MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS

Outline Cable Burial Risk Assessment

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Prepared by:

Morgan Offshore Wind Project Limited, Morecambe Offshore Windfarm Ltd

Prepared for:

Morgan Offshore Wind Project Limited, Morecambe Offshore Windfarm Ltd

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HASKONINGDHV UK LTD.

Marlborough House
Marlborough Crescent
Newcastle upon Tyne
NE1 4EE
United Kingdom
Water & Maritime
VAT registration number: 792428892

+44 191 2111300 **T**
+44 1733 262243 **F**
info.newcastle@uk.rhdhv.com **E**
royalhaskoningdhv.com **W**

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CABLE BURIAL RISK ASSESSMENT (CBRA)

Cable Burial Risk Assessment (CBRA)

KP		Co-ordinates		Length (km)	Proposed cable installation method	Sub-seabed geology and ground conditions			Seabed features			Hazard depth [m]				Depth of lowering[3] [m]		
From	To	From [Easting , Northing]	To [Easting , Northing]			Summary of Geology over typical depth of burial	Relevant exploratory holes	Comments	Bathymetry [m CD]	Seabed features	Comments	Maximum mobile bedform height	Fishing[1]	Anchor threat[2]	Principal sediment type for anchoring assessment	Recommended Depth of Lowering (DOL) to mitigate risks from fishing and mobile sediments	Recommended Depth of Lowering (DOL) to mitigate risks from anchors	Comments on Recommended Minimum Depth of Lowering
Export Cable Landing Section (KP0 – KP13.25)																		
0.0	**0.75**	497093.53, 5958057.39	496556.07, 5957798.23	**0.60**	Estimated HDD entry point at KP0 [from TJB to exit point reception pit within beach surf zone]	Superficial deposits consist of Blown Sand - Sand	Currently no relevant exploratory holes	Geology inferred from BGS onshore GeoIndex	Planned HDD section			Planned HDD section				Planned HDD section		
0.75	1.55	496556.07, 5957798.23	495682.57, 5957415.92	0.95	Estimated HDD exit point at KP0.6 Intertidal cable lay and burial	Superficial deposits consist of Storm Beach Deposits – Gravel and Tidal Flat Deposits – Clay and Silt	All Fugro Intertidal CPT	Geology inferred from BGS onshore GeoIndex	No geophysical survey coverage of this area			Not mapped	Negligible	Negligible	SAND	Sediment morphology TBC, but intertidal variability understood to be +-1.5m	Negligible	Minimum DOL 3.0m considered adequate at this stage
1.55	3.55	495682.57, 5957415.92	493873.61, 5956565.55	2.0	Nearshore cable lay and burial	SAND and Slightly gravelly clayey SAND. Loose to dense gravelly SAND or very low strength CLAY	Gardline 2022 investigation : BP22MOR_VC_105 BP22MOR_CPT_105	VC_105 terminated at depth 6.2m within the Mercia Mudstone layer of the Irish Sea Formation	-1.34 to -3.85	Sand with ripple 0.03m in height and 4.9m in wavelength up to approx. KP4.2 Boulder of size 0.5m or greater detected	Unknown wreck and debris noted north-east of KP3.55	0.53	0.2	0.25	SAND	0.73	0.25	Minimum DOL 1.5m considered adequate
3.55	6.35	493873.61, 5956565.55	491196.97, 5955892.25	2.8	Nearshore cable lay and burial	Vibrocore: Silty fine SAND, Silty fine to medium SAND	Gardline 2022 investigation : BP22MOR_VC_104 BP22MOR_CPT_104		-3.85 to -7.6	SAND. Area of ripple with height of 0.03m and wavelength of 4.9m up to approx. KP4.2 Boulder of sizes between 0.1- 0.5m or greater detected	Magnetometer anomaly noted south of KP3.75 and north of approx.. KP4.8	0.53	0.2	0.25	SAND	0.73	0.25	Minimum DOL 1.5m considered adequate
6.35	9.85	491196.97, 5955892.25	487702.72, 5955764.14	3.5	Nearshore cable lay and burial	Clayey SAND with Slightly Gravelly Clayey SAND and SAND	Gardline 2022 investigation : BP22MOR_VC_103 BP22MOR_CPT_103	BGS Offshore GeoIndex noted South-North fault line noted at approx. KP6.5	-7.6 to -11.13	Clayey SAND with Slightly Gravelly Clayey SAND and SAND Boulder with size 0.3-0.4 and 0.5 noted to the south of KP7.95 and north of KP8.05 respectively	Debris noted at KP7.25	0	0.2	0.25	SAND	0.2	0.25	Minimum DOL 1.5m considered adequate
9.85	11.5	487702.72, 5955764.14	486102.68, 5955699.81	1.65	Nearshore cable lay and burial	SAND and Clayey SAND		Base Unit II (Western Irish Sea Formation – A, Mud Facies) becomes thinner between KP		Clayey sand with Slightly gravelly clayey SAND up to approx. KP 10.5. SAND with ripple of 0.03m in height and 4.9m in wavelength AND clayey SAND		0.03	0.2	0.25	SAND	0.23	0.25	Minimum DOL 1.5m considered adequate

