B, 19A/19B, 34A/34B, 36A/36B, 38A/38B, 42A/42B, 43A/43B, 47A/47B on Figure 3.11, Volume 1: Figures). This includes all temporary and permanent areas (e.g. temporary construction compounds and accesses and operational accesses) required to facilitate the construction works and operational activities for the landfall.

3.14.1.2 The installation of the offshore export cables at the landfall (between the beach and the TJBs) will be undertaken by direct pipe alternate trenchless technique installation (CoT44, **Table 3.2**). HDD is no longer proposed as a landfall construction technique, to mitigate potential impacts to ornithology (Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES (document reference F3.4)). The direct pipe trenchless technique is a hybrid method between micro-tunnelling and Horizontal Directional Drilling (HDD) that allows for installation under sensitive features and avoidance of direct impact to the Preston to Blackpool South Railway Line, the Lytham St Annes Local Nature Reserve, the A584 Clifton Road North, and the Lytham St Anne's Dunes Site of Special Scientific Interest (SSSI). Further details on direct pipe installation are set out in **section 3.14.3**.

3.14.1.3 The landfall, including the intertidal area, is described in the following sections of this chapter:

- Site preparation activities (**Section 3.14.2**):
  - temporary compounds to facilitate intertidal construction activities; and
  - temporary compounds to facilitate construction activities related to the TJBs.
- Direct pipe trenchless technique installation (**Section 3.14.3**);
- Construction of the TJBs (**Section 3.14.4**);
- Construction works between the direct pipe exit pits on the beach to MLWS (**Section 3.14.5**), including:
  - pull in of offshore export cables; and
  - offshore export cable burial between the direct pipe exit pits and MLWS;
- Temporary construction access (**Section 3.14.5**); and
- Construction working hours (**Section 3.13**).

3.14.1.4 The maximum total duration of the landfall construction works (sequential construction) is 36 months for Morgan Offshore Wind Project: Transmission Assets and 30 months for the Morecambe Offshore Windfarm: Transmission Assets with further details on duration provided in **section 3.9.2**.

3.14.1.5 Details of the operation and maintenance activities and decommissioning associated with the landfall are set out in **section 3.19** and **section 3.20,** respectively.

3.14.1.6 Activities related to the onshore export cables, east of the TJBs are presented in **section 3.15**.

3.14.2 Site preparation activities

3.14.2.1 The general sequence of site preparation activities includes the establishment of temporary compounds as outlined below. The full list of 'onshore site preparation activities' are provided in **section 3.11.2**:

- establishment of temporary access tracks and any gates which may be required to access the compound;
- installation of secure fencing or hoarding of the temporary compound area;
- surfacing works for the temporary compounds (only track matting such as geotextile or track-matting would be used at Compounds 2 and 3, see **Table 3.11**), installation of welfare and site security arrangements; and
- delivery of equipment required for the works.

3.14.2.2 All compounds will require suitable security fencing or hoarding. Lighting may be used within the compound boundaries for security, during periods of low light levels/darkness (e.g. during the autumn/winter months) (for

safety), or where nighttime activities may be required (e.g., offshore cable pull-in, see **paragraph 3.14.5.17** for further details).

3.14.2.3 The Applicants have sought to minimise the duration of beach works by committing to a direct pipe trenchless installation technique (CoT 44, **Table 3.2**) in order to limit potential disruption to users of the beach, as well as to minimise potential environmental impacts upon designated features of the Ribble and Alt Estuary Special Protection Area (SPA), Ribble and Alt Estuary Ramsar site, Ribble Estuary SSSI, and Lytham St Anne's Dunes SSSI. In order to achieve this and to facilitate construction at the landfall, multiple compounds are required due to the complex nature of the constraints in landfall area (see **c**). Where possible, compounds have been sited to avoid key constraints in and around the landfall area (for example, not within A584 Clifton Drive North, the railway line and the Lytham St. Annes Dunes SSSI).

3.14.2.4 In a concurrent construction scenario both projects would use the temporary construction compounds in **Table 3.11** within each project's overall construction period. The Applicants will work together to plan their respective landfall and beach work activities to ensure effective management and use of these areas. This is due to the complexity of the constraints around the landfall area which does not allow for completely distinct compounds areas for each project to be identified.

3.14.2.5 In a sequential construction scenario all temporary compounds would be in use during each project's construction period. If the first project completes its construction prior to the second project commencing, the first project would most likely demobilise the compound areas in line with the durations set out in **Table 3.11**, unless it is agreed with the relevant stakeholders that it would be less disruptive (e.g. environmentally or for nearby users) to leave the compounds in place.

3.14.2.6 Where overlapping works areas will remain for operation and maintenance (i.e. Works nos 4A/4B, 5A/5B, 34A/34B, 47A/47B and 49A/49B), use of these area is only expected for infrequent routine inspections, and in the event that cable reburial and repair is required (see **section 3.19** and **Table 3.36** for further details).

Compounds west of the TJBs (Work No. 10) to MLWS

3.14.2.7 Up to four compounds, as detailed in **Table 3.11,** are required west of the TJBs (between the TJBs and MLWS). The locations of these compounds are shown in Figure 3.15, Volume 1: Figures.

3.14.2.8 These compounds have been identified to minimise the interaction and duration of works at the beach and would be overlapping temporary compounds (i.e., for use by both Applicants, with only one of the Applicants using each compound at one time). Further details on overlapping work areas are provided in **section 3.10.2**, and further details on how these compounds would be used in different construction scenarios is provided in, **Table 3.11**, and **paragraphs 3.14.2.4 - 3.14.2.6**.

3.14.2.9 In the event that simultaneous beach works are required for the Morgan Offshore Wind Project: Transmission Assets and the Morecambe Offshore Windfarm: Transmission Assets, the use of overlapping

compounds will be coordinated between the Applicants (see **section 3.14.2** above). Equally, where the offshore wind farms may be in construction sequentially (see **section 3.9.2**), all compounds would still be required by each Applicant to facilitate construction activities.

Table 3.11: Design envelope – landfall compounds

Compounds	Maximum total area of landfall compound (m2)	Maximum durations including mobilisation and demobilisation (Isolation)		Maximum total durations (concurrent)	Maximum total durations (Sequential)
		Morgan OWL	Morecambe OWL		
Welfare Compound at North Beach Car Park (Compound 1)	300	24 weeks (within 36 months)	12 weeks (within 30 months)	36 weeks (within 36 months)	36 weeks (within 66 months)
Compound 2	2,500	32 weeks (within 36 months)	16 weeks (within 30 months)	48 weeks (within 36 months)	48 weeks (within 66 months)
Compound 3	510	32 weeks (within 36 months)	16 weeks (within 30 months)	48 weeks (within 36 months)	48 weeks (within 66 months)
Clifton Drive North Compound (Compound 4)	600	24 months (within 36 months)	12 months (within 30 months)	36 months	66 months

3.14.2.10 The maximum durations for these compounds are provided in **Table 3.11,** which demonstrates that certain activities have a significantly shorter active construction duration than the overall sequential construction window of 66 months for active construction works. The duration of active construction for the landfall works from start to finish must allow flexibility for these activities to shift within the overall construction duration for the landfall to account for variables such as tidal constraints, the timings of offshore and onshore works reaching landfall, coordination of works at overlapping compounds, and weather conditions, as well as the need to restrict offshore export cable pull-in activities during the wintering period, as committed to by the Transmission Assets to mitigation potential impacts to the Liverpool Bay SPA and Ribble and Alt. Estuaries SPA (CoT110, CoT111, and CoT130, **Table 3.2**).

3.14.2.11 All construction compounds will be removed, and sites reinstated once construction has been completed.

TJBs and associated compounds

3.14.2.12 Up to two compounds, as detailed in **Table 3.12** may be required in order to facilitate the construction works for the TJBs (i.e. one for Morgan OWL, and one for Morecambe OWL). These compounds will be situated within Work Nos 14A/14B.

Table 3.12: TJB construction compounds within Blackpool Airport

TJB Compounds	Maximum total area of landfall compound (m^2)		Maximum durations including mobilisation and demobilisation (Isolation/ concurrent)		Maximum total durations (sequential)
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	
Landfall compound in Blackpool Airport (m^2) within work nos. 14A/14B	15,000	11, 500	36 months	30 months	66 months
TJB working area (m^2) within work nos 10A/10B	4,900	2,800	18 months active construction within an overall construction duration of 24 months	11 months active construction within an overall construction duration of 21 months	29 months of active construction within an overall construction duration of 45 months

3.14.3 Direct pipe trenchless installation

3.14.3.1 The offshore export cables between the TJB working area (work nos 10A/10B) and the beach will be installed using the direct pipe trenchless technique. The direct pipe installation is a fully cased system which generally reduces risks associated with frack out of drilling fluids if unsuitable ground conditions are encountered along the drill profile.

3.14.3.2 The direct pipe will exit on the beach with a minimum offset distance of 100 m seaward of the western boundary of the Lytham St Annes Dunes SSSI (see CoT 44, **Table 3.2**, and Figure 3.14, Volume 1: Figures). As a result, the installation will also avoid direct impacts to the Preston to Blackpool South Railway Line, the Lytham St Annes Local Nature Reserve, the A584 Clifton Road North and the sand dunes at Lytham St Annes Dunes SSSI.

3.14.3.3 Installation would be carried out by launching a micro-tunnel boring machine (MTBM) from an excavated launch pit within TJB area. Steel casing pipe would be welded in section lengths and connected to the MTBM, and the whole assembly would then be jacked towards the beach exit location by hydraulic rams or thrusters located within the direct pipe entry pits within the TJB working area.

3.14.3.4 The casing pipe is typically made of graded steel and would form the permanent ducting/piping through which the offshore cables would be pulled into the TJB area (**section 3.14.3)**. Due to the horizontal and vertical push forces associated with the direct pipe activity, sheet piles with bracing and suitable anchorage to a concrete base slab are anticipated to be required around the entry points within the TJB work area at Blackpool Airport.

3.14.3.5 The direct pipe will exit on the beach, at least 100 m from the western boundary of the Lytham St. Annes dunes SSSI (CoT 44, **Table 3.2**) with the final location of exit pits subject to further post-consent survey and detailed design. To allow the recovery the MTBM, an exit pit would be required for each circuit, which may require the installation of cofferdams on the beach.

3.14.3.6 During the direct pipe trenchless installation and cable pull in activities, it may be necessary to monitor progress of works. A temporary construction on foot only (pedestrian) monitoring access, of up to approximately 5 m in width, has been provided through the St Anne's Old Links golf course (Work Nos 43A/43B, Figure 3.11, Volume 1: Figures). Where vehicular access may be required during construction, an emergency vehicular access into the golf course has been provided via Work Nos 36A/36B from within Blackpool Airport (Figure 3.11, Volume 1: Figures). This would be used in emergencies, for example, in the event of a frack out.

3.14.3.7 Direct pipe maximum design parameters (construction) are detailed in **Table 3.13**.

Table 3.13: Design envelope – direct pipe parameters (construction)

Parameter	Maximum Design Parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Length of direct pipe per circuit from entry to exit pit (m)	1500	1500	1500
Trenchless external bore diameter (mm) per circuit	1270	1270	1270
Entry Pits within TJB working area (Work nos 10A/10B)			
Number of entry pits	4	2	6
Direct pipe entry pit area (m2) per circuit	450	450	450
Direct pipe entry pit depth (m)	6	6	6
Direct pipe entry pit excavated volume (m^3) per circuit	2700	2700	2,700
Total duration of (direct pipe) works within Work nos 10A/10B	**Table 3.12**	**Table 3.12**	**Table 3.12**
Exit Pits on beach (Work nos 4A/4B or 5A/5B)			
Number of exit pits	4	2	6

Parameter	Maximum Design Parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Cofferdam area dimensions per pit/circuit/ cable (m^2). Indicative dimensions (m)	75 (15 x 5)	75 (15 x 5)	N/A
Exit pit working areas (with or without cofferdams) (m^2) per circuit	875	875	N/A
Depth of exit pit (m)	3	3	3
Volume of exit pit excavation per circuit (m^3)	225	225	N/A
Duration of exit pit works on the beach (per circuit)	2 weeks	2 weeks	2 weeks
Minimum drill depth (m)	10	10	10
Maximum drill depth (m)	30	30	30

Plate 3.4: Direct pipe thruster equipment at the landfall compound

Plate 3.5: MTMB machine at exit location

3.14.4 Construction of the TJBs

3.14.4.1 Once the direct pipe ducts/pipes for the offshore export cables have been installed between the TJBs and the beach exit points, the permanent TJBs will then be constructed within Blackpool Airport (see Figure 3.11, Volume 1: Figures, within Work Nos 10A/10B. Temporary and permanent access to the TJBs will be off of Leech Lane, and via the installation of a new gate in to Blackpool Airport). Permanent access has also been provided north of the airport off Squires Gate Lane. Creation of a new permanent access is likely to be required off Leech Lane, requiring hardstanding and construction of a bellmouth, as no access currently exist in this location.

3.14.4.2 Up to six TJBs are required, one for each cable circuit, i.e. up to four for the Morgan Offshore Wind Project: Transmission Assets and up to two for Morecambe Offshore Windfarm: Transmission Assets. The maximum design parameters for the permanent TJBs are presented in **Table 3.14**.

3.14.4.3 A TJB consists of an excavation with a concrete reinforced floor, into which the offshore and onshore export cables are pulled before the cables are jointed together.

3.14.4.4 Each TJB will contain an underground link box, contained within an underground chamber and will be accessible via an inspection cover at ground level. Each TJB will also include a similar underground fibre optic

link box, also contained within an underground chamber with surface level access.

Table 3.14: Design envelope - transition joint bay parameters (permanent infrastructure)

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Number of TJBs	4	2	6
Depth of TJBs (each) (m)	4	4	4
Area of TJBs (m2)	1100	500	1600

3.14.5 Works between the direct pipe exits pits to MLWS

Pull-in of the offshore export cables

3.14.5.1 The offshore export cables will be transported via cable lay vessels to the closest position of approach feasible and the pull-in operation will be supported by cable lay vessels (e.g., jack-up vessels or barges) to the direct pipe exit pits on the beach and towards the TJBs via the pre-installed direct pipe duct. Due to the anticipated distance that the offshore export cables will need to be pulled from the cable lay vessels to the TJBs (up to 7,000 m, dependent upon the draft of the selected cable lay vessels/barge and its closest approach position to the beach), up to two jack-up vessels per cable may be required to support the offshore export cable pull-in activities (counted as part of the cable lay and support vessels identified in **Table 3.10**). Whilst it is currently anticipated that the jack-up vessels could be accommodated outside of the Fylde MCZ, the worst-case scenario has allowed for one jack-up vessel per circuit to be within the far eastern boundary of the Fylde MCZ and the other jack-up vessel outside of the Fylde MCZ between its eastern boundary and the intertidal area. No walking jack-up vessels would be used within the Fylde MCZ (CoT 117, **Table 3.2**). The detailed installation methods, including vessel requirements and locations, will be refined post-consent taking into account further pre-construction survey results. Parameters for jack-up vessels are provided in **Table 3.15**.

3.14.5.2 To facilitate the landing of the offshore export cables from the marine environment to the TJB area, a maximum 50 m working corridor is required for each offshore export cable to accommodate construction activities. The offshore export cable pull-in working corridor will maintain a minimum offset distance of 100 m seaward of the western boundary of the Lytham St Annes Dunes SSSI (see CoT 44, **Table 3.2**).

