Morecambe Offshore Windfarm: Generation Assets

Development Consent Order Documents

Volume 6

Outline Scour Protection and Cable Protection Plan

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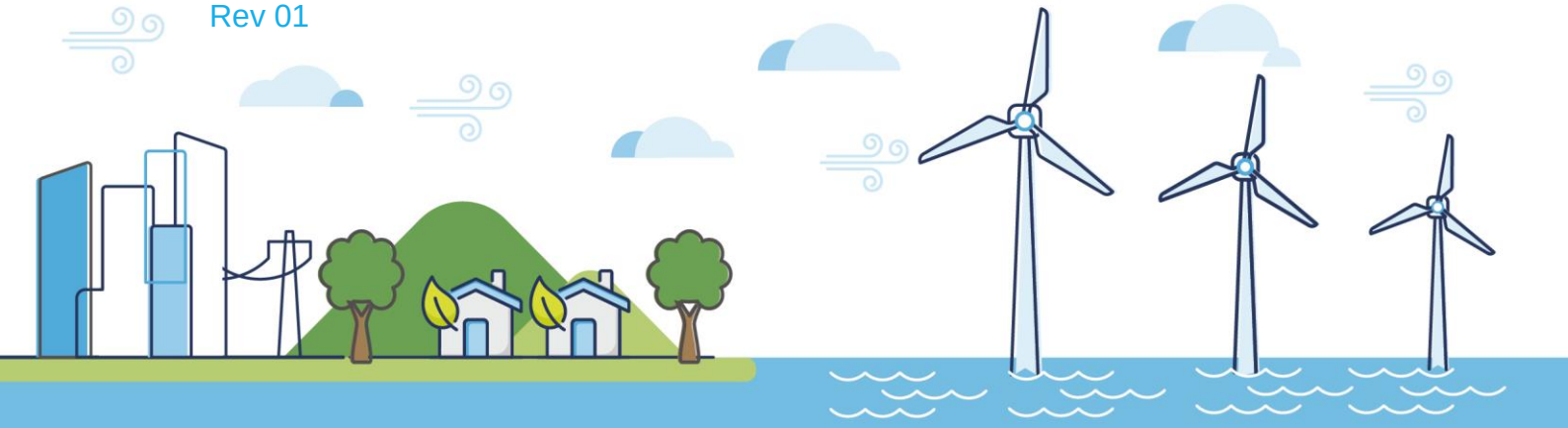
Rev 01



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Glossary of Acronyms

AfL	Agreement for Lease
DCO	Development Consent Order
DML	Deemed Marine Licence
ES	Environmental Statement
GBS	Gravity Base Structure
MMO	Marine Management Organisation
OSP(s)	Offshore substation platform(s)
PDE	Project Design Envelope
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
WTG(s)	Wind turbine generator(s)

Glossary of Unit Terms

km	kilometre
km^2	kilometre squared
m	metre
m^3	metre cubed

Glossary of Terminology

Applicant	Morecambe Offshore Windfarm Ltd
Application	This refers to the Applicant's application for a Development Consent Order (DCO). An application consists of a series of documents and plans which are published on the Planning Inspectorate's (PINS) website.
Agreement for Lease (AfL)	Agreements under which seabed rights are awarded following the completion of The Crown Estate tender process.
Generation Assets (the Project)	Generation assets associated with the Morecambe Offshore Windfarm. This is infrastructure in connection with electricity production, namely the fixed foundation wind turbine generators (WTGs), inter-array cables, offshore substation platform(s), OSP(s) and possible platform link cables to connect OSP(s).
Inter-array cables	Cables which link the WTGs to each other and the OSP(s).
Offshore substation platform(s)	A fixed structure located within the windfarm site, containing electrical equipment to aggregate the power from the WTGs and convert it into a more suitable form for export to shore.
Platform link cable	An electrical cable which links one or more OSP(s).
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations due to the flow of water.
Windfarm site	The area within which the WTGs, inter-array cables, OSP(s) and platform link cables will be present.
Wind turbine generator (WTG)	A fixed structure located within the windfarm site that converts the kinetic energy of wind into electrical energy.