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KP		Co-ordinates		Length (km)	Proposed cable installation method	Sub-seabed geology and ground conditions			Seabed features			Hazard depth [m]				Depth of lowering[3] [m]		
From	To	From [Easting , Northing]	To [Easting , Northing]			Summary of Geology over typical depth of burial	Relevant exploratory holes	Comments	Bathymetry [m CD]	Seabed features	Comments	Maximum mobile bedform height	Fishing[1]	Anchor threat[2]	Principal sediment type for anchoring assessment	Recommended Depth of Lowering (DOL) to mitigate risks from fishing and mobile sediments	Recommended Depth of Lowering (DOL) to mitigate risks from anchors	Comments on Recommended Minimum Depth of Lowering
								9.85-11.5 and eventually thins out at KP11		between KP10.5 to KP11.5 Rock dump is noted between KP11.2 and 11.25 Possible boulder with unknown siez and boulder of size 0.4 taken from MBES data reported at KP10.95								
11.5	**13.25**	486102.68, 5955699.81	484283.88, 5955631.27	1.85	Nearshore cable lay and burial	Vibrocore: Very soft low strength dark grey seilty very sandy CLAY overlying silty fine to medium SAND	Gardline 2022 investigation : BP22MOR_VC_102 BP22MOR_CPT_102		-11.13 to -14.23	SAND. Clayey SAND and Slightly Gravelly Clayey SAND. SAND with ripple 0.03m in height and 4.9m in wavelength Boulder with size between 0.3-0.4m at approx. KP12.1	2 no. wrecks noted between these KPs. Debris noted south-east of est. KP12.8	0.03	0.2	0.25	SAND	0.23	0.25	Minimum DOL 1.5m considered adequate
Export Cable Offshore Routing Section (KP13.25 to KP68)																		
13.25	**17.0**	484283.88, 5955631.27	480542.6, 5955658.42	3.75	Offshore cable lay and burial	Vibrocore: Very soft extremely low strength silty very sandy slightly gravelly CLAY overlying slightly silty fine to medium SAND Sub-bottom profile: Loose to dense gravelley SAND or very low strength CLAY overlying Dense to very dense gravelly SAND Unit III Western Irish sea formation throughout KP13.25 to KP17 apart from KP14.25 to KP15.25 where Holocene Sand overlies Base Unit II (Western Irish Sea Formation – A. Mud Facies followed by Unit III.	Gardline 2022 investigation : BP22MOR_VC_101 BP22MOR_CPT_101	VC_101 terminated at depth 2.64m	-14.23 to -17.75	SAND and Clayey SAND detected between KP13.25 to 16.5 with ripple of 0.02m in height and 5.2m in wavelangth between KP13.25 to 15.75. Clayey SAND present between KP15.75 to 17 and sandy CLAY present between KP16.25 to 17 Area of fishing scars reported between KP16.5 to 17.		0.02	0.25	1.1	SAND	0.27	1.1	Minimum DOL 1.5m considered adequate
17.0	**21.0**	480542.6, 5955658.42	478285.63, 5958254.29	4.0	Offshore cable lay and burial	Vibrocore: Very soft extremely low strength silty sandy CLAY	Gardline 2022 investigation : BP22MOR_VC_37		-17.75 to -16.25	Sandy CLAY and Clayey SAND detected between KP17 to 21.	AQUA-COMSS HAV 1.5 crossing the cable routing perpendicular at	0.5	0.7	3.3	CLAY	1.2	3.3	Minimum DOL 3m considered adequate