3.14.5.3 During direct pipe duct installation and offshore cable pull-in activities, public access to the beach would be maintained wherever possible. During active construction, access across the working area would be managed to ensure that public access is maintained (see the outline open space management plan, document reference J1.5 for further details).

For safety reasons, temporary management of the beach may be needed, for example, as vehicles traverse the beach.

3.14.5.4 Following instatement of the temporary compounds (as required) and provision of any temporary public access diversion, the location of the previously installed and buried duct/pipe (from the direct pipe installations as described in **section 3.14.3**) will be identified. Cofferdams would be constructed (measurements in **Table 3.15**) and excavated to expose the capped end of the duct/pipe.

3.14.5.5 Temporary construction infrastructure may be required, such as cable floats, intermediate pulling platform(s), and cable roller boxes as detailed in **Table 3.15**. The infrastructure would be installed from the direct pipe exit pits seawards towards and potentially into the subtidal environment. The final configuration of the cable pull-in infrastructure will be determined during post consent detailed design.

3.14.5.6 The intermediate pulling platform(s) are anticipated to be up to 120 m^2 (see **Table 3.15**). Up to 2 platforms may be used per cable circuit. The platforms may be ballasted platforms and/or vibro-piled platforms. Barges (e.g. a spud barge) or a small jack-up vessel may be floated in, before being jacked up in the subtidal area (but not within the Fylde MCZ) or intertidal area. The platforms may be ballasted platforms (e.g. spud barge) and/or vibro-piled platforms (e.g. with a small jack-up vessel). Up to 600 cable roller boxes may be required to support each offshore export cable during the pull-in, installed via single vibro-piles spaced at approximately 3 m (see **Table 3.15**).

Plate 3.6: Example roller boxes and intermediate pulling platform installation (image courtesy of Boskalis)

Plate 3.7: Example intermediate pulling platform barge

3.14.5.7 The offshore export cables would then be floated between the cable lay vessels and the intertidal area using cable floats (**Plate 3.8**). The cable floats support the cable pull-in and cable catenary until it reaches the cable roller boxes on the beach.

Plate 3.8: Typical Cable Floats, image courtesy of Doowin

3.14.5.8 The offshore export cables would then be brought ashore to the beach via the cable lay vessels, cable floats, cable roller boxes, and intermediate pulling platform(s) and pulled through the direct pipe exit pits on the beach to the TJBs. It may be necessary to install cofferdams to facilitate cable pull-in activities, if the cofferdams used for the direct pipe duct installation have been demobilised.

3.14.5.9 The offshore export cables would then be jointed to the onshore export cables via the TJBs. This process would be repeated for each cable circuit, to each TJB.

3.14.5.10 The offshore cable pull-in parameters are summarised in **Table 3.15.**

Table 3.15: Design envelope – offshore export cable pull-in

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Vessel types under consideration for offshore export cable pull-in (see **section 3.12.7** for further details on vessel requirements)	Cable lay vessels, shallow draft barges, jack-up vessels, spud pole barges, anchored barges		
Seabed footprint per jack-up vessel (assume 4 legs, each with 4m^2 spudcan) m^2	16	16	N/A
Total seabed footprint for jack-up vessels (m2) (up to two jack-ups per cable, a maximum of one of would be within Fylde MCZ at any one time)	128	64	192
Area of Intermediate Pulling Platform (m^2) – per platform (ballasted and/or vibro-piled) (m^2)	120	120	N/A
Area of Intermediate Pulling Platforms for all export cables (up to 2 platforms per cable) (m^2)	960	480	1,440
Number of roller boxes (per cable), each single vibro-pile spaced at approximately 3 m	600	600	N/A
Total number of roller boxes for all export cables	2,400	1,200	3,600
Cofferdam area dimensions per circuit/cable (m^2). Approximate dimensions (m)	75 (15 x 5)	75 (15 x 5)	N/A
Width of corridor working areas (m) per circuit/cable	50	50	N/A

Offshore export cable burial between exit pits and MLWS

3.14.5.11 Following the completion of the pulling-in of the offshore export cable into the TJBs (section above), the offshore export cables will be buried between the direct pipe exit pits (see **section 3.14.3**) and MLWS. The initial burial starts at the direct pipe exit pit (i.e. at the cofferdam locations) via open trenching, towards MLWS. Each trench is likely to be a stepped side trench to maintain stability with a top width of up to 10 m and a depth

of approximately 3 m. Up to 300 m of open cut trenching may be required per cable before transitioning to a mechanical trencher.

3.14.5.12 The parameters for open cut trenching for cable burial on the beach are set out in **Table 3.16**.

Table 3.16: Design envelope – open cut trenching on the beach (construction)

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Work Nos 4A/4b and 5A/5B			
Number of open cut trenches	4	2	6
Stepped trench maximum width at the top (m) per trench	10	10	N/A
Stepped trench width at the bottom (m) per trench	3	3	N/A
Length per open cut trench (m)	300	300	N/A
Width of corridor working areas (m) per circuit/cable	50	50	N/A
Total area disturbed (m^2) per trench (i.e. total working area)	15,000	15,000	N/A
Total volume of excavated material (m^3) per trench	5,850	5,850	N/A

3.14.5.13 As soon as practicable, there will be a transition from open trenching to a beach trencher, which will cover the intertidal area. This will be a marinised trencher (**Plate 3.9**) suitable for the intertidal environment (mechanical and/or water jet trenching) and will provide 3 m deep trenching but with a narrower trench width at the surface / top of approximately 3 m wide.

Plate 3.9: Example Cable Trenchers

3.14.5.14 Cable pull-in and burial would take up to six weeks per cable (including mobilisation and de-mobilisation) with cable pull-in and burial works limited to 36 weeks in total on the beach (**Table 3.17**), spread across a 36 month construction period. This allows for the direct pipe to be installed prior to pulling-in the offshore export cable as well as the limited cable pull-in works during the wintering period (CoT110, **Table 3.2**) to

minimise impacts to over-wintering birds who may forage in the intertidal area.

3.14.5.15 The parameters in **Table 3.17** apply to all construction scenarios. In all scenarios, only one project would be able to undertake cable pull-in activities at any one time.

Table 3.17: Offshore export cable pull-in and burial durations (construction)

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter (all construction scenarios)
Duration of cable pull and cable burial mobilisation (per cable)	1 week	1 week	N/A
Duration of cable pull and cable burial de-mobilisation (per cable)	1 week	1 week	N/A
Duration of cable pull and cable burial per cable	4 weeks	4 weeks	N/A
Total duration of mobilisation, cable pull and cable burial, and de-mobilisation (per cable)	6 weeks	6 weeks	N/A
Total active construction duration of cable pull and cable burial (including mobilisation and demobilisation)	24 weeks (up to 4 cables)	12 weeks (up to 2 cables)	36 weeks total

Temporary construction access

3.14.5.16 Temporary access tracks will be required to access the compounds and landfall working areas.

3.14.5.17 The Welfare Compound at North Beach Car Park (Compound 1) would be accessed via the existing North Beach Car Park access road off of the A584 / Clifton Drive N (TAT_MGMC_4, Work Nos 19A/19B, see Figure 3.15, Volume 1: Figures). Onward access to the beach work areas (e.g. Work Nos 4A/4B and 5A/5B) from the Welfare Compound would be pedestrian access only via existing walkways from North Beach Car Park to the beach (Work Nos 42A/42B, see Figure 3.15, Volume 1: Figures). No vehicles or plant would access the beach works areas from the welfare compound or North Beach Car Park.

3.14.5.18 Vehicles and plant accessing Compound 1, Compound 2 and the beach working areas would utilise existing access from A584 / Clifton Drive N that traverses between the dunes (AP TAT_MGMC_3, Work Nos 7A/7B, Figure 3.15, Volume 1: Figures). The track would be up to maximum of 6 m in width as shown on Work Nos 7A/7B and would never encroach into the Lytham St Annes Dunes SSSI. Track matting, or similar removable membrane, may also be required to transition from track to the beach

and onwards to Compound 1 or the beach working areas. Access will also be required from Squires Gate Lane on to the beach (AP TAT_MGMC_1, Work Nos 19A/19B, see Figure 3.15, Volume 1: Figures) to allow the launch of small shallow draft vessels . It is anticipated that there will be up to 3 return trips per cable pull in which are assumed to be AIL movements as worst-case.

3.14.5.19 Clifton Drive N Compound (Compound 4) would be accessed from the A584 / Clifton Drive N via new access point from the highway (TAT_MGMC_2), see Figure 3.15, Volume 1: Figures).

3.14.5.20 Refuelling of plan and machinery would only take place Compound 2 or Compound 4 (Clifton Drive N Compound), shown on Figure 3.15, Volume 1: Figures).

3.14.5.21 Temporary construction access for direct pipe trenchless works within Work Nos 8A/8B has been outlined in **paragraph 3.14.3.6**.

3.15 Onshore elements of the Transmission Assets

3.15.1 Introduction

3.15.1.1 As set out in **paragraph 3.1.1.4**, the permanent onshore infrastructure for the Transmission Assets includes the onshore export cables, onshore substations and the 400 kV grid connection cables through to the connection to the National Grid at Penwortham. In addition, temporary infrastructure (such as construction accesses and temporary construction compounds) will be required. This section sets out the design parameters and the proposed installation and construction methods assessed within this ES for each of these components.

3.15.1.2 The offshore export cables come onshore at the landfall. The onshore export cables will transfer the electricity from the offshore export cables from the TJBs to the onshore substations. The 400 kV grid connection cables will then connect the onshore substations to the National Grid substation at Penwortham.

3.15.1.3 The permanent and temporary onshore infrastructure, including temporary compounds and accesses, as well as permanent accesses, will be located within the Onshore Infrastructure Area.

3.15.2 Onshore export cable corridor

Cable route design

3.15.2.1 An onshore export cable corridor has been identified, within which the onshore export cables will be located as shown on Works Plans – Onshore and Intertidal (document reference B8).

3.15.2.2 From the TJBs, the onshore export cable corridor routes east away from the coast. In the vicinity of Blackpool Airport, the onshore export cable corridor splits, with one section passing in the northerly section of the Onshore Infrastructure Area through Blackpool Airport (Work Nos 11A11B) and the other section passing through Blackpool Airport (Work

Nos 12A/12B), Leach Lane and the Blackpool Road Playing Field (Works Nos 52A/52B, 51A/51B 12A12B, 15A15B and 53A/53B).

3.15.2.3 Beyond Blackpool Airport and Queensway (B5261), the onshore export cable corridor narrows and routes south east towards North Houses Lane. It then passes to the north of Higher Ballam, avoiding the Farmland Conservation Area.

3.15.2.4 The corridor then continues north east towards Halls Cross, north of Freckleton before reaching the onshore substation just west of Newton-with-Scales.

3.15.2.5 Up to 18 onshore export cables are anticipated to be required (up to 12 for the Morgan Offshore Wind Project: Transmission Assets and up to six for the Morecambe Offshore Windfarm: Transmission Assets). Onshore export cables will be installed in cable circuits (with each circuit typically comprising three cables laid either separately or in trefoil formation).

3.15.2.6 The operating voltage of the cables will be selected prior to construction but is likely to be either 220 kV or 275 kV. The number of cable circuits required will depend on the voltage selected (with higher voltages requiring fewer cable circuits). Fibre-optic cables are likely to be required for communications and temperature sensing. This may include up to one communication and one temperature sensing fibre-optic cable per circuit.

3.15.2.7 The onshore export cables themselves will consist of copper or aluminium conductors wrapped with various materials for insulation, protection, and sealing.

3.15.2.8 Once installed, the electrical cables must be suitably spaced out in order to minimise the mutual heating effect of one cable circuit on another, and to allow for heat dissipation. This enables the cables to effectively carry the large power volumes required without overheating and damaging the cable. Typically, the permanent easement of the onshore export cable corridor will be approximately 70 m wide excluding the separation area between the onshore export cable corridor for Morgan Offshore Wind Project: Transmission Assets and the onshore export cable corridor for the Morecambe Offshore Windfarm: Transmission Assets. The width of temporary and permanent corridor may also vary and increase in specific locations due to complex crossings of sensitive features, for example, at railway crossings or where there are likely to be challenging ground conditions such as at the River Ribble. Figure 3.16, Volume 1: Figures, shows the places where a wider area has been proposed temporary and permanent onshore export cable corridor. Further information is provided in **Table 3.20**.

3.15.2.9 The onshore cable corridor will be approximately 17 km in length. The maximum design parameters for the onshore export cables are presented in **Table 3.18**.

Table 3.18: Design envelope – permanent infrastructure related to the onshore export cables

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Length of onshore export cables (per circuit) (km)	17	17	17
Number of export cables	12	6	18
Number of fibre-optic cables	8	4	12
Number of cable circuits	4	2	6
Typical permanent cable corridor width (m)	45	25	70
Diameter of duct (mm) excluding at trenchless crossing locations	300	300	300
Joint bays			
Number of joint bays	72	38	110
Maximum distance between joint bays (on one circuit) (m)	2,000	2,000	2,000
Anticipated minimum distance between joint bays (on one circuit) (m)	500	500	500
Link Boxes			
Number of link boxes	72	38	110

Joint bays and link boxes

3.15.2.10 Joint bays and link boxes will be required along the onshore export cable corridor. Joint bays are typically concrete floor lined pits below ground, that provide a clean and dry environment for jointing sections of cable together & provide support for the cable joint itself. The Applicants will always try and maximise the distance between joint bays to provide a less intrusive and cost-effective cable installation. The minimum distance between joint bays is subject to post consent detailed design as each cable manufacturer must consider their specific cable performance

specifications, installation tolerances for cable pulling and handling as well as where joint bays and link boxes may need to be located closer together to facilitate safe and effective installation around sharp bends, steep inclines or unexpected subsurface features. Land above the joint bays will be fully reinstated: joint bays will only require access during the operations and maintenance phase in the event of a cable failure requiring replacement. The joint bays are also anticipated to include fibre optic cable boxes within them.

3.15.2.11 Link boxes are smaller pits compared to joint bays, which house connections between the cable shielding, joints for fibre optic cables and other auxiliary equipment. Link boxes are typically located adjacent the joint bay locations; they comprise concrete chambers with a manhole cover set at ground level to provide access during the operation and maintenance phase. Access to link boxes is anticipated on an annual basis for routine inspection, for example to check on condition and water egress. Further information operation and maintenance can be found in **section 3.19**.

3.15.2.12 The design envelope for the joint bays and link boxes is set out in **Table 3.18**.

3.15.3 Installation of onshore export cables

3.15.3.1 Installation of the onshore export cables is anticipated to be undertaken in the following broad sequence. However, some sequencing may differ once the Contractor(s) is appointed and at detailed design. Related pre-construction and/or site preparation activities have been outlined in **section 3.11**).

- Completion of any pre-construction surveys;
- Environmental mitigation (for instance, hedgerow removal or creation of mitigation badger setts);
- Establishment of construction compounds and new access points from the highway where required;
- Installation of fencing around the construction areas;
- Site preparation works, installation of pre-construction drainage, topsoil removal and storage, establishment of temporary compounds, installation of temporary haul roads;
- HDD works (or equivalent trenchless technique), direct pipe and/or micotunnel technique installation, at identified locations;
- Trench excavation works, installation of backfill materials and installation of ducts and protective tape;
- Backfilling of trench to subsoil level;
- Excavation and construction of joint bays along the route;
- Installation of power and fibre optic cables though installed ducts between joint bays and installation of link boxes and inspection covers;

- Jointing together of cables at joint bay locations;
- Installation of post-construction drainage, removal of haul roads, removal of temporary compounds and fencing;
- Replacement of topsoil along the onshore export cable corridor and reinstatement to previous land use;
- Removal of temporary accesses and planting of any sections of replacement hedgerow; and
- Removal/ reinstatement of temporary construction compounds.