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1 Introduction

1.1 Purpose of this document

1. This Outline Scour Protection and Cable Protection Plan forms part of a set of documents that supports the Development Consent Order (DCO) application submitted by Morecambe Offshore Windfarm Ltd (the Applicant) for the Morecambe Offshore Windfarm Generation Assets (the Project).

2. This Outline Scour Protection and Cable Protection Plan outlines the key principles of how the Applicant intends to manage the protection of foundations and cables from the effects of scour and other hazards (e.g., snagging anchors in the case of cables), both immediately post-construction and throughout the operational life of the Project. This statement also provides a summary of the effects of scour and cable protection as presented in the Environmental Statement (ES).

3. This Outline Scour Protection and Cable Protection Plan relates to scour and cable protection within the Project windfarm site.

4. Any additional cable or scour protection installed outside of areas occupied by that installed during construction of the Project would be subject to an additional marine licence. This would be applied for at the time of need and the requirement is confirmed in Annex 1 of the Outline Offshore Operation and Maintenance Plan (Document Reference 6.6).

5. A geophysical (bathymetry sub-bottom profiling, sidescan sonar, magnetometer and ultra-high resolution seismic) survey of the Project's 125km^2 Agreement for Lease (AfL) area, as presented in the Preliminary Environmental Information Report (PEIR), was completed between October and November 2021 (MMT, 2022) (**Appendix 7.1 Offshore Geophysical Survey** of the ES (Document Reference 5.2.7.1)).

6. A benthic survey was also undertaken over the Project's AfL area between May and June 2022 (Ocean Ecology Ltd, 2022) (**Appendix 9.1 Benthic Characterisation Survey** of the ES (Document Reference 5.2.9.1)). The benthic survey included a total of 50 sample stations distributed across the 125km^2 survey area. Following a reduction in the windfarm site boundary since PEIR, this represents 36 stations within the reduced (87km^2) windfarm site and a further 14 stations within 5km of the western boundary. Further information on the underlying geological conditions of the site would be developed through further geophysical and geotechnical surveys prior to construction.

7. The Environmental Impact Assessment has assumed a realistic worst-case scenario of all foundations having scour protection in order to provide a precautionary assessment.

8. Based on provisional studies, cable burial is expected to be possible throughout the majority of the Project windfarm site. Cable protection would be installed where burial is not possible, and at cable crossing locations and entry points to foundations. In order to provide a conservative and future-proof impact assessment, a contingency estimate for cable protection has been included in the assessment to account for areas where cable burial may not be possible (e.g., due to unexpected hard substrate being encountered during the pre-construction surveys or cable burial).

9. As the final Project design develops and based on information arising from pre-construction surveys, a final Scour Protection and Cable Protection Plan would be developed post-consent in consultation with the Marine Management Organisation (MMO) and the relevant Statutory Nature Conservation Body, as required in the construction method statement under the relevant condition with the DCO.

10. The Deemed Marine Licence (DML) sets out certain timescales in advance of commencement of the licensed activities, by when the final Scour Protection and Cable Protection Plan is required to be submitted to the MMO for its approval.

11. In addition, as detailed in the relevant condition in the DCO, post-installation reporting is required for scour and cable protection.

1.1 Background

12. The Applicant is proposing to develop Morecambe Offshore Windfarm, an offshore windfarm in the Eastern Irish Sea.

13. The Project includes the Generation Assets to be located within the windfarm site (wind turbine generators (WTGs), inter-array cables, offshore substation platform(s) (OSP(s)) and possible platform link cables to connect OSP(s)). A full description of the Project Design Envelope (PDE) on which the DCO Application has been made is presented in **Chapter 5 Project Description** of the ES (Document Reference 5.1.5).

14. The windfarm site (encompassing all Project infrastructure) covers a seabed area of 87km^2. The nearest point from the windfarm site to shore (coast of northwest England) is approximately 30km.

15. The detailed design of the Project (e.g., number of WTGs and OSP(s), layout configuration, foundation type and requirement for scour protection) would not be determined until post-consent. Therefore, realistic worst-case scenarios in terms of potential impacts/effects have been adopted to undertake a precautionary and robust impact assessment.

16. Given the potential range in WTG sizes, two WTG scenarios have been used to encompass the PDE:

- More (35) smaller WTGs
- Fewer (30) larger WTGs

17. In addition, up to two OSPs and a network of up to 70km of inter-array cables and 10km of platform link cables within the Project windfarm site are being considered as part of the design envelope.