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KP		Co-ordinates		Length (km)	Proposed cable installation method	Sub-seabed geology and ground conditions			Seabed features			Hazard depth [m]				Depth of lowering[3] [m]		
From	To	From [Easting , Northing]	To [Easting , Northing]			Summary of Geology over typical depth of burial	Relevant exploratory holes	Comments	Bathymetry [m CD]	Seabed features	Comments	Maximum mobile bedform height	Fishing[1]	Anchor threat[2]	Principal sediment type for anchoring assessment	Recommended Depth of Lowering (DOL) to mitigate risks from fishing and mobile sediments	Recommended Depth of Lowering (DOL) to mitigate risks from anchors	Comments on Recommended Minimum Depth of Lowering
						overlying silty fine to coarse SAND. Sub-bottom profile: Loose to dense gravelly SAND or very low strength CLAY overlying Dense to very dense gravelly SAND	BP22MOR_CPT_42			Area of fishing spot scars present between KP17 to 18.25.	approximately KP18.5 to 19 Lanis 1 Cable crossing the cable route at 90 degrees between KP19 to 19.5.							
21.0	**29.0**	478285.63, 5958254.29	471719.22, 5962768.3	7.0	Offshore cable lay and burial	Vibrocore: Very soft extremely low strength silty sandy CLAY overlying soft very low strength silty sandy CLAY Sub-bottom profile: Very low strength CLAY overlying very low to low strength CLAY	Gardline 2022 investigation : BP22MOR_VC_35 BP22MOR_CPT_39 BP22MOR_CPT_40	VC_35 terminated at depth 2.6m. Mud Facies is within depth of burial	-16.25 to -20	Clayey SAND and SAND reported between KP21 to 28.25 and Sandy CLAY reported between KP28.25 to 29. Area of scars reported between KP26 to 28.5.	Linear debris 12.2m in length detected just after KP21 Side scan sonar detected linear debris feature between KP28.5 to 29. Magnetometer anomaly recorded near KP28.5. CLAY layer between KP22 to 24.25 ranging from depth 17m to 20.5m and 17m. This layer is found again between KP25.75 to 29 where this layer begins at depth 18.5m and extends beyond 29m.	0.5	0.7	3.3	CLAY	1.2	3.3	Minimum DOL 3m considered adequate
29.0	**34.2**	471719.22, 5962768.3	467739.1, 5966144.21	5.2	Offshore cable lay and burial	Vibrocore: Very soft extremely low strength silty sandy CLAY overlying soft very low strength silty sandy CLAY Sub-bottom profile: Very low strength CLAY overlying very low to low strength CLAY	Gardline 2022 investigation : BP22MOR_VC_36 BP22MOR_CPT_41 BP22MOR_CPT_38	VC_36 terminated at depth 6m.	-20 to -18 at KP30.5 to -21 at KP34.1	Sandy CLAY and Clayey SAND reported from geophysical survey	Magnetometer anomaly recorded northeast and west of KP30.5	0.5	0.7	3.3	CLAY	1.2	3.3	Minimum DOL 3m considered adequate
34.1	**37.0**	467739.1, 5966144.21	465900.89, 5968215.8	2.9	Offshore cable lay and burial	Vibrocore: Very soft extremely low to very low strength silty sandy CLAY overlying slightly sandy SILT followed by sandy CLAY	Gardline 2022 investigation : BP22MOR_VC_33 BP22MOR_CPT_36	VC_33 terminated at depth 6m Ground truthing suggests weak soils at this section and	-21 to -22.5	Clayey SAND reported from geophysical survey in this section .	Boulders detected between KP36.5 to 37. Magnetometer anomaly detected between KP34.5 to 35 which shows the Calders to Rivers Onshore	0.5	0.7	3.3	CLAY	1.2	3.3	Minimum DOL 3m considered adequate

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KP		Co-ordinates		Length (km)	Proposed cable installation method	Sub-seabed geology and ground conditions			Seabed features			Hazard depth [m]				Depth of lowering[3] [m]		
From	To	From [Easting , Northing]	To [Easting , Northing]			Summary of Geology over typical depth of burial	Relevant exploratory holes	Comments	Bathymetry [m CD]	Seabed features	Comments	Maximum mobile bedform height	Fishing[1]	Anchor threat[2]	Principal sediment type for anchoring assessment	Recommended Depth of Lowering (DOL) to mitigate risks from fishing and mobile sediments	Recommended Depth of Lowering (DOL) to mitigate risks from anchors	Comments on Recommended Minimum Depth of Lowering
						Sub-bottom profile: Very low strength CLAY overlying very low to low strength CLAY		may be part of the Irish Sea Mudbelt.			Terminal 24 Gas Line							
37.0	**39.0**	465900.89, 5968215.8	464711.64, 5969839.82	2.0	Offshore cable lay and burial	Vibrocore: Very soft extremely low strength silty sandy slightly gravelly CLAY overlying soft very low strength sandy slightly gravelly CLAY Sub-bottom profile: Loose to dense gravelly SAND or very low strength CLAY overlying very low to low strength CLAY	Gardline 2022 investigation : BP22MOR_VC_32 BP22MOR_CPT_35	Ground truthing suggests weak soils at this section and may be part of the Irish Sea VC_32 terminated at depth 6m	-22.5 to 24.25	Clayey SAND reported from geophysical survey in this section	PL1958 Bains Wellhead to Morecambe DP1 8" Gas pipeline and PL1959: Morecambe DP1 to Bains Wellhead Chemical pipelines detected between KP37 and 37.5. PL144 South Morecambe 35 Gas Trunkline is detected between KP37.5 to 38. Depth of burial is reported to be 1.3m from bed level.	0.5	0.7	3.3	CLAY	1.2	3.3	Minimum DOL 3m considered adequate
39.0	**44.0**	464711.64, 5969839.82	461674.6, 5973746.41	5.0	Offshore cable lay and burial	Vibrocore: Clayey fine to medium SAND with organic staining overlying very soft to soft sandy CLAY with a depth of arounf 3m. Sub-bottom profile: Loose to dense gravelly SAND or very low strength CLAY overlying very low to low strength CLAY	Gardline 2022 investigation : BP22MOR_VC_31 BP22MOR-CPT-34	Ground truthing suggests weak soils at this section and may be part of the Irish Sea VC_31 terminated at depth 6m	-24.25 to -23 at KP39.75 to -25.25 at KP44	Clayey SAND reported from geophysical survey in this section. CLAY layer becomes thinner from KP39 and disappears at KP40. Layer reappears again from KP41.25 and extends to KP44 appearing to show a thickness of 3.5m	24 magnetometer anomalies detected along this section.	0.5	0.7	3.3	CLAY	1.2	3.3	Minimum DOL 3m considered adequate
44.0	**51.0**	461674.6, 5973746.41	455667.64, 5977378.08	7.0	Offshore cable lay and burial	CPT: Very loose to loose silty SAND to depth 3.79m below bed level overlying extremely low to low strength sandy CLAY at depth 5.13m below bed level Sub-bottom profile: Loose to dense gravelly SAND or very low strength CLAY overlying very low to low strength CLAY.	Gardline 2022 investigation : BP22MOR-CPT-33	CPT-33 terminated at depth 5.98m	-25.25 to -30.5	Clayey SAND reported from geophysical survey in this section.	3 magnetometer anomalies were detected in this section 1 no. well located between KP50.5 to 51	0.5	0.25	1.1	SAND	0.75	1.1	Minimum DOL 2m considered adequate
51.0	**53.0**	455667.64, 5977378.08	453931.73, 5978346.74	2.0	Offshore cable lay and burial	Vibrocore: Silty fine to medium	Gardline 2022 investigation :	VC_30 terminated	-30.5 to -30.5	Clayey SAND reported from	Magnetometer reading detected	0.5	0.25	1.1	SAND	0.75	1.1	Minimum DOL 2m considered adequate