3.15.3.2 Further detail is provided in the following sections.

Pre-construction surveys

3.15.3.3 Pre-construction surveys are likely to be required. These may include:

- topographic surveys;
- ecological surveys to update EIA findings and inform any protected species mitigation licence(s) that may be required;
- ground investigations (e.g., geotechnical and ground stability surveys);
- soil surveys;
- land drainage surveys; and
- targeted archaeological excavations to confirm the findings of the EIA process.

3.15.3.4 Any targeted investigations will be undertaken in accordance with industry best practice and applicable guidelines.

Cable route installation

3.15.3.5 The majority of the cable circuits will be installed using open trenching methods. The cable circuits will be buried in up to six separate trenches (up to four for the Morgan Offshore Wind Project: Transmission Assets and two for the Morecambe Offshore Windfarm: Transmission Assets).

3.15.3.6 Where open trenching is used, topsoil and subsoil will be removed from the trench and stored next to the trench (topsoil and subsoil stored separately) within the temporary working corridor.

3.15.3.7 The trenches will be excavated using a mechanical excavator or trencher. Cable ducts will be installed into the open trench with specialised backfill material that ensures a consistent structural and thermal environment for the onshore export cables.

3.15.3.8 Each trench would have a typical depth of approximately 1.8 m to the bottom of the trench (**Table 3.19**). This burial depth may be exceeded where the route crosses features such as pipelines and land drains, and it may vary according to ground conditions.

3.15.3.9 Trench widths at the surface and base are also subject to specific ground conditions encountered along the route. For instance, free-flowing sand

conditions may result in wider trenches at the surface due to the tendency for sand to remain mobile. More rigid soil types such as clay are able to maintain a narrower trench width at the surface. Therefore, trench widths are defined as "target" within the defined parameters of the design envelope and will be subject to detailed ground investigation.

3.15.3.10 Protective tiles or protective tape and marker tape will be installed in the trenches above the cable ducts to ensure the cable is not damaged by any third party.

3.15.3.11 Once the cable ducts are installed, the trenches will be backfilled with the excavated material; first with the subsoil, followed by the topsoil and the land reinstated back to its previous use.

3.15.3.12 Following installation of the ducts and backfilling of the trenches, the cables will be pulled through the ducts from the joint bays. This may require the use of a temporary cable pulling pad adjacent to the joint bays (for example, in the event of bad weather).

3.15.3.13 The onshore export cable corridor is currently anticipated to have a maximum width of up to 100 m during construction, except at the at complex crossings, for example railway crossings. The locations at which the temporary and permanent onshore export cable corridor exceeds these parameters is provided in **Table 3.20**.

3.15.3.14 The design envelope for the onshore export cable installation is provided in **Table 3.19**.

Table 3.19: Design envelope – construction parameters related to the onshore export cables installation

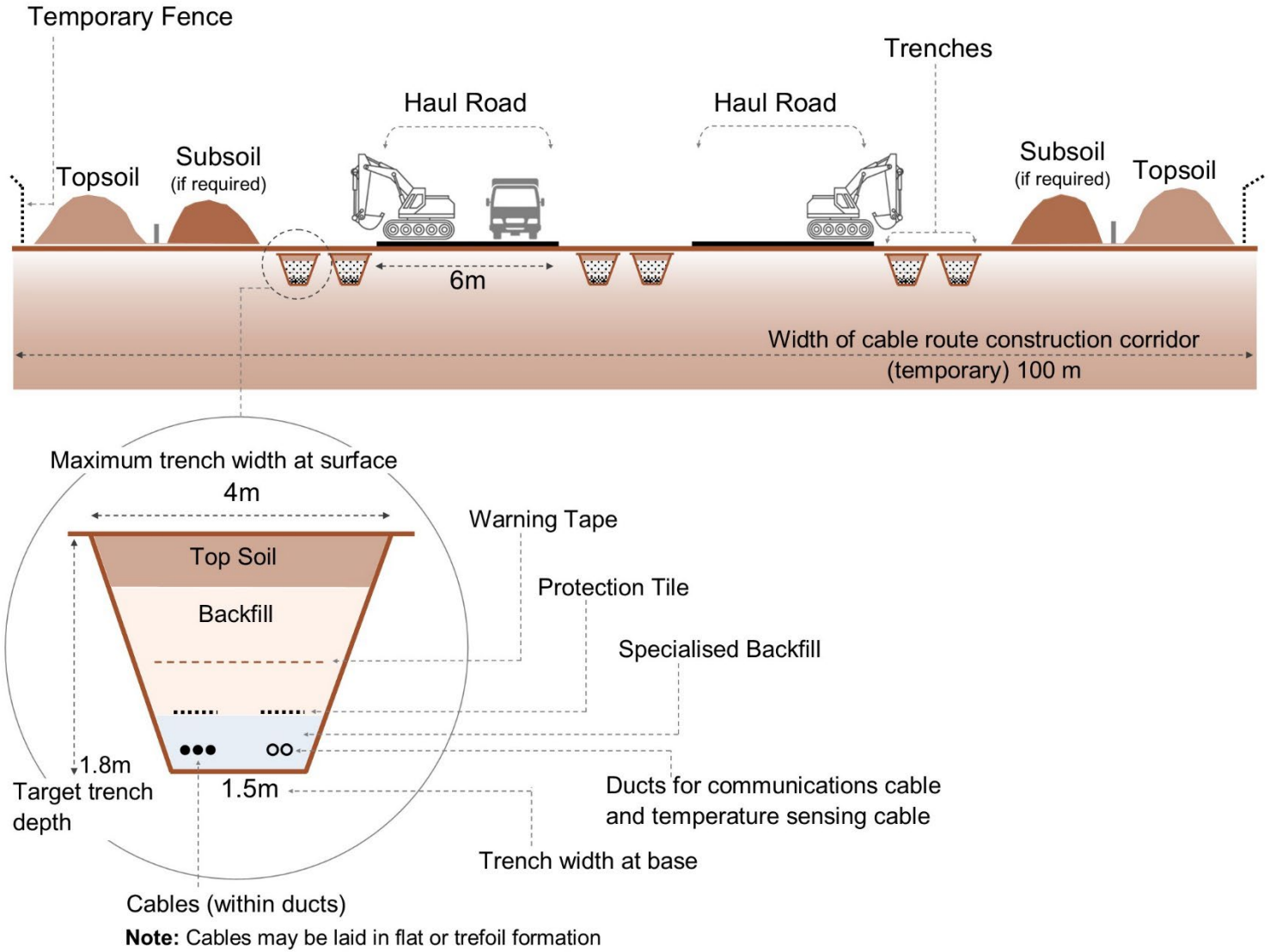
Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Number of cable trenches	4	2	6
Target trench width at base (m) per trench	1.5	1.5	N/A
Target trench width at surface (m)	4	4	N/A
Target depth of trench (m) to bottom of trench	1.8	1.8	N/A
Target trench depth (m) to the top of protective tile	1.2	1.2	N/A
Depth of stabilised backfill (m)	0.65	0.65	N/A
Typical width of construction cable corridor (temporary) (m)	62	38	100
Width of temporary access tracks (m)	10	10	N/A
Number of haul roads	1	1	2
Width of haul road (m) excluding passing bays	6	6	6

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Duration of works (months)	36	30	66 (if sequential) 36 (if concurrent)
HDD compounds size (m^2) dimensions (m)	3,100 (62 x 50)	1,900 (38 x 50)	N/A
HDD launch pit area (m^2) Indicative dimensions (m)	100 (10 x 10)	100 (10 x 10)	N/A
HDD reception pit size (m^2) Indicative dimensions (m)	100 (10 x 10)	100 (10 x 10)	N/A
HDD bore diameter (per circuit) (mm)	650	650	N/A
Typical HDD cable burial depth (m)	15	15	15
Joint Bays			
Area of joint bay (m^2) (below ground)	250	250	N/A
Volume of material excavated per joint bay (per circuit) (m^3)	1,000	1,000	N/A
Link Boxes			
Area of link box (m^2)	4	4	N/A
Volume of material excavated per link box (per circuit) (m^3)	8	8	N/A

3.15.3.15 Dewatering of trenches may be required. This will require a pump. In the event that trenches need dewatering, water from such activities will be discharged in agreement with Lancashire County Council (as the Lead Local Flood Authority (LLFA) and/or the Environment Agency to a local drainage ditch or watercourse and/or spread over ground in controlled manner.

3.15.3.16 An indicative cross section for the construction corridor is shown in **Diagram 3.1**.

Diagram 3.1: Indicative temporary cable corridor cross section



Crossings and trenchless techniques

3.15.3.17 The onshore export cable corridor will cross existing infrastructure and obstacles such as roads, railways and rivers. All major crossings, such as major roads, river and rail crossings will be undertaken using HDD or other trenchless technologies, such as auger boring or micro-tunnelling, where practicable, with the exception of Leech Lane, which may be open cut (see CoT02, **Table 3.2**).

3.15.3.18 HDD involves drilling underneath the obstacle. Every HDD depth will be dependent on the feature being crossed, the asset owner requirements and the localised geology, which will be assessed and determined during detailed design. The drilling is commenced from an entry pit with a small diameter pilot drill which is advanced along the drill line by rotating the drill until punches out at the desired exit location. Bentonite is pumped to the drilling head during the drilling process to stabilise the hole and ensure that it does not collapse. The duct is placed inside the borehole and the export cable is pulled through. These ducts are either constructed offsite or will be constructed onsite, then pulled through the drilled hole either by the HDD rig or by separate winches.

- The following features will be crossed by HDD (or other trenchless methodologies), as set out in the Onshore Crossing Schedule (CoT02, **Table 3.2**). A, B and Classified unnumbered roads (known as C roads) (including the Preston Western Distributor Road, A582 South Ribble Western Distributor Upgrade and M55 Heyhouses Link Road; excluding Leech Lane);
- All Environment Agency Main Rivers, including: Moss Sluice, east of Midgeland Road along Pegs Lane; Savick Brook, south of A583; Wrea Brook southeast of Cartmell Lane; Dow Brook east of Lower Lane between the A584 and the A583; Middle Pool north of Lund Way; and
- All Network Rail crossings, including along the line which runs between Blackpool North and Preston, south of Cartmell Lane; and at the Network Rail crossing along the line which runs to Blackpool North, south east of Squires Gate, parallel to the A584.Network Railway Crossings.

3.15.3.19 The locations where the onshore export cable deviates from the typical width are shown on Figure 3.16, Volume 1: Figures, with further information provided in **Table 3.20**.

Table 3.20: Onshore export cable non-standard construction widths

Location on Figure 3.16, Volume 1: Figures	Key obstacle crossing ID(s)	Key Crossing Feature
Inset 1	MGMC_ECC_PW_292 MGMC_ECC_PW_294 MGMC_ECC_WA_300 MGMC_ECC_TAT_RO_301	Bridleways Roads EA Main Rivers

Location on Figure 3.16, Volume 1: Figures	Key obstacle crossing ID(s)	Key Crossing Feature
	MGMC_ECC_RO_317 MGMC_ECC_PW_323 MGMC_ECC_WA_324 MGMC_ECC_PW_325 MGMC_ECC_PW_327 MGMC_ECC_PW_332 MGMC_ECC_WA_333 MGMC_ECC_PW_334	
Inset 2	MGMC_ECC_UT_416 MGMC_ECC_RO_417	Road Gas Pipeline
Inset 3	MGMC_ECC_WA_574	EA Main River
Inset 4	MGMC_ECC_RA_604	Railway
Inset 5	MG_ECC_PW_988	Bridleway

3.15.3.20 Where possible, HDD (or other trenchless methodologies) crossings will be undertaken by non-impact methods, excluding preparatory works in order to minimise construction vibration beyond the immediate location of works.

Temporary access

3.15.3.21 Temporary construction access points will be required from the public highway to the onshore export cable corridor and construction compounds. Temporary access points off the public highway will be installed to facilitate vehicle access from the highway to the onshore export cable corridor and temporary construction compounds during construction. The access points will be constructed in line with Lancashire County Councils' requirements as relevant highways authority. Temporary haul roads (one for each project) will be installed within the onshore export cable corridor to reduce the number of HGVs travelling on the public highway (CoT 24, **Table 3.2**). The haul roads will also provide vehicular access from the temporary construction compounds to the onshore export cable corridor. The haul roads will be constructed early in the construction programme and will be used where needed throughout the installation of the onshore export cables and 400 kV grid connection cable corridor. Each haul road will be a maximum of 6 m wide (excluding passing places).

3.15.3.22 The haul road will be made up of permeable gravel aggregate (at an average 0.4 m in depth) with a geotextile or other type of protective matting.

Temporary construction compounds

3.15.3.23 Temporary construction compounds will be established early in the construction programme. Three types of construction compound have been identified to support the construction of the onshore export cables, as set out in **Table 3.21**.

3.15.3.24 Compounds may include central offices, welfare facilities and stores, as well as acting as a staging post and secure storage for equipment and component deliveries, as well as for laydown and storage of materials and plant, as well as providing space for small temporary offices, welfare facilities, security and parking for staff.

3.15.3.25 Construction compounds will be prepared by removing and storing topsoil and subsoil and then constructing hardstanding areas using crushed stone.

3.15.3.26 All construction compounds will be removed, and sites reinstated to their original condition once construction has been completed. The maximum design parameters for the temporary compounds are presented in **Table 3.21**. This table includes the temporary construction compounds required within Blackpool Airport to facilitate onshore export cable corridor works. Indicative dimensions are used to calculate the maximum temporary construction compounds, as the precise dimensions and layout will depend on site-specific factors such as ground condition, compound layout and access constraints. The hierarchy of construction compounds are summarised below.

3.15.3.27 Type A compounds will be required to support the construction of the onshore export cable corridor and would act as a Main Office for the Contractor, subcontractors and the client for the duration of the works and would be constructed before the onshore export cable corridor construction works commence. These compounds would include an area for storage for equipment and materials.

3.15.3.28 The main intention for the Type B compounds is for the storage of construction materials and equipment required to construct the onshore export cable corridor. Although Type B compounds would primarily be used for storage of materials and equipment it is anticipated that a small area could be utilised for site offices and welfare facilities.

3.15.3.29 Type C compounds are smaller in size in comparison to Type A and Type B compounds and will be used for offices and welfare as well as a minimal amount of storage of materials and equipment.

Table 3.21: Design envelope – construction compounds along the onshore export cable corridor

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Number of Type A compounds	1	1	2
Number of Type B compounds	3	3	6
Number of Type C compounds	1	1	2
Type A compound size (m^2) Indicative dimensions (m)	15,000 (150 x 100)	11,500 (115 x 100)	26,500 (concurrent)
Type B compound size (m^2) Indicative dimensions (m)	15,000 (150 x 100)	11,500 (115 x 100)	79,500 (concurrent)
Type C compound size (m^2) Indicative dimensions (m)	10,000 (100 x 100)	7,500 (100 x 75)	17,500 (concurrent)
Duration (all compounds) (months)	36	30	66 (if sequential)

3.15.3.30 Temporary HDD (or other trenchless technique) compounds will also be required where trenchless techniques, such as HDD are used. Major HDD operations will require an HDD compound to contain the drilling rig, equipment and the drill entry and exit pit. However, most compounds for HDD crossings will be located either side of the haul road and within the temporary construction corridor.