18. The construction window is anticipated to be up to 2.5 years. **Chapter 5 Project Description** of the ES provides an indicative construction programme.

2 Foundation scour protection

19. The effects of scour are influenced by marine processes acting upon WTG/OSP foundations. Depending on metocean conditions and seabed features, scour protection may be required around foundations to protect against currents and waves that may cause erosion of the seabed and lead to changes in suspended sediment concentrations (SSCs) and associated bed level changes.

20. **Chapter 5 Project Description** of the ES provides details of the worst-case scenario footprint (including scour protection) for WTGs/OSPs. The footprint has been based on the maximum extent requirements for each foundation type, as below:

- Gravity Base Structure (GBS): Scour protection covering an area which extends 15m from foundations (which are 65m wide) in all directions
- Multi-legged pin-piled jacket (three or four-legged jacket): Scour protection covering an area which is six times the pin-pile diameter, around each pin-pile
- Monopile: Scour protection covering an area which is six times the pile diameter
- Multi-legged suction bucket jacket (three-legged jacket): Scour protection covering an area which is two times the bucket diameter, around each suction bucket

21. For all foundation types, scour protection materials could include rock, concrete and geotextile fabric. Further details are provided in Section 5.5.3.5 of **Chapter 5 Project Description** of the ES,

22. The quantities and extent of scour protection material would be dependent on current speed, seabed movement, sediment type and the foundation details and would therefore be determined post-consent based on the final design

and pre-construction surveys. The worst-case scenario has assumed that a maximum of 278,980m^3 of scour protection would be required in total for all WTG/OSP foundations (see **Table 2.1**). The maximum height of scour protection at any given point would be 2.0m.

23. The exact requirements for scour protection would be identified post-consent, prior to the start of construction, based on the final WTG and OSP locations and detailed site surveys.

Table 2.1 Worst-case scenario for scour protection[1]

Foundation	Scour protection area per foundation (excluding foundation) (m^2)	Scour protection volume per foundation (excluding foundation) (m^3)	Maximum number of foundations	Total scour protection area (m^2)	Total scour protection volume (m^3)
WTGs	3,770	7,540	35	131,950	263,900
OSPs	3,770	7,540	2	7,540	15,080
Total				**139,490**	**278,980**

3 Cable protection

3.1 Unburied cables due to ground conditions

24. The preferred method for cable protection would be burial, however there may be some locations where inter-array or platform link cables cannot be buried due to ground conditions and so alternative methods of protection would be required. Additionally, cables would require protection at entry points to WTG/OPS foundations and at cable crossings (see **Sections 3.2** and **3.3**).

25. From the interpretation of data from surveys undertaken to date, the ground conditions across the majority of the windfarm site are conducive to cable burial, being of suitable slope, largely free of obstruction and formed of very loose to dense clayey sands in the depth of interest. In order to provide a conservative and future-proof impact assessment, the following contingency estimate for cable protection has been included in the ES assessment. This worst-case scenario estimate assumes that cable burial would not be possible at up to 10% of the overall cable length due to ground conditions (such as presence of hard substrate):

[1] Assumes GBS foundation structures.

- Up to 7km of cable protection for inter-array cables
- Up to 1km of cable protection for platform link cables
- The maximum width and height of cable protection for unburied cables would be 13.0m and 2.0m, respectively
- The maximum width and height of cable protection at cable crossings would be 17.8m and 2.8m, respectively

3.2 Cables approaching WTGs and OSP(s)

26. It is necessary for cables to be surface laid as they approach each WTG/OSP foundation in order to allow the cables to be connected into foundation J tubes. A maximum length of 50m per cable both entering and leaving each foundation is anticipated and there would be up to 70 points of entry across all foundations. The maximum total length of cable protection for all foundation cable entry points within the windfarm site would be 3,500m.