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KP		Co-ordinates		Length (km)	Proposed cable installation method	Sub-seabed geology and ground conditions			Seabed features			Hazard depth [m]				Depth of lowering[3] [m]		
From	To	From [Easting , Northing]	To [Easting , Northing]			Summary of Geology over typical depth of burial	Relevant exploratory holes	Comments	Bathymetry [m CD]	Seabed features	Comments	Maximum mobile bedform height	Fishing[1]	Anchor threat[2]	Principal sediment type for anchoring assessment	Recommended Depth of Lowering (DOL) to mitigate risks from fishing and mobile sediments	Recommended Depth of Lowering (DOL) to mitigate risks from anchors	Comments on Recommended Minimum Depth of Lowering
						SAND overlying very soft extremely low strength sandy CLAY This layer is followed by clayey fine to medium SAND Sub-bottom profile: : Loose to dense gravelly SAND or very low strength CLAY overlying very low to low strength CLAY.	BP22MOR_VC_30 BP22MOR-CPT-32A	at depth 4.7m		geophysical survey with ripple of 0.5m in height and 1-1.5m in wavelength between KP51.5 to 53. PL1668: Dalton PLEM to DPPA 12" Gas Line and PL1671: Morecambe DPPA to Dalton PLEM detected between KP51.5 and 52.	that the depth of burial of the gas line is at 1.3m							
53.0	**57.0**	453931.73, 5978346.74	450220.15, 5979830.09	4.0	Offshore cable lay and burial	CPT: Very loose to loose silty SAND to depth 3.79m below bed level overlying extremely low to low strength sandy CLAY at depth 5.13m below bed level	Gardline 2022 investigation : BP22MOR-CPT-31	CPT-31 terminated at depth 3.98m	-30.5 to -32	Clayey SAND reported from geophysical survey in this section. Ripples of 0.5m in height and 1-1.5m in wavelength present throughout this section.	0.8m height boulder detected between KP55 to 55.5 1 no. magnetometer anomaly reported between KP56.5 to 57	0.5	0.25	1.1	SAND	0.75	1.1	Minimum DOL 2m considered adequate
57.0	**59.0**	450220.15, 5979830.09	449136.4, 5980936.22	2.0	Offshore cable lay and burial	Vibrocore: Silty fine to medium SAND underlying gravelly medium SAND Sub-bottom profile: Loose to dense gravelly SAND overying very low to low strength CLAY	Gardline 2022 investigation : BP22MOR_VC_23 BP22MOR_VC_23A BP22MOR-CPT-21	VC_23 terminated at depth 2.5m VC_23A terminated at depth 2.3m	-32	Clayey SAND reported from geophysical survey in this section. Ripples of 0.5m in height and 10-15m in wavelength present throughout this section.		0.5	0.25	3.3	CLAY	0.75	3.3	Minimum DOL 3m[6] considered adequate
Export Cable Route to the array from KP59 to OSP 1																		
59.0	**61.0**	449136.4, 5980936.22	449346.82, 5983237.53	2.0	Offshore cable lay and burial	Vibrocore: Silty fine to coarse SAND overlying Clayey sandy SILT Sub-bottom profile: Loose to dense gravelly SAND overlying very low to low strength CLAY	Gardline 2022 investigation : BP22MOR_VC_24 BP22MOR-CPT-22	VC_24 terminated at depth 2.1m	-32 to -35	Clayey SAND reported from geophysical survey in this section. Ripples of 0.5m in height and 10-15m in wavelength present throughout this section.	Isle of Man Interconnector detected between KP59 and 59.5 with a depth of 2.4m from bed level 5 no. magnetometer anomaly reported between this section	0.5	0.25	1.1	SAND	0.75	1.1	Minimum DOL 2m considered adequate
61.0	**64.0**	449346.82, 5983237.53	446995.97, 5984934.5	3.0	Offshore cable lay and burial	Vibrocore: Silty fine to medium SAND overlying soft to extremely soft CLAY followed by gravelly fine to coarse SAND	Gardline 2022 investigation : BP22MOR_VC_27 BP22MOR-CPT-27 BP22MOR-CPT-27A	VC_27 terminated at depth 6m	-35 to -34.5	Clayey SAND reported from geophysical survey in this section. Ripples of 0.5m in height and 10-15m in wavelength present throughout this section.		0.5	0.25	1.1	SAND	0.75	1.1	Minimum DOL 2m considered adequate