3.15.4 Works between the TJBs to Queensway (B5261)

3.15.4.1 The TJB construction works are described in **section 3.14.4**, with information on the TJB landfall compounds provided in **section 3.14.2**.

3.15.4.2 The works from the TJBs within Blackpool Airport to Queensway (B5261) are include the following:

- the temporary construction compounds associated with the onshore export cable corridor within Blackpool Airport (Work Nos 14A/14B);
- the onshore export cable corridor installation within Blackpool Airport (Work Nos 11A/11B);
- the onshore export cable corridor installation within Blackpool Airport to Blackpool Road Recreation Ground (Works Nos 52A/52B, 51A/51B, 15A/15B, 53A/53B and 54A/54B); and
- onshore export cable installation within the eastern section of Blackpool Airport to Queensway (B5261) (Works Nos 13A/13B).

3.15.4.3 The Transmission Assets has committed to HDD (or other trenchless techniques) installation, for up to 4 circuits (for either Morgan OWL or

Morecambe OWL) within Blackpool Road Recreation Ground to mitigate potential impacts to users of the space (CoT 123, **Table 3.2**).

3.15.4.4 Where open trenching is an installation technique for the areas shown in Work Nos 11A/11B, 12A/12B and 13A/13B, the following parameters will not deviate from those on the rest of the onshore export cable corridor. These parameters are outlined in **section 3.15.2**. These parameters are as follows and thus are not included within the maximum design envelope tables below in this section:

- maximum trench width at base;
- maximum trench width at surface;
- target depth of trench;
- target trench depth to top of protective tile;
- trench depth of specialised backfill;
- link box dimensions;
- joint bay dimensions; and,
- duration of works.

3.15.4.5 Similarly, where trenchless techniques may be used as an installation technique in Work Nos 11A/11B, 12A/12B, 52A/52B, 51A/51B, 15A/15B, 53A/53B, 54A/54B, 13A,13B, the following parameters will not deviate from those on the rest of the onshore export cable corridor:

- maximum HDD launch pit size;
- maximum HDD reception pit size;
- maximum HDD temporary construction works area;
- maximum HDD bore diameter (per circuit); and,
- maximum HDD cable burial depth.

3.15.4.6 The duration of works within Blackpool Airport are presented as “anticipated” worst case to reflect the need for ongoing coordination with Blackpool Airport Operations Ltd (BAOL), flexibility around the Airport’s operational requirements. Durations for activities within Blackpool Airport are provided in **Table 3.22** below.

Table 3.22: Temporary construction durations for the onshore export cable corridor within Blackpool Airport

Activity	Morgan OWL	Morecambe OWL	Concurrent	Sequential
Anticipated duration of open cut and/or trenchless installation construction, including direct pipe (outside the Obstacle Limitation Surface (OLS)	6 months of active construction within a total of 9 months	4 months of active construction within a total of 9 months	6 months of active construction within a total of 9 months	10 months of active construction within a total of 18 months
Anticipated duration of open cut and/or trenchless installation construction, including direct pipe (inside OLS)	6 months	5 months of active construction within a total of 6 months	6 months	11 months of active construction within a total of 12 months
Anticipated duration of trenchless installation construction, including direct pipe (from Work Nos 53A/53B in to 13A/13B)	3 months	2.5 months of active construction within a total of 3 months	3 months	5.5 months of active construction within a total of 6 months

Temporary construction compounds within Blackpool Airport associated with the onshore export cable corridor (Works No. 14A14B)

3.15.4.7 In order to be able to install the onshore export cable corridor within Blackpool Airport, up to two compounds will be required: one compound for Morgan OWL and the other for Morecambe OWL. Both of these compounds will be Type B compounds. A description of the types of compounds can be found in **section 3.15.3** with compound parameters provided in **Table 3.21.**

Onshore export cable installation within Blackpool Airport (Works No. 11A/11B & 12A/12B)

3.15.4.8 The onshore export cables through Blackpool Airport will be installed in up to two areas – Work nos 11A/11B, and 12A/12B (Figure 3.11, Volume 1: Figures). The Transmission Assets is seeking the ability to install up to 4 circuits within Work Nos 11A/11B and 12A/12B, up to a maximum of 6 circuits for both Morgan OWL and Morecambe OWL.

3.15.4.9 The onshore export cables in Work Nos 11A/11B and 12A/12B could be installed via open cut trenching, HDD (or other trenchless techniques), or direct pipe. **Table 3.23** outlines the parameters for the different installation techniques.

Table 3.23: Design envelope - onshore export cables installation within Blackpool Airport (Work Nos 11A/11B)

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Onshore export cable permanent infrastructure within Work Nos 11A/11B			
Number of export cables	12	6	12
Number of fibre-optic cables	8	4	8
Number of cable circuits	4	2	4
Permanent cable corridor width (m)	45	25	45
Onshore export cables – construction parameters within Work Nos 11A/11B			
Width of construction cable corridor (temporary) (m)	62	38	76
Number of haul roads	1	1	2
Width of haul road (m) excluding passing bays	6	6	N/A
Onshore export cables – open cut installation parameters within Work Nos 11A/11B (see Table 3.19 for other open cut parameters).			
Number of cable trenches	4	2	4
Target trench width at base (m)	See **Table 3.19**		
Target trench width at surface (m)	See **Table 3.19**		
Target depth of trench(m)	See **Table 3.19**		
Target trench depth (m) to the top of protective tile	See **Table 3.19**		
Trench depth of stabilised backfill (m)	See **Table 3.19**		
Duration of works (months)	See **section 3.15.4** and **Table 3.22**		
Onshore export cables – HDD installation parameters within Work Nos 11A/11B (See Table 3.19 for other HDD parameters).			
Number of HDD launch pits	4	2	4
Number of HDD reception pits	8	4	8
HDD launch pit size	See **Table 3.19**		
HDD reception pit size	See **Table 3.19**		
HDD temporary construction works area	See **Table 3.19**		

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
M HDD Bore Diameter (per circuit) (mm)	See **Table 3.19**		
Typical HDD cable burial depth.	See **Table 3.19**		
Onshore export cables – direct pipe installation parameters within Work No. 10A/10B to 11A11B			
Entry pits (Work Nos 10A/10B)			
Number of entry pits	4	2	4
Direct pipe entry pit area (m^2) per circuit	450	450	N/A
Direct pipe entry pit depth (m)	6	6	N/A
Direct pipe entry pit excavated volume (m3) per circuit	2,700	2,700	N/A
Exit pits (if in Work Nos 11A/11B)			
Number of direct pipe exit pits	4	2	N/A
Area of direct pipe exit pit (m^2) per circuit	750	750	N/A
Depth of direct pipe exit pit (m)	4.5	4.5	N/A
Volume of direct pipe exit pit excavation per circuit (m^3)	3,375	3,375	N/A

Onshore export cable installation within Blackpool Airport (Work Nos 12A/12B) and Blackpool Road Recreation Ground

3.15.4.10 As set out above, the onshore export cables through Blackpool Airport will be installed in two areas. The second of these is described in this section – Work Nos 12A/12B. The Transmission Assets is seeking the ability to install to four cable circuits within Work Nos 12A/12B, up to a total maximum of six circuits between Work Nos 11A/11B and 12A12B for both Morgan OWL and Morecambe OWL.

3.15.4.11 The onshore export cables through the south-western section of Blackpool Airport (Work No. 12A12B) towards the Blackpool Road Recreation Ground could be installed via open cut trenching, HDD (or other trenchless techniques) including direct pipe.

3.15.4.12 The width of the onshore export cable corridor has been reduced within Work Nos 52A/52B, 51A/51B, 15A15B, 53A/53B and 54A/54B only, to

limit the potential impact to users of the recreation ground, and nearby residential curtilage adjacent to the crossing at Leach Lane (Work Nos 52A/52B). The reduction in the width of the corridor would be achieved due to the reduced number of circuits (i.e. a maximum of 4 circuits as opposed to 6), and the removal of the haul road, when compared to the remainder of the onshore export cable corridor.

3.15.4.13 Installation of the onshore export cables across Leach Lane may be undertaken by open cut, HDD (or other trenchless installation techniques), or direct pipe (CoT02, **Table 3.2**). Should HDD (or other trenchless installation techniques) (as opposed to direct pipe) within Blackpool Road Recreation Ground it may be necessary to lay out and assemble the ducts for the trenchless installation crossing within the airport before either pulling the ducts through ducts or culverts which would need to be installed under Leach Lane, or by pulling the strung out ducts for the HDD (or other trenchless installation technique) across Leach Lane at surface level under temporary traffic management measures. This process would need to take place for each drill or bore.

3.15.4.14 Additionally, the Transmission Assets has committed to HDD installation (or other trenchless technique), including direct pipe within Blackpool Recreation Grounds (CoT123**, Table 3.2**). which would reduce the requirement for soil storage inside the working corridor for Work No 15A15B. This commitment has been made to minimise impacts to users of the Blackpool Road Recreation Ground open space (CoT123, **Table 3.2**).

3.15.4.15 The total active construction duration within the Blackpool Road Recreation Ground will last a maximum of 5 months within the overall construction duration for the onshore export cable corridor. Appropriate security fencing (minimum of 2 m in height) would be installed around the entry and exit pits associated with the trenchless works within Blackpool Road Recreation Ground (Work Nos 51A/51B and 53A/53B). To minimise impacts on the users of Blackpool Road Recreation Grounds (Work Nos 15A/15B) no haul road will be installed between the entry and exit pits, instead access to Works No 53A/53B will be taken from The Hamlet (AP TAT_MGMC_63, Access to Works Plans, document reference: B11). Fencing at a minimum height of 1.2 m, will be required along the trajectory of the trenchless installations within Work Nos. 15A/15B, to minimise interaction with the public. This fencing will be in place for a maximum of 2 months within the 5 months total construction duration within the recreation grounds (CoT123, **Table 3.2**). The extent and duration for which access will be limited to Works No 15A15B in Blackpool Road Recreation Ground will vary depending on the construction activities and the associated safety risks.

3.15.4.16 Once construction is completed and the testing has been completed, the recreation ground will be reinstated and fully accessible for public use.

Table 3.24: Design envelope - Onshore export cable installation within Blackpool Airport and Blackpool Road Playing Field (Work Nos 12A12A, 52A/52B, 51A/51B, 15A15B, 53A/53B, 54A/54B)

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Onshore export cable infrastructure within Work Nos 12A12A, 52A/52B, 51A/51B, 15A/15B, 53A/53B, 54A/54B			
Number of export cables	12	6	12
Number of fibre-optic cables	8	4	8
Number of cable circuits	4	2	4
Permanent cable corridor width (m)	45	25	45
Onshore export cables – construction parameters within Work Nos 12A12A, 52A/52B, 51A/51B, 15A/15B, 53A/53B, 54A/54B			
Width of construction cable corridor (within Work Nos 52A/52B, 51A/51B, 15A/15B, 53A/53B and 54A/54B) (temporary) (m)	50	25	50
Width of construction cable corridor (temporary) (m) for 12A12B	62	38	76
Number of haul roads (within Work Nos 12A/12B)	1	1	2
Width of haul road (m) excluding passing bays (within Work Nos 12A/12B)	6	6	N/A
Duration of works within Work Nos 12A12B (months)	See **Table 3.22**		
Duration of works within Work Nos 52A/52B, 51A/51B, 15A/15B, 53A/53B, 54A/54B (months)	5 months of active construction, within the overall construction duration for the onshore export cable corridor (36 months) (see CoT123, **Table 3.2**)		
Onshore export cables – open cut installation parameters within Work No. 12A12B			

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Number of cable trenches	4	2	4
Target trench width at base (m)	See **Table 3.19**		
Target trench width at surface (m)	See **Table 3.19**		
Target depth of trench (m)	See **Table 3.19**		
Target trench depth to top of protective tile (m)	See **Table 3.19**		
Trench depth of stabilised backfill (m)	See **Table 3.19**		
Onshore export cables– HDD installation parameters within Work No. 12A12B, 52A/52B, 51A/51B, 15A15B, 53A/53B and 54A/54B			
Number of HDD reception pits (Work No. 12A/12B)	4	2	4
Number of HDD launch pits (Work No. 12A/12B)	4	2	4
Number of HDD pits (Work No. 51A/51B)	8	4	8
Number of HDD pits (Work No. 53A/53B)	8	4	8
HDD launch pit size (m)	See **Table 3.19**		
HDD reception pit size (m)	See **Table 3.19**		
HDD temporary construction works area (m^2)	See **Table 3.19**		
HDD Bore Diameter (per circuit) (mm)	See **Table 3.19**		
Typical maximum HDD cable burial depth (m)	See **Table 3.19**		
Onshore export cables – direct pipe installation parameters within Work Nos 12A12A, 52A/52B, 51A/51B, 15A/15B, 53A/53B, 54A/54B Note – the installation could be undertaken in either direction therefore entry pit MDS or exit pit MDS only apply.			

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Entry pit			
Number of entry pits (in either Work Nos. 12A/12B, 51A/51B and 53A/53B)	12	6	12
Direct pipe entry pit area (m^2) per circuit	450	450	N/A
Direct pipe entry pit depth (m)	6	6	6
Direct pipe entry pit excavated volume (m3) per circuit	2,700	2,700	N/A
Exit pit			
Number of exit pits (in either Work Nos. 12A/12B, 51A/51B and 53A/53B)	12	6	12
Area of direct pipe drill exit pit (m^2) per circuit	750	750	N/A
Depth of direct pipe drill exit pit (m)	4.5	4.5	4.5
Volume of direct pipe exit pit excavation per circuit (m^3)	3,375	3,375	N/A

Onshore export cable installation within the eastern section of Blackpool Airport (Work No. 13A13B)

3.15.4.17 The onshore export cable corridor within Work No. 13A13B will include up to maximum of six circuits (up to four for the Morgan Offshore Wind Project: Transmission Assets and two for the Morecambe Offshore Windfarm: Transmission Assets). These could be installed via open cut trenching, HDD, or other trenchless techniques including direct pipe.

Table 3.25: Design envelope - onshore export cable installation within the eastern section of Blackpool Airport (Work No. 13A13B)

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Onshore export cable permanent infrastructure within Work No. 13A13B			
Number of export cables	12	6	18
Number of fibre-optic cables	8	4	12
Number of cable circuits	4	2	6
Typical permanent cable corridor width (m)	45	25	70
Onshore export cable – construction parameters within Work No. 13A13B			
Width of construction cable corridor (temporary) (m)	62	38	100
Number of haul roads	1	1	2
Width of haul road (m) excluding passing bays	6	6	6
Onshore export cable – open cut installation parameters within Work No. 13A13B			
Number of cable trenches	4	2	6
Target trench width at base (m)	See **Table 3.19**		
Target trench width at surface (m)	See **Table 3.19**		
Target depth of trench (m)	See **Table 3.19**		
Target trench depth to top of protective tile (m)	See **Table 3.19**		
Trench depth of specialised backfill (m)	See **Table 3.19**		
Onshore export cable – HDD installation parameters within Work No. 13A13B			
Number of HDD launch pits	4	2	6
Number of HDD reception pits	4	2	6
HDD launch pit size (m)	See **Table 3.19**		
HDD reception pit size (m)	See **Table 3.19**		
HDD temporary construction works area (m^2) per compound	See **Table 3.19**		
HDD bore diameter (per circuit) (mm)	See **Table 3.19**		
Typical maximum HDD cable burial depth (m)	See **Table 3.19**		

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Onshore export cable – direct pipe installation parameters within Work No. 13A13B Note – the installation could be undertaken in either direction therefore entry pit MDS or exit pit MDS only apply.			
Entry pits			
Number of entry pits	12	6	16
Direct pipe entry pit area (m^2) per circuit	450	450	N/A
Typical maximum direct pipe entry pit depth (m)	6	6	6
Direct pipe entry pit excavated volume (m^3) per circuit	2,700	2,700	N/A
Exit pits			
Number of exit pits	12	6	16
Area of drill exit pit (m^2) per circuit	750	750	750
Depth of drill exit pit (m)	4.5	4.5	4.5
Volume of exit pit excavation per circuit (m^3)	3,375	3,375	3,375

3.15.5 Reinstatement

3.15.5.1 As set out in **Table 3.18**, the permanent corridor width would be 70 m. In terms of above ground features, once the installation work is completed, the haul road(s) will be removed and the ground reinstated using stored subsoil and topsoil. All temporary construction compounds and temporary fencing will be removed, field drainage and/or irrigation will be instated and the land reinstated. Where practicable, consideration will be given to early restoration of sections of the cable route.