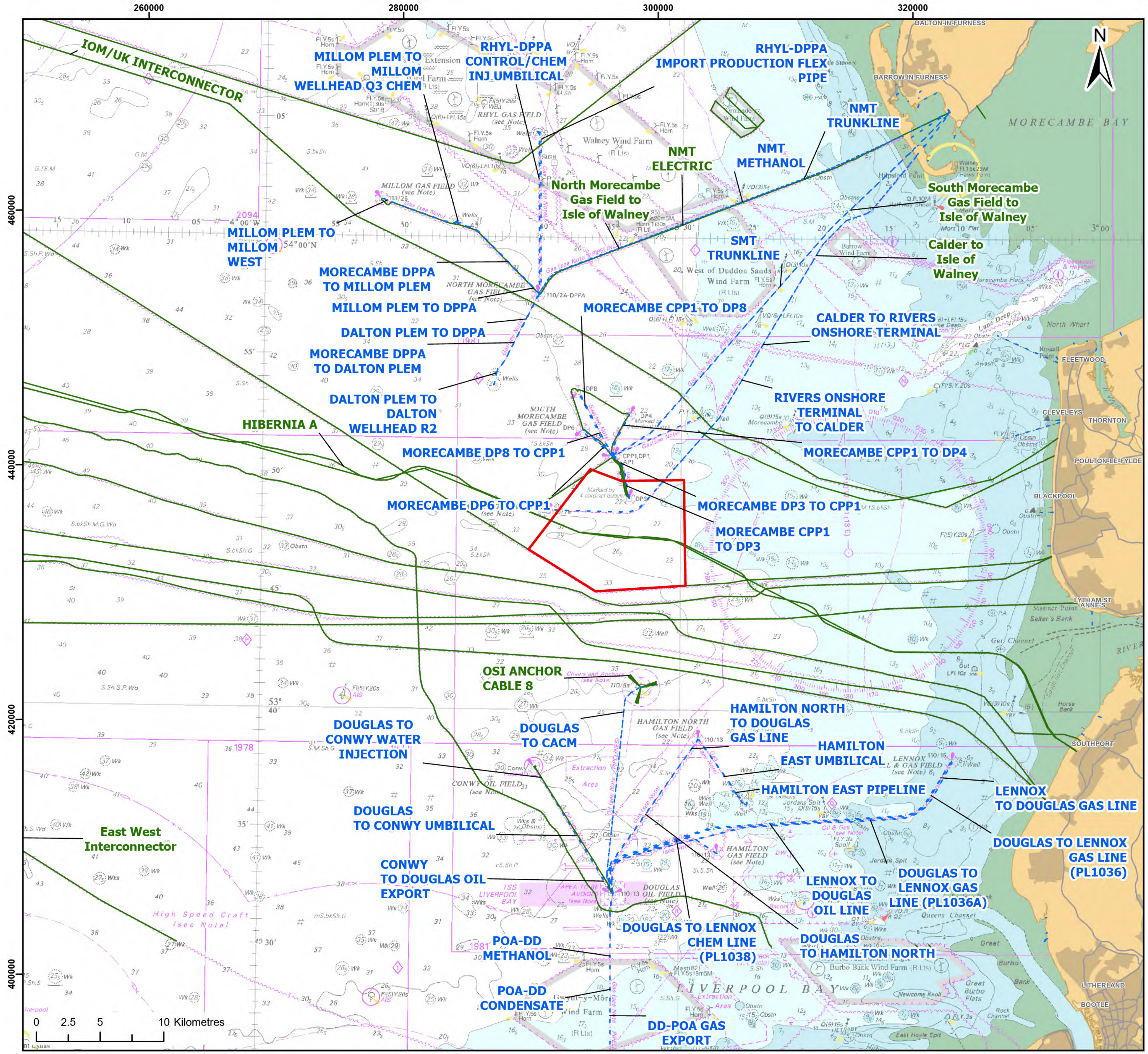
3.3 Crossings

27. Where cables are required to cross an obstacle such as an existing pipeline or an existing in-use cable (see **Figure 3.1**), protection would be installed to protect the obstacle being crossed and the cable being installed. At each crossing, the Project cable would be placed on top of a layer of protection, with a further layer of protection then placed above the installed Project cable.

28. Up to 15 cable/pipeline crossings are estimated to be required within the windfarm site (up to nine crossings for inter-array cables and up to six for platform link cables). Each crossing would require a carefully agreed procedure between the cable/pipeline owners. Each crossing agreement would be finalised post-consent and following further, pre-construction marine surveys.