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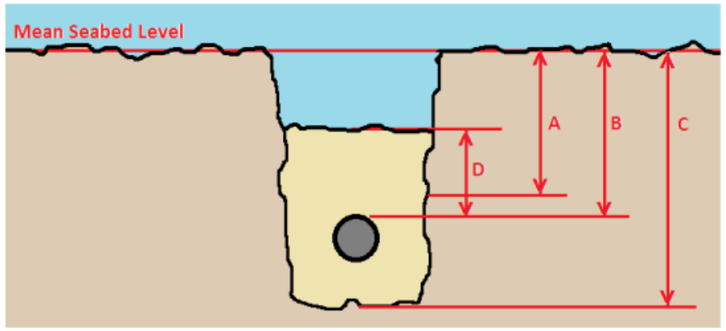
KP		Co-ordinates		Length (km)	Proposed cable installation method	Sub-seabed geology and ground conditions			Seabed features			Hazard depth [m]				Depth of lowering[3] [m]		
From	To	From [Easting , Northing]	To [Easting , Northing]			Summary of Geology over typical depth of burial	Relevant exploratory holes	Comments	Bathymetry [m CD]	Seabed features	Comments	Maximum mobile bedform height	Fishing[1]	Anchor threat[2]	Principal sediment type for anchoring assessment	Recommended Depth of Lowering (DOL) to mitigate risks from fishing and mobile sediments	Recommended Depth of Lowering (DOL) to mitigate risks from anchors	Comments on Recommended Minimum Depth of Lowering
64.0	**68.0**	446995.97, 5984934.5	443181.69, 5986151.95	4.0	Offshore cable lay and burial	Vibrocore: Silty fine to medium SAND overlying sandy gravelly CLAY and sandy clayey GRAVEL	Gardline 2022 investigation : BP22MOR_VC_26 BP22MOR-CPT-26 BP22MOR-CPT-25	VC_26 terminated at depth 4.7m	-34.5 to -35	Clayey SAND reported from geophysical survey in this section. Ripples of 0.5m in height and 10-15m in wavelength present throughout this section	Debris of length 6.3m and 0.7m detected near KP66.5 1 no. magnetometer anomaly reported between this section	0.5	0.25	3.3	CLAY	0.75	3.3	Minimum DOL 3m[6] considered adequate
68.0	**77.0**	443181.69, 5986151.95	435929.89, 5990638.79	9.0	Offshore cable lay and burial	Vibrocore: Slightly silty slightly gravelly fine to coarse SAND overlying extremely low to low strength CLAY followed by fine to coarse SAND	Gardline 2022 investigation : BP22MOR_VC_25 BP22MOR-CPT-23 BP22MOR-CPT-24	VC_25 terminated at depth 5m	-35 to -43	Clayey SAND reported from geophysical survey in this section Ripples of 0.5m in height and 10-15m in wavelength present between KP68 to 69.5 Megaripples of 0.6m in height and 15m in wavelength is present between KP69.5 to 77	2 no. boulders of height 0.2m detected near KP73.5 9 no. boulders of varying height Isle of Man Interconnector detected near KP77	0.6	0.25	3.3	CLAY	0.85	3.3	Minimum DOL 3m[6] considered adequate
77.0	**OSP 1**	435929.89, 5990638.79	434854.14, 5988167.94	*2.0 [4 a]*	Offshore cable lay and burial Connection to OSP 1	Borehole: Calcareous fine to medium SAND overlying slightly gravely slight sandy CLAY followed by slightly silty slighty calcareous SAND	Fugro array investigation: MRG-BH22-05	MRG-BH22-05 terminated at depth 38.3m Slightly cemented SAND noted at depth 3.55m below bed level Ultra-high strength CLAY present from 9.3m below bed level	*-43 to -47 [5]*	Shelly SAND reported in this section [5] Megaripples noted within this section [5]		*0.6 [4 b]*	0	1.1	SAND	0.6	1.1	Minimum DOL 2m considered adequate
Export Cable Route to the array from KP59 to OSP2																		
59.0	**61.0**	449136.4, 5980936.22	449346.82, 5983237.53	2.0	Offshore cable lay and burial	Vibrocore: Silty fine to coarse SAND overlying Clayey sandy SILT Sub-bottom profile: Loose to dense gravelly SAND overying very low to low strength CLAY	Gardline 2022 investigation : BP22MOR_VC_24 BP22MOR-CPT-22	VC_24 terminated at depth 2.1m	-32 to -35	Clayey SAND reported from geophysical survey in this section. Ripples of 0.5m in height and 10-15m in wavelength present throughout this section.	Isle of Man Interconnector detected between KP59 and 59.5 with a depth of 2.4m from bed level 5 no. magnetometer anomalies	0.5	0.25	1.1	SAND	0.75	1.1	Minimum DOL 2m considered adequate