3.15.5.2 Hedgerows will be replanted using locally sourced native species, where practicable, and subject to landowner agreement. Suitably qualified and experienced contractors will be used to undertake the reinstatement, which will be based on restoring the hedge to match the remaining hedgerow at each location. Where appropriate, enhancement (such as planting of additional suitable species) may be undertaken.

3.15.5.3 Joint bays will be completely buried, with the land above reinstated. An inspection cover will be provided on the surface for link boxes for access during the operation and maintenance phase.

3.15.6 Onshore export cable corridor operational accesses

3.15.6.1 All temporary accesses will be reinstated once construction is completed. The operational access routes have been designed and included along the onshore export cable corridor and 400kV grid connection corridor, from the landfall to the national grid, to enable periodic access for routine operation and maintenance activities (e.g. routine inspections of joint bays via link boxes). Routine inspections can expect to take place on an annual basis.

3.15.6.2 No construction is proposed for operational accesses (i.e. only a permanent right of access is being sought) for the onshore export cable corridor and 400kV grid connection cable corridor (with the exception of the new operational access to the TJBs from Leech Lane), and where possible, operational accesses have been identified using existing access routes or gates/ gaps in the hedgerows. A newly constructed operational access point is required from Leech Lane for operation and maintenance activities for the TJBs and associated link boxes. As the access point enters through the operational boundary of Blackpool Airport , access will need to be managed and controlled with fencing and gate(s). They have been designed to be approximately 3.5 m in width and follow existing paths, where practicable. The width of operational accesses may vary in places, for example, to ensure alignment with the boundaries of existing access tracks.

3.15.6.3 If required, clearance of vegetation or other obstacles may be necessary to facilitate access, and so the Applicants are seeking powers to maintain these operational access areas to ensure that the accesses are usable for the required purpose.

3.15.6.4 Operational accesses for the onshore export cable corridor and 400kV grid connection cable corridor would typically be accessed using a Light Goods Vehicle or other 4x4 or multi-terrain vehicle. However, no vehicles are proposed to be used along PRoWs or bridleways for operation and maintenance activities.

3.15.7 Onshore substations

3.15.7.1 The purpose of the proposed onshore substations is to transform the power supplied through the onshore export cables into an appropriate voltage to allow a connection to the National Grid substation at Penwortham.

3.15.7.2 To maintain electrical independence, one substation is required for the Morgan Offshore Wind Project, and one is required for the Morecambe Offshore Windfarm. The two substations will, however, be located approximately 300 m apart.

Location

3.15.7.3 The location of the onshore substations is shown on Figure 3.17 and Figure 3.18, Volume 1: Figures, and are described in more detailed below. The site selection methodology for the onshore substations is

described in Volume 1, Chapter 4: Site selection and consideration of alternatives of the ES (document reference F1.4).

Morgan onshore substation site

3.15.7.4 The Morgan substation site is located between Kirkham and Freckleton, directly to the south of the A583 Kirkham Bypass. HM Prison Kirkham is to the north-west of the site and Newton-with-Scales is to the east.

3.15.7.5 Public bridleway BW0505016 runs from Lower Lane, Hall Cross, located to the west of the of the site, and connects to other public rights of way to the north of Freckleton. It runs adjacent to the full western extent of the proposed permanent substation area. Dow Brook runs adjacent to the eastern extent of the site.

3.15.7.6 The site is an irregular shape, set by field boundaries and Dow Brook, and is used for cattle grazing. It gently slopes in an easterly direction, from approximately 16 m AOD at its highest point down towards Dow Brook at the lowest point.

3.15.7.7 The site is show on Figure 3.17, Volume 1: Figures. Morgan substation parameters are provided in **Table 3.26** and **Table 3.27**.

Morecambe onshore substation site

3.15.7.8 Morecambe onshore substation site is located to the south of the Morgan onshore substation site, east of Lower Lane and to the north of Freckleton. A public bridleway and Dow Brook run to the east of the site. The land at the Morecambe onshore substation site is relatively flat at between 9 to 12 m AOD. The Morecambe onshore substation will be located within a single compound. Temporary construction compounds will be located west and northwest of the substation site to facilitate construction of the substation. The site is show on Figure 3.18, Volume 1: Figures. Morecambe substation parameters are provided in **Table 3.26** and **Table 3.27**.

3.15.7.9 The temporary construction access for the Morecambe onshore substation runs north from the A584 road to the temporary construction compound. A new junction will be constructed from the A584 and will include a two-way traffic control system where the temporary construction access meets the new junction. This will allow construction traffic to pass safely in both directions. The length of the temporary construction access will be approximately 760 m, and it will be 20 m in width. Space for topsoil storage, drainage and temporary fencing has been incorporated into the temporary width. Approximately 325 m of this temporary construction access is shared with a construction access to the 400 kV cable corridor. The Outline Construction Traffic Management Plan (document reference J5) states how this shared construction access will be managed for the duration of construction.

3.15.7.10 This temporary access crosses two PRoWs. During construction, the PRoWs would be managed. The final measures will be agreed with Lancashire County Council as set out in the Outline Public Rights of Way Management Plan (document reference J1.5). This will include the

installation of gates to the north and south of the temporary construction access to ensure the separation of construction traffic and the public.

3.15.7.11 This access will be retained post-construction as an operational access for Abnormal Indivisible Load (AIL) and Heavy Goods Vehicles (HGV) deliveries to the Morecambe onshore substation. The permanent area will be reduced to 15 m in width. Access gates will be in place to control access to the substation site. This operational access will not be fenced where it crosses agricultural fields, thus ensuring agricultural activities can continue unhindered during the operational life of the substation.

3.15.7.12 The main operational access for the Morecambe onshore substation will be off Lower Lane. This operational access will be approximately 130 m in length with a permanent width of 15 m. This operational access will be used for routine visits by cars and light goods vehicles only and will facilitate safe access during normal operations. The operational access would be fenced with a gate in place to control access to the substation site. In addition, gates will be placed to the north and south of the operational access track to allow agricultural activities to continue during the operational phase.

3.15.7.13 The Morecambe onshore substation will be unmanned however the access provisions stated above will facilitate 24 hour access for personnel and equipment to facilitate routine and emergency maintenance.

Design

3.15.7.14 The onshore substations will contain the electrical components for transforming the power supplied from the offshore wind farms to 400 kV and to adjust the power quality and power factor, as required to meet the UK Grid Code for supply to the National Grid. The onshore substations will also house the auxiliary equipment and facilities for operating, maintaining and controlling the onshore substations.

3.15.7.15 The onshore substation compounds will contain electrical equipment including power transformers, switchgear, reactive compensation equipment, harmonic filters, cables, lightning protection masts, control buildings, communication masts, backup generators, access, fencing and other associated equipment, structures or buildings.

3.15.7.16 Two broad substation design options are included in the design envelope for the Morecambe Offshore Windfarm: Transmission Assets: Air Insulated Switchgear (AIS) and Gas Insulated Switchgear (GIS) designs. For an AIS option, the equipment will be housed in an ‘open yard’ style. For a GIS option, some of the equipment will be housed within single or multiple buildings. It is also possible to have a combination of the above. There may also be some smaller buildings required to house components such as smaller equipment and control rooms.

3.15.7.17 The Morgan OWL onshore substation will employ a GIS design.

3.15.7.18 The onshore substation building substructures are likely to comprise steel frames and external sheet cladding materials. The structural

steelwork will be fabricated and prepared off site and delivered to site for assembly.

3.15.7.19 An Outline Design Principles (ODP) document accompanies the application for development consent (document reference J3). The ODP sets out the considerations that will inform the detailed design of the permanent works at each of the onshore substations. The detailed design of each of the substations will be developed substantially in accordance with the Outline ODP, as secured by the draft DCO (document reference C1). These details will be submitted to and approved by the relevant planning authority prior to start of construction at each of the onshore substations.

3.15.7.20 The maximum design parameters for the onshore substations are provided in **Table 3.26**. It should be noted that AIS and GIS substations are different in form and size; however, the maximum design parameters are presented here.

Table 3.26: Design envelope - onshore substations (permanent)

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Switchgear Technology	GIS	GIS or AIS	N/A
Transmission type	HVAC	HVAC	N/A
Substation platform footprint (m2)	80,000	29,700	109,700
Permanent footprint including substation platform, landscaping, access, drainage and attenuation (m2)	164,000	59,500	223,500
Impermeable footprint (m2)	48,000	17820	N/A
Number of main buildings	4	4	N/A
Main building height (m)	15	13	N/A
Lightning protection height (m)	30	30	N/A
Number of lightning protection rods	14	8	N/A
Length of main building (m)	140	30	N/A
Width of main building (m)	80	15	N/A
Width of temporary construction access (m)	20	20	N/A
Width of permanent access road and associated utilities/ services / landscaping (m)	15	15	N/A

Fencing

3.15.7.21 The permanent onshore substation sites will be clearly marked and secured with appropriate fencing. The fencing will be a maximum of 3m high and may be electrified for security purposes.

Landscaping

3.15.7.22 The onshore substation sites benefit from some substantial existing hedgerows and woodland blocks within the local area. However, the Applicants are committed to additional planting to further screen the selected onshore substation location and provide to biodiversity benefit.

3.15.7.23 An Outline Landscape Management Plan accompanies the application for development consent (document reference J2). The Outline Landscape Management Plan includes an illustrative landscape strategy plan that identifies areas of landscape mitigation planting at the onshore substation sites. A detailed Landscape Management Plan will be prepared post consent (as secured in the DCO) and will be agreed with the relevant authorities. This will include details such as the number, location and species of plants, as well as details for their management and maintenance.

3.15.7.24 The mitigation planting will be designed to include a mix of faster growing 'nurse' species and slower growing 'core' species. The core species will comprise a mix of preferred native, canopy species that will outlive the nurse species and characterise the woodland structure over the longer term. In locations where it is possible to achieve advanced planting, the landscape mitigation planting will be established as early as reasonably practicable in the construction phase.

3.15.7.25 Operational lighting requirements at the onshore substations may include:

- Low level lighting to illuminate warning signs associated with electrified fences and gates;
- security lighting around perimeter fence of the platform, to allow CCTV coverage;
- car park lighting – standard car park lighting, which may be motion sensitive; and
- repair/maintenance – task related flood lighting may be necessary.

Morgan substation – environmental mitigation and biodiversity benefit

3.15.7.26 Areas identified for environmental mitigation are detailed in the OEMP (document reference J6). Areas and proposals for biodiversity benefit have been outlined in the Onshore biodiversity benefit statement (document reference: J11). Proposals for environmental mitigation and biodiversity benefit will be developed post-consent, as a part of the detailed design.

Construction

3.15.7.27 An overview of the key construction activities is provided below and maximum design parameters for the onshore substation construction are presented in **Table 3.27**.

Table 3.27: Design envelope - construction of the onshore substations

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Temporary compound (combined) (m^2), includes working and laydown areas (excludes permanent substation footprint)	70,000	52,500	122,500
Duration of onshore site preparation and enabling works (months)	9	3	12 months (sequential) 9 months (concurrent)
Duration of construction and installation (months)	30	24 (8 weeks for access permanent access road)	54 months (sequential) 30 (concurrent)

Temporary construction compounds

3.15.7.28 Temporary construction compounds will be established to support the construction of the onshore substations. The construction compounds will be located within the onshore substation development areas and will provide offices, welfare facilities, soil and material storage, storage of plant and equipment and parking for construction staff.

3.15.7.29 A construction compound and laydown area will also be provided to facilitate the construction of the Morgan onshore substation construction access road and access bell mouth from A583 Kirkham Bypass (Figure 3.17, Volume 1: Figures).

3.15.7.30 A construction compound and laydown area will also be required for the construction of the Morecambe onshore substation construction access road and access bell mouth from the A584 Preston New Road. The location of the construction compounds and laydown areas are shown on Figure 3.18, Volume 1: Figures.

3.15.7.31 Construction mitigation measures will be in accordance with the detailed CoCPs. An Outline CoCP is included in the DCO application (document reference J1). In order to establish the temporary construction compounds the topsoils will be stripped and stored, and any areas of hard standing will be formed. Areas of hardstanding may be created for car parking and access points. Water, sewerage and electricity services will be supplied either via mains connection or mobile services such as bowsers, septic tanks and generators. Security fencing and lighting will

be required at the compounds; task lighting may also be required during working hours in the winter months. Construction activities will be in accordance with the measures provided in the detailed CoCP(s), an outline for which has been provided with the application for development consent (document reference J1).

3.15.7.32 On completion of the temporary bell mouth improvement works and the onshore substation construction access roads, the laydown areas will be removed. and a gate house will be established to control construction vehicles entering and leaving the onshore substation works areas.

Grading and earthworks

3.15.7.33 To install the onshore substation working platforms, some 'cut and fill' will be required (i.e., excavated material may be used to create a level site for substation construction after foundation installation). An indicative cut/fill exercise has been undertaken for both substation platforms. The final 'cut and fill' levels will be determined at detailed design stage.

3.15.7.34 The entire area will be stripped of all organic matter and loose rocks. Any waste material encountered will be removed as required by the environmental and geotechnical investigations. Once the surface has been cleared, the grading operation will begin. Topsoil and subsoil will be stored in separate stockpiles in line with the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (PB13298) or the latest relevant available guidance. Any suspected or confirmed contaminated soils will be appropriately separated, contained and tested before removal, if required. Further information is contained in the Outline Soil Management Plan (document reference J1.7).

3.15.7.35 If it were to prove impossible or impractical to balance the earthwork quantities, it would be necessary to either export excess soil or import new fill soil. Any soil exported would be transported by a licensed waste carrier to an appropriate waste management facility. Excavations of foundations and trenches will commence following the completion of grading.

3.15.7.36 The methodology for grading and earthworks will be set out in the CoCP. An Outline CoCP is included in the DCO application (document reference J1).

Surface water drainage

Temporary Drainage

3.15.7.37 Prior to the commencement of cut/fill operations, existing field drains will be diverted where intercepted and cut off ditches/drains will be provided to intercept field surface runoff where required. The key principles are set out in the Outline CoCP (document reference J1).

Operational Drainage

3.15.7.38 During the operations and maintenance phase, drainage from the onshore substations and the operational access roads will be managed

in accordance with the Operational Onshore Substation Drainage Management Plan that will be agreed with the relevant authority (as secured in the DCO).