29. The maximum width and length of cable protection for cable crossings would be 17.8m and 250m, respectively. The maximum height of cable crossings would be 2.8m.

30. Where the Project cables cross out of service (disused) cables, the necessary sections would be cut and recovered from the seabed before the start of installation of the Project cables. The cut ends would then be secured by weights (known as clump weights). The use of this removes the requirement to install cable protection at a cable crossing point.


260000
280000
300000
320000
460000
440000
420000
400000
IOM/UK INTERCONNECTOR
MILLOM PLEM TO MILLOM WELLHEAD Q3 CHEM
RHYL-DPPA CONTROL/CHEM INJ UMBILICAL
RHYL-DPPA IMPORT PRODUCTION FLEX PIPE
NMT TRUNKLINE
NMT ELECTRIC
NMT METHANOL
North Morecambe Gas Field to Isle of Walney
South Morecambe Gas Field to Isle of Walney
MILLOM PLEM TO MILLOM WEST
SMT TRUNKLINE
Calder to Isle of Walney
MORECAMBE DPPA TO MILLOM PLEM
MILLOM PLEM TO DPPA
MORECAMBE CPP1 TO DP8
CALDER TO RIVERS ONSHORE TERMINAL
DALTON PLEM TO DPPA
MORECAMBE DPPA TO DALTON PLEM
RIVERS ONSHORE TERMINAL TO CALDER
DALTON PLEM TO DALTON WELLHEAD R2
HIBERNIA A
MORECAMBE DP8 TO CPP1
MORECAMBE CPP1 TO DP4
MORECAMBE DP6 TO CPP1
MORECAMBE DP3 TO CPP1
MORECAMBE CPP1 TO DP3
OSI ANCHOR CABLE 8
HAMILTON NORTH TO DOUGLAS GAS LINE
DOUGLAS TO CONWY WATER INJECTION
DOUGLAS TO CACM
HAMILTON EAST UMBILICAL
HAMILTON EAST PIPELINE
LENNOX TO DOUGLAS GAS LINE
DOUGLAS TO CONWY UMBILICAL
DOUGLAS TO LENNOX GAS LINE (PL1036)
East West Interconnector
CONWY TO DOUGLAS OIL EXPORT
LENNOX TO DOUGLAS OIL LINE
DOUGLAS TO LENNOX GAS LINE (PL1036A)
DOUGLAS TO LENNOX CHEM LINE (PL1038)
DOUGLAS TO HAMILTON NORTH
POA-DD METHANOL
POA-DD CONDENSATE
DD-POA GAS EXPORT
MORECAMBE BAY
LIVERPOOL BAY
N
0 2.5 5 10 Kilometres

Legend:

- Morecambe Offshore Windfarm Site
- Pipeline
- Subsea Cable

Report: Morecambe Offshore Windfarm: Generation Assets Scour Protection and Cable Protection Plan

Title: Existing cables and pipelines

Figure: 3.1 | Drawing No: PC1165-RHD-ES-OF-DG-Z-0112

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	12/02/2024	JH	SB	A3	1:300,000
P02	26/04/2024	JH	SB	A3	1:300,000

Co-ordinate system: WGS 1984 UTM Zone 30N

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3.4 Types of cable protection

31. As detailed in Section 5.5.4.3 of **Chapter 5 Project Description** of the ES, the following cable protection options may be used, and this would be determined during the final design of the Project:

- Rock berms or gravel bags
- Concrete mattresses
- Flow energy dissipation devices (used to describe various solutions that dissipate the flow of energy and entrap sediment, including options such as frond mats, mats of large linked hoops, and structures covered with long spikes)
- Bagged solutions (including geotextile sand containers, rock-filled gabion bags or nets, and grout bags)

3.5 Cable protection quantities and location

32. The quantities, extent and location of cable protection would be dependent on the final design and findings of the pre-construction surveys. **Table 3.1** provides an overview of the maximum area and volume of cable protection for the Project, as well as providing an overview of where certain cable protection may be required.