KP		Co-ordinates		Length (km)	Proposed cable installation method	Sub-seabed geology and ground conditions			Seabed features			Hazard depth [m]				Depth of lowering[3] [m]		
From	To	From [Easting , Northing]	To [Easting , Northing]			Summary of Geology over typical depth of burial	Relevant exploratory holes	Comments	Bathymetry [m CD]	Seabed features	Comments	Maximum mobile bedform height	Fishing[1]	Anchor threat[2]	Principal sediment type for anchoring assessment	Recommended Depth of Lowering (DOL) to mitigate risks from fishing and mobile sediments	Recommended Depth of Lowering (DOL) to mitigate risks from anchors	Comments on Recommended Minimum Depth of Lowering
											reported between this section							
61.0	**64.0**	449346.82, 5983237.53	446995.97, 5984934.5	3.0	Offshore cable lay and burial	Vibrocore: Silty fine to medium SAND overlying soft to extremely soft CLAY followed by gravelly fine to coarse SAND	Gardline 2022 investigation : BP22MOR_VC_27 BP22MOR-CPT-27 BP22MOR-CPT-27A	VC_27 terminated at depth 6m	-35 to -34.5	Clayey SAND reported from geophysical survey in this section. Ripples of 0.5m in height and 10-15m in wavelength present throughout this section.		0.5	0.25	1.1	SAND	0.75	1.1	Minimum DOL 2m considered adequate
64.0	**68.0**	446995.97, 5984934.5	443181.69, 5986151.95	4.0	Offshore cable lay and burial	Vibrocore: Silty fine to medium SAND overlying sandy gravelly CLAY and sandy clayey GRAVEL	Gardline 2022 investigation : BP22MOR_VC_26 BP22MOR-CPT-26 BP22MOR-CPT-25	VC_26 terminated at depth 4.7m	-34.5 to -35	Clayey SAND reported from geophysical survey in this section. Ripples of 0.5m in height and 10-15m in wavelength present throughout this section	Debris of length 6.3m and 0.7m detected near KP66.5 1 no. magnetometer anomaly reported between this section	0.5	0.7	3.3	CLAY	1.2	3.3	Minimum DOL 3m[6] considered adequate
68.0	**OSP 2**	443181.69, 5986151.95	436557.73, 5979907.8	*9.0* [4a]	Offshore cable lay and burial Connection to OSP 2	Vibrocore: Sightly fine to medium SAND underlying gravelly fine to coarse SAND	Gardline 2022 investigation : BP22MOR_VC_09A Fugro array investigation: MRG-BH22-17	VC_09A terminated at depth 0.8m	*-35* [5]	Gravelly shelly SAND and Gravelly SAND with patches of shelly sand reported [5] Intermittent sand waves and megaripples reported within this section [5]		0.6 [4b]	0.25	1.1	SAND	0.85	1.1	Minimum DOL 2m considered adequate
Export Cable Route to the array from KP59 to OSP 3																		
59.0	**OSP 3**	449136.4, 5980936.22	442917.25, 5981407.8	*6.0* [4a]	Offshore cable lay and burial Connection to OSP 3	Vibrocore: Slightly silty fine to coarse SAND overlying GRAVEL	Gardline 2022 investigation : BP22MOR_VC_10	VC_09A terminated at depth 2.85m	*-35 to -36* [5]	Clayey SAND and Shelly SAND reported [5] Megaripples reported in this section [5]		0.6 [4b]	0.25	1.1	SAND	0.85	1.1	Minimum DOL 2m considered adequate

Notes:		**Reference:**
1.	**Fishing gear hazard:** Fishing gear hazard taken from CTC835 Table 9-1 for generally sandy bed conditions	Carbon Trust Cable Burial Risk Assessment Methodology, Guidance for the Preparation of Cable Burial Depth of Lowering Specification, CTC835, February 2015
2.	**Semi-qualitative worst credible anchor penetration for vessels crossing the Morgan cable landfall (KP0.6 – KP13.25):**	
	Relevant port for existing vessels in transit across cable landfall: **Fleetwood (Principal vessel traffic: Unit loads Ro-Ro, vehicles/wheeled cargoes, Dredgers and Fisheries)**	Associated British Ports | Fleetwood (abports.co.uk)
	Co-ordinates (WGS84 30N): **Easting: 499684.28** **Northing: 5975215.15**	
	Maximum vessel capacity: **400 dwt fishing vessel (based on largest fishing vessel based in Fleetwood)**	Ship SUFFOLK CHIEFTAIN (Trawler) Registered in United Kingdom - Vessel details, Current position and Voyage information - IMO 6815304, MMSI 232006830, Call Sign MMFK9 | AIS Marine Traffic
	Typical draught (scantling): **3m**	