3.15.7.39 An Outline Operational Drainage Management Plan is included in the DCO application (document reference J10). This has been developed in line with the latest relevant drainage guidance notes in consultation with the Environment Agency and the Lead Local Flood Authority (Lancashire County Council). It includes measures to ensure that existing land drainage is reinstated and/or maintained; measures to limit discharge rates and attenuate flows to maintain greenfield runoff rates at the onshore substations; and measures to control surface water runoff, including measures to prevent flooding of the working areas or offsite and to ensure any runoff is treated appropriately.

3.15.7.40 Based on current understanding and in line with the SuDS hierarchy it is anticipated that surface water run-off from the Morgan and Morecambe onshore substations will be collected by perimeter drains and attenuated within water attenuation features (e.g. ponds), prior to controlled discharge to the Dow Brook. Additional SuDS components will be incorporated as necessary (source control) and confirmed at the detailed design stage. The indicative location of the attenuation pond is shown in the Outline Operational Drainage Management Plan (document reference J10). Appropriate drainage will be provided for the operational access road.

3.15.7.41 The rate of surface water runoff discharging into local watercourses will be no greater than existing rates for all events up to the 1% AEP (1 in 100 annual chance) plus a minimum 35% allowance for climate change.

3.15.7.42 Within the substation platform area and outside of the impermeable areas, the site finishes would consist of stone chippings over an appropriate thickness of sub-base to provide suitable surface for plant maintenance and permeability.

Utilities

3.15.7.43 It is intended that both the onshore substation sites and associated temporary construction compound welfares will be connected to the mains water and electricity during the construction phase. Foul drainage would be collected in either of the following ways:

- mains connection discharge to a local authority sewer system, if available; or
- septic tank located within the onshore substation site boundary or a packaged sewage treatment plant which can treat foul water.

3.15.7.44 The preferred method for controlling foul waste will be determined during detailed design and will depend on the availability and cost of a mains connection and the number of visiting hours staff will attend site.

Lighting

3.15.7.45 As a maximum design scenario, it has been assumed that some periods of 24-hour construction may be required, for which task related flood lighting may be necessary. Details of construction lighting will be set out in the Construction Artificial Light Emissions Management Plan as part of the CoCP. An Outline Construction Artificial Light Emissions Management Plan is included in the application for development consent (document reference J1.11).

Electrical connection

3.15.7.46 The electrical equipment will be installed and tested before being connected to the offshore wind farms and the existing National Grid Penwortham substation. Once the construction of the onshore substations is complete, the site will be secured and the supporting infrastructure finalised in readiness for hot commissioning phase and under strict rules of entry, the temporary construction areas will be demobilised and reinstated.

Programme

3.15.7.47 The onshore substations construction is expected to take up to 36 months in total (including site preparation activities and reinstatement).

3.15.7.48 See **section 3.13** for information on construction working hours, and **section 3.9** for further detail as to how the construction programme for the onshore substations fits into the wider project programme.

3.15.8 400 kV grid connection cables

Design

3.15.8.1 The connection between the proposed onshore substations and the existing National Grid Penwortham substation will be achieved by the 400 kV grid connection cables, which will connect the proposed onshore substations for the Transmission Assets to the existing National Grid Penwortham substation.

3.15.8.2 Up to 12 400 kV grid connection cables, in up to four circuits, are anticipated to be required. The cables are anticipated to be buried in up to four separate trenches (one circuit per trench, with up to two cable circuits/trenches for the Morgan Offshore Wind Project: Transmission Assets and two for the Morecambe Offshore Windfarm: Transmission Assets).

3.15.8.3 Where practicable, the 400 kV grid connection cable corridors for each project abut, making one larger cable corridor. However, this is not possible for a short distance on their exits from the onshore substations, due to the substations being several hundred meters apart, as well as not being possible south of the River Ribble, due to the connection points for each project being on opposite sides of the National Grid Penwortham substation.

3.15.8.4 The design envelope for the 400 kV grid connection cables is provided in **Table 3.28**.

Table 3.28: Design envelope – 400 kV grid connection cables (permanent infrastructure)

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Length of onshore export cables (per circuit) (km)	13	13	13
Number of export cables	6	6	12
Number of fibre optic cables	4	4	8
Number of cable circuits	2	2	4
Typical permanent cable corridor width, including River Ribble crossing (m)	25	25	50
Diameter of duct (mm) excluding at trenchless crossing locations	300	300	N/A
Joint bays			
Number of joint bays	30	30	60
Maximum distance between joint bays (on one circuit) (m)	2,000	2,000	N/A
Anticipated minimum distance between joint bays (on one circuit) (m)	500	500	N/A
Link Boxes			
Number of link boxes	30	30	60
Maximum distance between link boxes (on one circuit) (m)	2,000	2,000	N/A
Anticipated minimum distance between link boxes (on one circuit) (m)	500	500	N/A

3.15.8.5 Joint bays and link boxes will be located along the cable route where sections of the cable will be joined together. The dimensions and parameters of these are the same as for the onshore export cables (**Table 3.18**), but the number of joint bays and link boxes are scaled according to the length of the grid connection export cables. As such, it is anticipated that there will be a maximum of 60 link boxes and 60 joint bays along the 400 kV grid connection cable route for both Morgan OWL and Morecambe OWL. The Applicants will always try and maximise the distance between joint bays to provide a less intrusive and cost-effective cable installation. The minimum distance between joint bays is subject to

post consent detailed design as each cable manufacturer has to consider their specific cable performance specifications, installation tolerances for cable pulling and handling as well as where joint bays and link boxes may need to be located closer together to facilitate safe and effective installation around sharp bends, steep inclines or unexpected subsurface features.

Cable installation

3.15.8.6 As for the onshore export cables, installation of the 400 kV grid connection cables is anticipated to be undertaken using the same methodology as outlined in **section 3.15.3**.

Pre-construction surveys

3.15.8.7 Pre-construction surveys are likely to be required and are anticipated to include the same as those outlined in **section 3.15.3**.

3.15.8.8 Any targeted investigations will be undertaken in accordance with industry best practice and applicable guidelines.

Cable route installation

3.15.8.9 The majority of the cable circuits will be installed using open cut trenching methods. The cable circuits will be buried in up to two separate trenches (up to two for the Morgan Offshore Wind Project: Transmission Assets and two for the Morecambe Offshore Windfarm: Transmission Assets).

3.15.8.10 **Section 3.15.3** outlines the general methodology for open cut trenching.

3.15.8.11 The 400 kV grid connection construction cable corridor is currently anticipated to have a maximum width of up to 38 m for each offshore wind farm during construction. Exceptions to this maximum width include the River Ribble crossing (see below for further details), and the connection to National Grid Penwortham substation, as the exact point of connection will be determined by National Grid. There is a high pressure gas pipeline crossing on the approach to Penwortham that requires a perpendicular crossing to limit interference. In addition the Order Limits need to accommodate any interaction with National Grid's own works which are as yet unknown. Figure 3.19, Volume 1: Figures, shows the places where a wider area has been proposed for the temporary and permanent onshore export cable corridor.

3.15.8.12 The proposed 400 kV grid connection cables will also require temporary access tracks to allow the movement of construction vehicles and the installation of the cable circuits, in addition to other related works such as temporary compounds and laydown areas. **Table 3.29** below outlines the temporary and operational track parameters.

Table 3.29: Design envelope –parameters related to the 400 kV grid connection cable corridor (construction)

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Maximum number of cable trenches	2	2	4
Typical width of construction cable corridor, not including River Ribble crossing (temporary) (m)	38	38	76
W width of construction cable corridor for River Ribble crossing (temporary) (m)	75	75	150
Target trench width at base per trench (m)	See **Table 3.19**		
Target trench width at surface (m)	See **Table 3.19**		
Target depth of trench(m)	See **Table 3.19**		
Target trench depth (m) to the top of the protective tile	See **Table 3.19**		
Trench depth of stabilised backfill (m)	See **Table 3.19**		
Number of haul roads	See **Table 3.19**		
Width of haul road (m) excluding passing bays	See **Table 3.19**		
Width of temporary access tracks (m)	See **Table 3.19**		
Duration of works (months)	36	30	66 (sequential) 36 (concurrent)
HDD launch pit area (m^2) Indicative dimensions (m)	1900 38 x 50	1900 38 x 50	N/A
HDD launch pit size	See **Table 3.19**		
HDD reception pit size	See **Table 3.19**		
HDD Bore Diameter (per circuit) (mm)	See **Table 3.19**		
Typical maximum HDD cable burial depth (m)	See **Table 3.19**		
Joint bays			
Area of joint bay (m^2)	See **Table 3.19**		
Volume of material excavated per joint bay (per circuit) (m^3)	See **Table 3.19**		

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Link boxes			
Depth of a link box excavation (each) (m^2)	See **Table 3.19**		
Area of link box (m^2)	See **Table 3.19**		
Volume of material excavated per link box (per circuit) (m^3)	See **Table 3.19**		

Temporary access

3.15.8.13 Temporary access points will be required from the public highway to the 400 kV grid connection corridor and construction compounds. See **paragraphs 3.15.3.20 - 3.15.3.21** above for further details on temporary access.

3.15.8.14 All parameters relating to temporary access along the 400 kV grid connection cable corridor can be found in **Table 3.29**.

Temporary construction compounds

3.15.8.15 Temporary construction compounds are likely to be established early in the construction programme, for each respective section of the cable corridor. The construction compounds identified along the 400 kV grid connection corridor are designed in accordance with those on the onshore export cable corridor. Details on the construction compounds required along the 400 kV grid connection corridor to the national grid (not including the River Ribble) can be found within **Table 3.30.**

3.15.8.16 Three types of construction compound have been identified to support the construction of the 400 kV grid connection cable corridor, as set out in **section 3.15.3**. The temporary construction compound locations are shown on Works Plans – Onshore and Intertidal (document reference B7).

Table 3.30: Design envelope – 400 kV grid connection construction compounds to the national grid (not including River Ribble)

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Number of Type A compounds	1	1	2
Number of Type B compounds	2	2	4
Number of Type C compounds	1	1	2
Type A compound size (m^2) Indicative dimensions (m)	15,000 (150 x 100)	11,270 (115 x 98)	26,270 (concurrent)

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Type B compound size (m^2) Indicative dimensions (m)	15,000 (150 x 100)	11,270 (115 x 98)	52,540 (concurrent)
Type C compound size (m^2) Indicative dimensions (m)	10,000 (100 x 100)	7,500 (100 x 75)	17,500 (concurrent)
Duration of works (months)	36	30	36 (concurrent) 66 (sequential)

3.15.8.17 All other details of cable installation and cable crossings will be as set out in **Section 3.15.3**. For the temporary compound areas in the vicinity of the national grid connection works (see Figure 3.20, Volume 1: Figures) the parameters will not exceed those given under Compound B

400 kV grid connection corridor operational accesses

3.15.8.18 Information on operational accesses has been provided in **section 3.15.6** above.

Crossings and trenchless techniques

3.15.8.19 The 400 kV grid connection cable corridor will cross existing infrastructure and obstacles such as roads, railways and rivers. All major crossings, such as major roads, river and rail crossings will be undertaken using HDD or other trenchless technologies, such as auger boring or micro-tunnelling, where practicable.

3.15.8.20 HDD involves drilling underneath the obstacle. The drilling is commenced from an entry pit with a small diameter pilot drill which is advanced along the drill line by rotating the drill until punches out at the desired exit location. Bentonite is pumped to the drilling head during the drilling process to stabilise the hole and ensure that it does not collapse. The duct is placed inside the borehole and the export cable is pulled through. These ducts are either constructed offsite or will be constructed onsite, then pulled through the drilled hole either by the HDD rig or by separate winches.

3.15.8.21 The following features will be crossed by HDD (or other trenchless methodologies), including direct and micro-tunnel (where applicable), as set out in the Onshore Crossing Schedule (CoT02, **Table 3.2**).

- A, B and Classified unnumbered roads (known as C roads) (including the Preston Western Distributor Road, A582 South Ribble Western Distributor Upgrade and M55 Heyhouses Link Road; excluding Leech Lane);
- All Environment Agency Main Rivers, including: Moss Sluice, east of Midgeland Road along Pegs Lane; Savick Brook, south of A583; Wrea Brook southeast of Cartmell Lane; Dow Brook east of Lower

Lane between the A584 and the A583; Middle Pool north of Lund Way; and

- All Network Rail crossings, including along the line which runs between Blackpool North and Preston, south of Cartmell Lane; and at the Network Rail crossing along the line which runs to Blackpool North, south east of Squires Gate, parallel to the A584.

3.15.8.22 Where possible, HDD (or other trenchless methodologies) crossings will be undertaken by non-impact methods, excluding preparatory works in order to minimise construction vibration beyond the immediate location of works.

3.15.8.23 A summary of areas where the 400kV grid connection cable corridor deviates from the standard width is presented in **Table 3.31**.

Table 3.31: 400 kV grid connection cable corridor non-standard construction widths

Location	Key Obstacle crossing ID(s)	Crossing Feature
Inset 1	N/A	The cable corridor is dependent on detailed design for the substation and cables
Inset 2	MC_GCC_WA_1067 MC_GCC_PW_1077 MC_GCC_WA_1075 MG_GCC_WA_1079	EA Main Rivers Public Right of Way
Inset 3	MGMC_GCC_WA_1471 MGMC_GCC_EN_1472 MGMC_GCC_UT_1474 MGMC_GCC_PW_1475 MGMC_GCC_EN_1476 MGMC_GCC_UT_1477 MGMC_GCC_EN_1479 MGMC_GCC_EN_1482 MGMC_GCC_WA_1622 MGMC_GCC_EN_1623 MGMC_GCC_WA_1635 MGMC_GCC_EN_1650 MGMC_GCC_EN_1652 MGMC_GCC_EN_1657 MGMC_GCC_EN_1658 MGMC_GCC_WA_1660 MGMC_GCC_PW_1661 MGMC_GCC_EN_1662 MGMC_GCC_PW_1664 MGMC_GCC_UT_1665	EA Main River Gas Pipelines Footpaths Utilities (Telecoms and Electrical)
Inset 4	MGMC_GCC_UT_1671 MGMC_GCC_UT_1675	EA Main River Gas Pipelines

Location	Key Obstacle crossing ID(s)	Crossing Feature
	MGMC_GCC_UT_1676 MGMC_GCC_UT_1677 MGMC_GCC_WA_1678 MGMC_GCC_PW_1679 MGMC_GCC_PW_1680 MGMC_GCC_PW_1682 MGMC_GCC_UT_1683 MGMC_GCC_UT_1684	Utilities (Sewerage) Footpaths
Inset 5	MGMC_GCC_UT_1805	High Pressure Gas Pipelines
Inset 6	MGMC_GCC_UT_1987 MGMC_GCC_UT_1988 MGMC_GCC_UT_1989 MGMC_GCC_UT_1990 MGMC_GCC_UT_1991 MGMC_GCC_UT_1992 MGMC_GCC_UT_1993 MGMC_GCC_UT_1994 MGMC_GCC_UT_1995 MGMC_GCC_UT_2004 MGMC_GCC_UT_2005	Utilities (Telecoms and Electrical)

River Ribble Crossing

3.15.8.24 Due to its length and expected technical challenge, two potential trenchless installation techniques are proposed for the crossing of the River Ribble: micro-tunnelling and direct pipe. These are described below.

Micro-tunnelling

3.15.8.25 For the micro-tunnelling technique, 'launch' and 'reception' compounds would be set up on either side of the Ribble River. A 'start' pit or shaft would be dug in the 'launch' compound and an 'exit' pit or shaft would be dug in the 'reception' compound to a maximum depth of up to 45 m. These pits/shafts are expected to have walls and floors made of steel and/or concrete.