Table 3.1 Maximum cable protection parameters

	Length (m)	Width on the seabed (m)	Height (m)	Maximum seabed footprint (m^2)	Maximum volume (m^3)	Location (see Figure 3.1)
Inter-array cables						
Unburied (based on 10% of the total cabling)	7000	13	2	91,000	98,000	Project windfarm site
Entry to WTG/OSP(s) (based on 63 entry points)	50	13	2	40,950	44,100	
Cable/pipeline crossings (based on 9 crossings)	250	17.8	2.8	40,050	59,220	
Total inter-array cable protection	**-**	**-**	**-**	**172,000**	**201,320**	
Platform link cables						
Unburied (based on 10% of the total cabling)	1,000	13	2	13,000	14,000	Project windfarm site
Entry to WTG/OSP(s) (based on 7 entry points)	50	13	2	4,550	4,900	
Cable/pipeline crossings (based on 6 crossings)	250	17.8	2.8	26,700	39,480	
Total platform link cable protection	**-**	**-**	**-**	**44,250**	**58,380**	

4 Scour and cable protection assessment in ES chapters

33. The technical chapters of the ES (chapters 7 – 22) present potential impacts relating to the presence of scour and cable protection installed during the construction phase, in addition to impacts through the operation and maintenance phase of the Project, where relevant.

34. It is important to highlight that the assessments presented in the ES have been based upon the realistic worst-case scenario relevant to a given potential impact, as drawn from details pertaining to the type, quantity and location of scour and cable protection specified in the Project Description. **Table 4.1** details the ES chapters and relevant impact assessments which consider these impacts.

Table 4.1 Impacts relating to the presence of scour and cable protection

ES reference	Impacts considered
Chapter 7 Marine Geology, Oceanography and Physical Processes (Document Reference 5.1.7)	
Section 7.6.3.1	Changes to the tidal regime due to the presence of structures on the seabed (WTG and OSP foundations)
Section 7.6.3.2	Changes to the wave regime due to the presence of structures on the seabed (WTG and OSP foundations)
Section 7.6.3.3	Changes to the bedload and suspended sediment transport regimes due to the presence of structures on the seabed (WTG and OSP foundations)
Section 7.6.3.4	Loss of seabed area due to the footprint of WTG and OSP foundations on the seabed
Section 7.6.3.5	Morphological and sediment transport effects due to cable protection measures within the windfarm site
Chapter 9 Benthic Ecology (Document Reference 5.1.9)	
Section 9.6.4.1	Change in habitat type due to presence of OWF subsurface infrastructure
Section 9.6.4.2	Change in hydrodynamic conditions due to presence of OWF subsurface infrastructure
Section 9.6.4.8	Colonisation of infrastructure by Invasive Non-Native Species
Chapter 10 Fish and Shellfish Ecology (Document Reference 5.1.10)	
Section 10.6.3.1	Permanent habitat loss
Section 10.6.3.6	Introduction of hard substrate

ES reference	Impacts considered
Chapter 13 Commercial Fisheries (Document Reference 5.1.13)	
Section 13.6.3.1	Reduction in access to, or exclusion from established fishing grounds
Section 13.6.3.5	Physical presence of Project infrastructure, and potential exposure of that infrastructure, leading to gear snagging
Chapter 15 Marine Archaeology and Cultural Heritage (Document Reference 5.1.15)	
Section 15.6.2.3	Indirect impact to heritage assets from changes to physical processes

5 Summary

35. The Applicant considers that details pertaining to the need, type, sources, quantity, distribution and installation methods for scour and cable protection have been specified within **Chapter 5 Project Description** to a sufficient extent to allow assessment of potential impacts within relevant ES chapters. It is noted that the specification of cable and scour protection within the PDE enables a required level of flexibility to be retained in the final engineering of these aspects. In consideration of this flexibility, the assessments presented in the ES are based upon the worst-case scenario relevant to a given potential impact, as drawn from the project envelope and presented in the relevant technical ES chapter.

36. It should be noted that the requirement for 'scour protection management and cable protection management', as well as the volumes of scour and cable protection are outlined in the relevant conditions within the Draft Development Consent Order (DCO) (Document Reference 3.1).

6 References

MMT (2022). Morecambe Offshore Windfarm: Offshore Geophysical Survey – Irish Sea (October – December 2021).

Ocean Ecology Ltd (2022). Morecambe Offshore Wind Farm Benthic Characterisation Survey Report 2022. Ref: OEL_FLOMOR0222_SYR.