KP		Co-ordinates		Length (km)	Proposed cable installation method	Sub-seabed geology and ground conditions			Seabed features			Hazard depth [m]				Depth of lowering[3] [m]		
From	To	From [Easting , Northing]	To [Easting , Northing]			Summary of Geology over typical depth of burial	Relevant exploratory holes	Comments	Bathymetry [m CD]	Seabed features	Comments	Maximum mobile bedform height	Fishing[1]	Anchor threat[2]	Principal sediment type for anchoring assessment	Recommended Depth of Lowering (DOL) to mitigate risks from fishing and mobile sediments	Recommended Depth of Lowering (DOL) to mitigate risks from anchors	Comments on Recommended Minimum Depth of Lowering
	Estimated draught (light ship): c. **5m**																	
	Estimated zone of possible cable transit: **> KP3**																	
	Typical anchor weight: **100 kg**															Carbon Trust Cable Burial Risk Assessment Methodology, Guidance for the Preparation of Cable Burial Depth of Lowering Specification, CTC835, February 2015		
	Typical Hall stockless anchor hall dimensions: fluke length = **378 mm** shank length = **750 mm**															3hall_anchors.pdf (seacat-schmeding.com) Hall Anchor | 40kg To 46000kg, Stockless Anchor | Pilotfits		
	Typical anchor penetration = 1 x fluke length (sand or stiff clay) x sin 45° = 3 x fluke length (soft clay) x sin 45°															Carbon Trust Cable Burial Risk Assessment Methodology, Guidance for the Preparation of Cable Burial Depth of Lowering Specification, CTC835, February 2015		
	Semi-qualitative worst credible anchor penetration for vessels crossing the Morgan cable landfall (KP0 – KP3):																	
	Maximum vessel capacity: **SUFFOLK CHEFTAIN (fishing vessel)**																	
	Typical draught: **3m**																	
	Estimated zone of possible cable transit: **KP1 – KP13.25**																	
	Estimated anchor weight: **60 kg**																	
	Typical Hall stockless anchor hall dimensions: fluke length = **347 mm** shank length = **637 mm**																	
	Typical anchor penetration = 1 x fluke length (sand or stiff clay) x sin 45° = 3 x fluke length (soft clay) x sin 45°																	
2b.	**The vessels considered in the assessment of anchor risk were extracted from relevant AIS data which have been categorised based on the navigation status (NAVSTATUS) :** a) Vessel status based on AIS NAVSTATUS AT_ANCHOR: A vessel is at anchor when it is held in position by an anchor on the bottom of a body of water, thus preventing a vessel from drifting away from the desired position (e.g. waiting for a berth, heavy weather, receiving fuel oil, loading, and unloading cargo, for maintenance purposes). ENGAGED_IN_FISHING: Any vessel fishing with nets, lines, trawls or other fishing apparatus. RESTRICTED_MANEUVERABILITY: Manoeuvring characteristics include turning, yaw-checking, course-keeping and stopping abilities of the vessel. The term "restricted manoeuvrability" means the vessel cannot keep out of the way of another vessel. It also includes: • A vessel engaged in laying, servicing, or picking up a navigational mark, submarine cable or pipeline. • A vessel engaged in dredging, surveying or underwater operations. • A vessel engaged in replenishment or transferring persons, provisions or cargo while underway. • A vessel engaged in the launching or recovery of aircraft. • A vessel engaged in mine clearance operations. • A vessel engaged in a towing operation such as severely restricts the towing vessel and her tow in their ability to deviate from their course. b) Worst case vessel size based on KP: - **Vessel Engaged in Fishing (assumed to have a Hall Anchor of 60kg)** KP0-26: no recorded Fishing Vessels															HHP Danforth Anchor | 20kg To 25000kg | Pilotfits Hall Anchor | 40kg To 46000kg, Stockless Anchor | Pilotfits		