3.15.8.26 During the construction of the start and finish pits/shafts, particularly where they need to be dug to their maximum depths of 45 m, it is expected that dewatering of the shafts and, potentially, the surrounding ground would be required.

3.15.8.27 Powerful hydraulic jacking rigs would be placed in the bottom of the 'start' pits/shafts, which jack concrete sleeve pipes into the ground, towards the 'exit' pits/shafts. A mini (or micro) tunnel boring machine would be situated at the front of the concrete pipe string, and soil would be excavated by the rotation of the MTBM cutting head, equipped with cutting tools specifically tailored to suit the geology. The spoil is mixed

with a bentonite slurry in the cutting chamber and is transported to the surface by pumps via inlet slurry and return slurry lines installed within the concrete pipe string. See **Plate 3.10** for an indicative schematic.

Plate 3.10: Indicative micro-tunnelling schematic

3.15.8.28 Once the tunnel reaches the exit pit/shaft, the MTBM would be removed and the slurry lines withdrawn, leaving the installed concrete sleeve tunnel *in situ*. Electrical cables would then be installed through the tunnel. Although use installation of a concrete sleeve tunnel is most likely for the River Ribble crossing, various different types of pipe could be used. For example, reinforced concrete pipes, steel pipes, polymer concrete pipes, glass fibre reinforced plastic pipes, vitrified clay pipes or ductile iron pipes.

3.15.8.29 Once the cables are installed, the pits/shafts would be filled in with soil, though their walls would likely remain in place, below the ground.

3.15.8.30 The maximum design parameters for the River Ribble Crossing utilising the micro-tunnelling methodology are presented in **Table 3.32**.

Table 3.32: Design envelope – River Ribble crossing (micro-tunnelling option)

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Number of micro-tunnels	2	2	4
Length of micro-tunnels (m)	650	650	N/A
External bore diameter per circuit (mm)	1,830	1,830	N/A
Number of entry pits	2	2	4
Number of exit pits	2	2	4

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Area of each entry pit (m^2) per circuit	100	100	N/A
Area of each exit pit (m^2) per circuit	100	100	N/A
Depth of entry and exit pits (m)	45	45	45
Minimum drill depth (m)	7	7	7
Maximum drill depth (m)	45	45	45
Area of the launch compound (m^2)	30,000 (indicative 75m x 400m)	30,000 (indicative 75m x 400m)	60,000 (2 compounds both each 75m x 400m)
Area of the reception compound (m^2) (m)	3,750 (75 x 50)	3,750 (75 x 50)	7,500 (2 compounds both each 75 x 50)

Direct pipe

3.15.8.31 The direct pipe technique developed from conventional micro-tunnelling and has been designed specifically to service the pipeline and power distribution sectors. It involves a type of mechanised, small diameter MTBM, but without the concrete pipe-jacking element, instead borrowing from the long-string pipe technology utilised in the Maxi HDD sector. In many ways, it is a hybrid between HDD and micro-tunnelling and is a rapidly developing discipline being adopted successfully on various major outfalls and oil/gas pipeline landfall projects around the world.

3.15.8.32 With the direct pipe technique, a mini (or micro) tunnel boring machine would still be used, but it would be fitted directly onto the front of a long, steel pipe. The MTBM and connected pipe would be pushed into the ground using a hydraulic thruster rig positioned in a start pit. The pipe would be pre-prepared and welded together on the surface and the slurry lines would be inserted and connected before the tunnel is started, making a long launch compound beneficial.

3.15.8.33 Once the pipe reaches the finish pit, the MTBM would be removed and the slurry lines withdrawn, leaving the installed steel pipe *in situ*. Electrical cables would then be installed through the pipe.

3.15.8.34 Once the cables are installed, the pits would be filled in with soil.

3.15.8.35 The maximum design parameters for the River Ribble Crossing utilising direct pipe methodology are presented in Table 3.33.

Table 3.33 River Ribble crossing (direct pipe option)

Parameter	Maximum design parameter		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Number of bores	2	2	4
Length of bores (m)	650	650	650
External bore diameter per circuit (mm)	1,570	1,570	N/A
Number of entry pits	2	2	4
Number of exit pits	2	2	4
Area of each entry pit (m^2) per circuit	450	450	N/A
Area of each exit pit (m^2) per circuit	750	750	N/A
Depth of entry and exit pits (m)	6	6	6
Minimum drill depth (m)	7	7	7
Maximum drill depth (m)	45	45	45
Area of the launch compound (Ribble South) (m^2)	30,000 (indicative 75m x 400m)	30,000 (indicative 75m x 400m)	60,000 (2 compounds both each 75m x 400m)
Area of the reception compound (Ribble North) (m^2)	5,250 (indicative 75m x 70m)	5,250 (indicative 75m x 70m)	10,500 (2 compounds both each 75m x 70m)

Temporary access

3.15.8.36 The temporary access tracks for the temporary compounds both north and south of the River Ribble are approximately 20m wide in order to facilitate the plant and machinery likely to be required to undertake the complex crossing.

Operational access

3.15.8.37 Operational access requirements are the same as for the remainder of the onshore export cable corridor and 400kV grid connection cable corridor.

Reinstatement

3.15.8.38 As set out in **Table 3.18,** the permanent corridor width would be 70 m. In terms of above ground features, once the installation work is completed, the haul road(s) will be removed and the ground reinstated using stored subsoil and topsoil. All temporary construction compounds and

temporary fencing will be removed, field drainage and/or irrigation will be instated and the land reinstated. Where practicable, consideration will be given to early restoration of sections of the cable route.

3.15.8.39 Hedgerows will be replanted using locally sourced native species, where practicable, subject to landowner agreement. Suitably qualified and experienced contractors will be used to undertake the reinstatement, which will be based on restoring the hedge to match the remaining hedgerow at each location. Where appropriate, enhancement (such as planting of additional suitable species) may be undertaken.

3.15.8.40 Joint bays will be completely buried, with the land above reinstated. An inspection cover will be provided on the surface for link boxes for access during the operation and maintenance phase.

3.16 Connection to the National Grid

3.16.1.1 The 400 kV grid connection cables will be connected to the National Grid substation at Penwortham. The areas within the Transmission Assets Order Limits required for connection to the National Grid substation form part of the overlapping works areas (see **section 3.10** for further details).

3.16.1.2 Installation of the 400 kV grid connection cables within the grid connection area will take place in the same manner as the onshore export cable corridor and 400 kV grid connection corridor (see **section 3.15.3**). The 400 kV grid connection cables will be installed and connected to the National Grid substation in ducts (see CoT43, **Table 3.2**) either by open cut or trenchless installation techniques.

3.16.1.3 Connection to the National Grid substation will likely include the installation of electrical infrastructure such as busbar circuit breakers, disconnectors, earth switches, current and voltage transformers, surge arresters, post insulators, cable sealing ends, steel structures, 400 kV cable connection protection systems, marshalling building/room, marshalling cabinets/ units and electrical earthing. The electrical infrastructure is proposed to be in an open yard style, in combination with a marshalling building which will house marshalling and electrical equipment.

3.16.1.4 The diversion of and connection to existing services and electrical cables and equipment may also be required to facilitate the connections. This includes provision of auxiliary electrical supplies from existing supplies.

3.16.1.5 Temporary construction compounds associated with these construction activities are presented in **Table 3.30**. Up to two Type B temporary construction compounds may be required, i.e., one for the Morgan Offshore Wind Project: Transmission Assets and one for the Morecambe Offshore Windfarm: Transmission Assets. The temporary construction compound(s) will be microsited within Work No. 18A18B (see Figure 3.20, Volume 1: Figures) being subject to detailed design and final connection locations.

3.17 Landfall and onshore construction environmental management

3.17.1 Introduction

3.17.1.1 The landfall and onshore elements of the Transmission Assets will be constructed in an environmentally sensitive manner. They will meet the requirements of all relevant legislation, codes of practice, and standards as identified in the topic chapters of this ES and will limit the adverse effects on the local community and environment as far as reasonably practicable.

3.17.1.2 Key commitments relevant to environmental management during construction are set out in this section. Details of all commitments proposed for the Transmission Assets are provided in Volume 1, Annex 5.3: Commitments Register (document reference F1.5.3), and those directly relevant to this Project Description are provided in **Table 3.2.**

3.17.2 Code of Construction Practice

3.17.2.1 Construction will be undertaken in accordance with the detailed CoCP(s). An Outline CoCP is provided with the application (document reference J1). The measures included cover the following items, including, but not limited to:

- Fencing;
- Construction Lighting;
- Drainage management;
- Pollution control and contamination;
- Air quality;
- Noise;
- Soil management;
- Ecological management (where relevant). Measures will otherwise predominantly be provided in the OEMP (document reference: J6);
- Pollution control and contamination; and
- PROW management.

3.18 Onshore and intertidal biodiversity benefit and mitigation only areas

3.18.1.1 The Applicants have proposed areas within the Transmission Assets Order Limits specifically to provide biodiversity benefit, and mitigation only. As such, these areas will not contain any electrical infrastructure or equipment. Areas identified iteratively through the EIA and route planning and site selection process to date as suitable for these areas are shown on Figure 3.12, Volume 1, Figures) and are in addition to the onshore and intertidal infrastructure areas. Any measures for enhancement have

been provided in the Outline Ecological Management Plan (document reference J6) and will be subject to landowner agreement.

3.18.1.2 Further details on biodiversity benefit and mitigation areas related to the Morgan onshore substation is provided in **section 3.15.7**.

3.18.1 Biodiversity benefit areas

3.18.1.1 Figure 3.12, Volume 1, Figures shows the areas that have been identified within the Transmission Assets Order Limits where current habitat conditions are anticipated to provide an opportunity to improve habitat quality or where improvements can be made to habitats identified as functionally linked to designated sites. These are to facilitate the Transmission Assets' overall project strategy for providing biodiversity benefit for above ground (i.e. for the onshore substations) infrastructure only. See the Onshore Biodiversity Statement (document reference J11) for further information including the potential proposals within these areas.

3.18.2 Environmental mitigation only areas

3.18.2.1 Environmental mitigation areas have been identified for both Morgan OWL and Morecambe OWL. The types of measures may include the creation of habitats (e.g. ponds) and supplementary feeding, for example. Further information on how these have been identified are provided in Volume 1, Annex 4.3: Selection and refinement of onshore infrastructure (document reference F1.4.3), and further details on measures and mitigation provided in the OEMP (document reference: J6).

3.18.2.2 Information on overlapping environmental mitigation areas is provided in **section 3.10**, and commitments related to environmental mitigation areas are provided in Volume 1, Annex 5.3: Commitments Register (document reference F1.5.3).

3.18.3 Temporary access for environmental mitigation and biodiversity benefit areas

3.18.3.1 Separate temporary accesses are required to enable the activities within the biodiversity benefit and environmental mitigation only areas. The temporary access may be prepared with track matting, geo-grid/geo-textile membrane, or similar materials to aid access for plant and equipment. However, they will not be lined with crushed stone or aggregate. If required, clearance of vegetation or other obstacles may be necessary. All temporary accesses will be reinstated on completion of the biodiversity, enhancement and/or mitigation works.

3.18.3.2 The temporary access tracks are approximately 3.5 m in width and follow existing paths, where practicable. They have been identified using existing gates, and openings and tracks and so the width of accesses may vary in places, for example, to ensure alignment with the boundaries of existing access tracks.

3.18.3.3 Vehicle activity levels for construction are expected to be low-level and intermittent (i.e. for the periods over which the mitigation is being put in place or maintained (if relevant).

3.18.4 Operational access to environmental mitigation and biodiversity benefit only areas

3.18.4.1 Operational accesses have been identified for biodiversity benefit areas and permanent environmental mitigation areas for the operational phase (35 years) for routine inspections, maintenance and management activities. Similar to the operational accesses for the onshore export cable corridor and 400kV grid connection corridor and follow the same areas as the temporary access tracks (see **section 3.18.3**).

3.18.4.2 No construction works are anticipated for these operational access routes, and access is expected to be taken either on foot or using a standard Light Goods Vehicle such as 4 x4 vehicle or other multi-terrain vehicle. If required, clearance of vegetation or other obstacles may be necessary to facilitate access, and so the Applicants are seeking powers to maintain access areas to ensure that the accesses are usable for the required purpose.

3.18.4.3 Similar to the operation and maintenance for the onshore export and 400kV grid connection cables, management of the areas is expected to be minimal and any ongoing monitoring would comprise a small number of visits a year at most.

3.19 Operation and maintenance

3.19.1 Offshore and beach operation and maintenance activities

3.19.1.1 The overall operation and maintenance strategy will be finalised once the detailed design and technical specifications of the Transmission Assets offshore and intertidal infrastructure are known. Further information on operation and maintenance requirements for the offshore export cables are set out within an outline Offshore Operations and Maintenance Plan (document reference: J19). This section provides a description of the reasonably foreseeable planned and unplanned operation and maintenance activities for the offshore infrastructure.

3.19.1.2 The general operation and maintenance strategy may rely on crew transfer vehicles, service operations vessels, supply vessels, cable and remedial protection vessels and helicopters for the operations and maintenance services. The maximum number of operations and maintenance vessels on site at any one time are presented in **Table 3.34.** The total operations and maintenance vessel and helicopter round trips per year for the Transmission Assets are presented in **Table 3.35**.

3.19.1.3 Routine inspections of the offshore export cables will be undertaken to ensure the cables are buried to an adequate depth and not exposed. The integrity of the cables and cable protection systems will also be checked. It is expected that on average the offshore export cables will require up to one routine inspection per year.

3.19.1.4 Between the direct pipe exit pits on the beach and the subtidal, where offshore export cable repairs and reburial may occur, access to the beach would be required. Inspection of the beach area is expected to take place on an annual basis, with a maximum of 2 persons on foot via the access between the dunes off Clifton Drive North (AP OAR_MGMC_2, Works 7A/7B, Figure 3.11, Volume 1: Figures).

3.19.1.5 Where cable repair and reburial may be required on the beach (within Nos 4A/4B and 5A/5B), similar plant, machinery and equipment as for construction would be required (see **section 3.14.5**). Compound 2 (as per **Table 3.11**) would be required to facilitate maintenance activities, and access for plant and equipment would also take place via the access between the dunes off Clifton Drive North (AP OAR_MGMC_2 (same access as in paragraph above), Works 7A/7B, Figure 3.11, Volume 1: Figures). The operational access would be required up to 6 m in width. The same methodology and maximum design parameters as for construction would be used for the operational access and Compound 2, for cable reburial and repair maintenance activities.

3.19.1.6 The maintenance activity parameters for remedial reburial and cable repair in the subtidal and on the beach are presented in **Table 3.36**. Maintenance works to rebury/replace and carry out repair works on offshore export cables generally takes between one to two weeks for subsea repair / reburial and between two to four weeks for intertidal repair / reburial, noting that in the nearshore area and Fylde MCZ, the Applicants will seek to utilise the least impactful methods but will be limited by the nature of the repair and the vessel availability at the time of the maintenance activity.

Table 3.34: Design envelope – offshore operations and maintenance vessels on site at any time

Parameter	Maximum number of vessels on site at any time		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Crew transfer vehicles/work boats	2	2	4
Jack-up vessels	1	1	2
Cable repair vessels	1	1	2
Other vessels	2	1	3
Excavators or backhoe dredgers	2	1	3
Helicopters	2	1	3
Inspection drones	1	1	2

Table 3.35: Design envelope – offshore operations and maintenance vessel return trips per year

Parameter	Total return trips per year		
	Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Crew transfer vehicles/work boats	28	14	42
Jack-up vessels	2	1	3
Cable repair vessels	2	2	4
Other vessels	16	4	20
Excavators or backhoe dredgers	4	4	8
Helicopters	10	6	16
Inspection drones	10	2	12

Table 3.36: Design envelope - offshore operation and maintenance activities

Parameter	Description	Maximum design parameter		
		Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Offshore export cable				
Routine inspections	Visual inspection and performance test of cables and any cable protection. Typically, routine inspections are required once per year.	Up to 35 routine inspections over the lifetime of the Morgan Offshore Wind Project.	Up to 35 routine inspections over the lifetime of the Morecambe Offshore Windfarm.	Up to a total of 70 routine inspections during operation and maintenance over the lifetime of the Transmission Assets.
Seabed surveys	Seabed surveys (e.g. ROV or SOV) will be required to ensure that cables remain buried and that cable protection remains intact. Typically, seabed surveys are required annually during first 5 years, then approximately every 4 years thereafter.	Up to 13 seabed surveys over the lifetime of the Morgan Offshore Wind Project.	Up to 13 seabed surveys over the lifetime of the Morecambe Offshore Windfarm.	Up to a total of 26 seabed surveys during operation and maintenance over the lifetime of the Transmission Assets.
Offshore export cable repair (subtidal)	Any cable failures would be detected by the Transmission Assets cable monitoring system. Where a fault is detected, it may be necessary to expose the export cable prior to recovery where testing will be conducted to establish the extent and type of repair required. The MDS has been calculated based on full cable re-burial always being required for cable repairs.	Up to 14 subtidal cable repair events (up to 4 km per event) totalling up to 56 km of subtidal cable repair over the lifetime of the Morgan Offshore Wind Project.	Up to 7 subtidal cable repair events (up to 4 km per event) totalling up to 28 km subtidal repair over the lifetime of the Morecambe Offshore Windfarm.	Up to 21 subtidal cable repair events totalling up to 84 km of subtidal repair over the lifetime of the Transmission Assets.

Parameter	Description	Maximum design parameter		
		Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
Offshore export cable remedial burial including remedial cable protection (subtidal)	Remedial burial of export cables may be required where cables have become exposed via natural sediment transport processes. Post-construction cable data will be reviewed to identify areas they may require remedial burial including use of remedial cable protection. A multibeam sonar (or similar) will then be used to confirm the exact location and current cable burial depth and/or areas of exposure. Should any areas of exposed or insufficiently buried cables be identified, plough, trenching or jetting will be used to re-bury the cable until the desired burial depth is achieved. If minimum burial depth is not achievable or in instances of repeated remedial reburial, then remedial cable protection may be necessary as part of remedial reburial maintenance activities. Once complete, a seabed survey will be conducted to determine the success of the operation. If necessary, another pass may be required to achieve the specified depth. Burial data will be documented and only once all remedial works have been agreed will the vessel and associated equipment transit from the field to port for demobilisation.	Up to 7 subtidal cable reburial events (up to 16 km per event) totalling up to 112 km over the lifetime of the Morgan Offshore Wind Project. Should remedial cable protection be required as part of cable reburial, then the total installed cable protection during the construction and operation and maintenance phases would not exceed the parameters provided in **Table 3.7** and as per CoT47.	Up to 7 subtidal cable reburial events (up to 3.4 km per event) totalling up to 23.8 km over the lifetime of the Morecambe Offshore Windfarm. Should remedial cable protection be required as part of cable reburial, then the total installed cable protection during the construction and operation and maintenance phases would not exceed the parameters provided in **Table 3.7** and as per CoT47.	Up to 14 subtidal cable reburial events totalling up to 135.8 km over the lifetime of the Transmission Assets. Should remedial cable protection be required as part of cable reburial, then the total installed cable protection during the construction and operation and maintenance phases would not exceed the parameters provided in **Table 3.7** and as per CoT47.
Offshore export cable repairs (intertidal)	Any cable failures would be detected by the Transmission Assets cable monitoring system. Where a fault is detected, it may be necessary to expose the export cable prior to recovery where testing will be conducted to establish the extent and type of repair required. The MDS has been	Up to 4 intertidal cable repair events (up to 1 km per event) totalling 4 km over the lifetime of the Morgan Offshore Wind Project.	Up to 4 intertidal cable repair events (up to 2.4 km per event) totalling 9.6 km over the lifetime the Morecambe Offshore Windfarm.	Up to 8 intertidal cable repair events totalling 13.6 km over the lifetime of the Transmission Assets.

Parameter	Description	Maximum design parameter		
		Morgan Offshore Wind Project	Morecambe Offshore Windfarm	Maximum design parameter
	calculated based on full cable re-burial always being required for cable repairs.			
Offshore export cable remedial burial (intertidal)	Any cable failures would be detected by the Transmission Assets cable monitoring system. Where a fault is detected, it may be necessary to expose the export cable prior to recovery where testing will be conducted to establish the extent and type of repair required.	Up to 28 intertidal cable reburial events (up 250 m per event) totalling up to 7 km over the lifetime of the Morgan Offshore Wind Project.	Up to 14 intertidal cable reburial events (up 250 m per event) totalling up to 3.5 km over the Morecambe Offshore Windfarm	Up to 42 intertidal cable reburial events totalling up to 10.5 km over the lifetime of the Transmission Assets.

3.19.2 TJB (landfall) and onshore operation and maintenance activities

TJBs and related link boxes

3.19.2.1 It is not expected that the TJBs will need to be accessed during the operation and maintenance phase. However, related link boxes will be provided with inspection covers to allow for access. Access to these link boxes is expected on an annual basis although are typically determined by the Offshore Transmission Owner (OFTO). The export cables will also be monitored remotely to determine if and where corrective activities may be required. The TJBs are only expected to require access in the event of a cable failure or fault resulting in replacement or repair.

3.19.2.2 Further information on operation access to the TJBs and landfall are provided in **section 3.15.6**.

Onshore export cables

3.19.2.3 The operation and maintenance requirements for the onshore export cables and 400 kV grid connection cables is expected to involve routine inspections of the links boxes at intervals along the onshore route.

3.19.2.4 The onshore export cables will be monitored remotely to determine if and where corrective activities may be required. Following completion of construction, access to the onshore export cables will be from access points along the existing highway within the onshore export cable corridor and via the operational access identified (see **section 3.15.6**).Access to these link boxes is expected on an annual basis although are typically determined by the Offshore Transmission Owner (OFTO).

3.19.2.5 Joint bays are only expected to require access in the event of a cable failure or fault resulting in replacement or repair.

Onshore substations

3.19.2.6 The onshore substations will be unmanned and will be continuously monitored remotely. Operation and maintenance staff are expected to visit the onshore substations approximately every 6 months to undertake preventative and corrective works on a regular basis. In some cases, visits could take place on a monthly basis.

3.19.2.7 Vehicle movements associated with planned operation and maintenance of the onshore substations are expected to operate only during the daytime and evening periods (i.e., 07:00 – 19:00). Vehicle movements may however be subject to unscheduled events outside these hours.

3.20 Decommissioning

3.20.1.1 At the end of the operational lifetime (assumed to be 35 years), the Transmission Assets may be decommissioned. As the seabed leases that the Applicants will enter into are for up to 60 years, it is anticipated that re-powering of the Generation Assets may be sought during the lease duration in line with the regulations, requirements, guidance and best practice relevant at that time.

In this case, new consents are likely to be required for the Generation Assets and the consenting requirements for the Transmission Assets would also be reviewed as part of that process alongside legislation and guidance in existence at that time. Although the design life of key components of the Transmission Assets (such as onshore substations) would allow for this, potential future repowering and operational life extension of the Transmission Assets is not included as part of the scope of this development consent application or EIA.

3.20.1 Offshore

3.20.1.1 Offshore Decommissioning Programme(s) (CoT55, **Table 3.2**) will be developed prior to decommissioning of each of the offshore wind farms to be submitted to the Secretary of State for Department for Energy Security and Net Zero (at the time of writing) prior to the commencement of construction. The decommissioning programme(s) will be updated during the lifetime of the offshore wind farms, including to take consideration of the latest relevant best practice, technological changes, legislation and policy at the time. The decommissioning sequence will generally be the reverse of the construction sequence and involve similar types and numbers of vessels and equipment.

3.20.1.2 The current preferred approach to the offshore export cables is that they would be left *in situ*; however, a future scenario could exist where they may be retrieved and, if retrieved, would be disposed of, or recycled, in line with latest relevant legislation and guidance at the time. It is preferable that cable protection outside of the Fylde MCZ (e.g. cable ducting, rock dump/armour, mattresses, etc) be left *in situ*. Further consultation would be undertaken with stakeholders and regulators at the time of decommissioning regarding the requirement for removal of cable protection that may have been installed within the Fylde MCZ (CoT109, **Table 3.2**). The removal of cables and cable protection has been assessed in relevant chapters where this represents the worst case scenario for that topic.

3.20.1.3 At this time, it is difficult to foresee what techniques would be used to remove cables during decommissioning. However, it is likely that equipment similar to that which is used to install the cables and cable protection could be used to reverse the burial process. Therefore, the area of seabed impacted during the removal of the cables and cable protection is likely to be the same as the area impacted during the installation of the cables and cable protection.

3.20.2 Landfall and Intertidal

3.20.2.1 At this time, it is difficult to determine whether it may be best to remove the offshore export cables from the intertidal environment. To minimise environmental and other disturbance, it may be preferrable to leave the offshore export cables *in situ* with the cable ends cut, sealed and securely buried. Alternatively, full or partial removal of the cables may be undertaken. The decommissioning approach will be developed in consultation with the relevant statutory consultees prior to decommissioning (CoT 36, **Table 3.2**).

3.20.2.2 Partial removal may be undertaken by pulling the cables back out of the ducts/ pipes, to recover the copper and/or aluminium and steel within them. Where

recycling or disposal may be necessary, this would be undertaken in accordance with the latest guidance, legislation and policy at the time.

3.20.3 Onshore

3.20.3.1 An Onshore Decommissioning Plan (see CoT36, **Table 3.2**) will be developed prior to decommissioning in a timely manner. The Onshore Decommissioning Plan will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan will be in line with the latest relevant available guidance.

Onshore export cables and 400 kV grid connection cables

3.20.3.2 To minimise the environmental disturbance during decommissioning the onshore export cables and 400 kV grid connection cables may be recovered and removed by pulling the cables through the ducts (e.g., for recycling). Otherwise, they will be left in place in the ground with the cable ends cut, sealed and securely buried as a precautionary measure.

3.20.3.3 Joint bays and link boxes will be removed only if it is feasible with minimal environmental disturbance or if their removal is required to return the land to its current agricultural use.

Onshore substations

3.20.3.4 The design life for the onshore substations will exceed 35 years. The case for decommissioning the onshore substations in the event of the Generation Assets being decommissioned will be reviewed in discussion with the transmission system operator and any relevant regulators in the light of any other existing or proposed future use of the onshore substations.

3.20.3.5 If complete decommissioning takes place, then all the electrical infrastructure will be removed, and any waste arising disposed of in accordance with relevant regulations and where applicable any legislative requirements at the time. Foundations will be broken up and the site reinstated, or alternately repurposed for another use. Where alternate uses may be explored, these may be subject to additional relevant consents and licenses at the time. For the purposes of EIA, decommissioning of the onshore substations is assumed to be similar to the construction and in reverse sequence.

3.21 Security

3.21.1.1 The Transmission Assets will be appropriately secure throughout all phases of the development to ensure the safety and security of those working on the Transmission Assets and the supply of electricity to National Grid. All above ground onshore infrastructure, such as the onshore substations, will be housed in secure compounds, as will any ongoing construction work. The onshore export cables will be buried and will not be readily accessible from the surface.

3.22 Quality, health, safety and environment

3.22.1.1 All elements of the Transmission Assets will be risk assessed according to the relevant government guidance as well as the Applicants' internal best practice. These risk assessments will then form the basis of the methods and safety mitigations put in place across the life of the Transmission Assets. The Applicants have a focus on employee safety culture in place in order to avoid incidents and accidents. There will be constant controls to ensure that the safety measures are observed, followed and the Applicants have built a safe workplace its employees and contractors. The focus on quality, health, safety and the environment is intended to ensure that everyone feels safe, in a highly controlled and safety-driven environment.

3.23 Accidents and disasters

3.23.1.1 The EIA Regulations require consideration of, where relevant, the potential for significant effects to arise from the vulnerability of the Transmission Assets to major accidents and disasters and the risk of major accidents and/or disasters.

3.23.1.2 The potential for major accidents and disasters arising from the construction, operation and maintenance, and decommissioning phases of the Transmission Assets has been considered in the topic chapters of this ES. In particular the following effects have been identified within specific chapters of the ES:

- the risk of vessel anchor and gear snagging: Volume 2, Chapter 7: Shipping and navigation (document reference F2.7);
- the risk of increased vessel collisions: Volume 2, Chapter 7: Shipping and navigation (document reference F2.7);
- a reduction of under keel clearance: Volume 2, Chapter 7: Shipping and navigation (document reference F2.7);
- a reduction of emergency response capability and reduced access for SAR responders: Volume 2, Chapter 7: Shipping and navigation (document reference F2.7);
- a reduction in groundwater quality and quantity resulting from accidental spillage: Volume 3, Chapter 1: Geology, hydrogeology and ground conditions (document reference F3.1);
- the impact of accidental pollution on quality of surface water and watercourses: Volume 3, Chapter 2: Hydrology and flood risk (document reference F3.2);
- increased flood risk: Volume 3, Chapter 2: Hydrology and flood risk (document reference F3.2);
- accidental pollution:
  - Volume 3, Chapter 3: Onshore ecology and nature conservation (document reference F3.3); and
  - Volume 3, Chapter 4: Onshore and intertidal ornithology (document reference F3.4).

- the impact of construction traffic on accidents and safety: Volume 3, Chapter 7: Traffic and transport (document reference F3.7);
- the impact of Abnormal Indivisible Loads on safety: Volume 3, Chapter 7: Traffic and transport (document reference F3.7); and
- the vulnerability of the Transmission Assets to climate change: Volume 4, Chapter 3: Climate change (document reference F4.1).

3.24 Waste management

3.24.1.1 Waste will be generated as a result of the Transmission Assets, with most waste expected to be generated during the construction and decommissioning phases. In accordance with Government policy contained in NPS EN-1 (DESNZ 2023a), consideration will be given to the types and quantities of waste that will be generated.

3.24.1.2 Procedures for handling waste materials will be set out in the following plans:

- Offshore Environmental Management Plan (OEMP, CoT65, **Table 3.2**) submitted post-consent and secured through the Draft DCO (document reference C1). Further information on the OEMP is provided in Table 5.3 of Volume 1, Chapter 5: Environmental Assessment Methodology of the ES (document reference F1.5); and
- Outline Site Waste Management Plan (document reference J1.6) appended to the Outline CoCP. It will describe quantifies of likely waste type arising from the Transmission Assets and how they will be managed (i.e., reuse, recycling, recovery or disposal). The Outline SWMP will also describe the duty of care requirements and identify potential management facilities in the vicinity of the Transmission Assets.

3.24.1.3 The OEMP and SWMP will be updated as further detailed design information becomes available prior to construction. A Materials Management Plan in line with the Contaminated Land: Applications in Real Environments Definition of Waste: Code of Practice will also be prepared and agreed prior to commencement of earthworks.

3.25 References

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