KP		Co-ordinates		Length (km)	Proposed cable installation method	Sub-seabed geology and ground conditions			Seabed features			Hazard depth [m]				Depth of lowering[3] [m]		
From	To	From [Easting , Northing]	To [Easting , Northing]			Summary of Geology over typical depth of burial	Relevant exploratory holes	Comments	Bathymetry [m CD]	Seabed features	Comments	Maximum mobile bedform height	Fishing[1]	Anchor threat[2]	Principal sediment type for anchoring assessment	Recommended Depth of Lowering (DOL) to mitigate risks from fishing and mobile sediments	Recommended Depth of Lowering (DOL) to mitigate risks from anchors	Comments on Recommended Minimum Depth of Lowering
		KP27-52: Z26 Avanti (575t DWT fishing vessel) KP53-72: no recorded Fishing Vessels KP73-74: Z26 Avanti (575t DWT fishing vessel) KP74-77: no recorded Fishing Vessels - **Vessels At Anchor** KP0-21: no recorded Vessels at Anchor KP22-36: Grampian Talisman (3614t DWT Offshore Supply Ship) KP37-77: no recorded Vessels at Anchor - **Vessels with Restricted Manoeuvrability** Some vessel types under this category have been filtered based on its destination, specifically survey vessels (e.g Forth Jouster) and vessels serving nearby offshore windfarms (Mona, Morgan and Morecambe). KP0-51: no relevant vessels with Restricted Manoeuvrability KP52-60: Boka Topaz (8009 GRT Multi-Purpose Offshore Vessel) (assumed to have Danforth Anchor of c. 1000kg) KP61-62: no relevant vessels with Restricted Manoeuvrability KP63- Deo Gloria (2100t DWT TSHD dredger) (assumed to have Danforth Anchor of c. 100kg) KP64-77: no relevant vessels with Restricted Manoeuvrability - **Isle of Man Ferries in transit** KP42 – KP76: Ben my Chree (12,747t GRT Ro-Ro ferry, several 1000's crossings) KP48 – KP70: Manannan (5,029t GRT High speed ferry)																	
3.		**Definition of Depth of Lowering (DOL) after CTC835 Section 9:** **9 Specifying Depth of Lowering** Having identified the size of vessel, larger than which the risk to the cable is tolerable, the potential depth of penetration of the associated anchor must be determined. This must be combined with the required Depth of Lowering from other factors such as fishing and changes to the seabed in order to specify the Depth of Lowering. **9.1 Depth of Lowering Definition** The authors have noted that the terms burial depth, depth of cover, target depth and trench depth are often used interchangeably by different operators, developers, consultants and contractors. For clarity the following definitions as shown in Figure 9 - 1, all referenced from mean seabed, are used in this document and are suggested for cable burial risk assessments. Note that the two target depths are installation parameters based on known protection method and site conditions, and as such are not covered by this document. • **Recommended Minimum Depth of Lowering** – This is the minimum depth recommended for protection from the external threats, it is the direct output of the risk assessment. • **Target Depth of Lowering** – This is the depth that cable installers should target; specified by the developer. Target Depth of Lowering should be equal to or greater than the recommended minimum Depth of Lowering and may include a factor of safety; it may also be prudent to increase the target Depth of Lowering where the recommended minimum Depth of Lowering is relatively shallow. This will account for instability in burial tools. Where the target Depth of Lowering is not achieved no remedial action would be required as long as the recommended Minimum Depth of Lowering is achieved. • **Target Trench Depth** - Cable installers should determine the trench depth that they require based on the cable properties and the trenching tool selected to complete the works. This is usually the diameter of the cable plus between 0.1 m and 0.4 m beyond the Target Depth of Lowering. • **Depth of Cover** - the thickness of material on top of the cable after trenching. It is not normally required for cable protection; however, it may be required by some consenting authorities e.g. BSH in the German Sector where the 2 K^{10} rule is imposed.																	

KP		Co-ordinates		Length (km)	Proposed cable installation method	Sub-seabed geology and ground conditions			Seabed features			Hazard depth [m]				Depth of lowering[3] [m]		
From	To	From [Easting , Northing]	To [Easting , Northing]			Summary of Geology over typical depth of burial	Relevant exploratory holes	Comments	Bathymetry [m CD]	Seabed features	Comments	Maximum mobile bedform height	Fishing[1]	Anchor threat[2]	Principal sediment type for anchoring assessment	Recommended Depth of Lowering (DOL) to mitigate risks from fishing and mobile sediments	Recommended Depth of Lowering (DOL) to mitigate risks from anchors	Comments on Recommended Minimum Depth of Lowering
		 A Recommended Minimum Depth of Lowering B Target Depth of Lowering C Target Trench Depth D Depth of Cover Figure 9-1: Definition of Trench Parameters																
4.	The end of the cable routes to the start of each OSP has been assumed to be in a straight line from the assumed separation point from the nominal routes to the OSP's as there is no definite cable route in the array. This is illustrated in the image below:  Due to this assumption, the following has been considered in the CBRA as seen by the following superscripts: 4a: Length of the cable route is taken as the straight line from the final KP of each cable to the OSP 4b: Value of seabed mobility adopted for the cables in the array are based upon the values quoted by Gardline 2022 Geophysical Survey report																
5.	Information provided by this subscript is based upon data obtained from Project Elizabeth. These include: a) Bathymetry Survey of the Array b) Seabed Features of the Array c) Seabed Sediments of the Array																
6.	Where significant soft clay deposits (e.g. Irish Sea Mud Belt deposits) underlie the seabed the theoretical anchor penetration may exceed 3m. However in these instances the recommended DOL was limited to 3m which is the typical maximum practicable DOL which is achievable.																