MachairWind Offshore Windfarm

Chapter 3 Project Description

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GLOSSARY OF ACRONYMS

Term	Definition
ADD	Acoustic deterrent device
BGS	British Geological Survey
CMS	Construction Method Statement
DoL	Depth of lowering
DP	Dynamic Positioning
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMF	Electromagnetic fields
FLO	Fisheries Liaison Officer
GBS	Gravity base structures
GW	Gigawatts
HAT	Highest astronomical tide
HDD	Horizontal Directional Drilling
HND	Holistic Network Design
HV	High Voltage
HVDC	High Voltage Direct Current
IACs	Inter-array cables
km	Kilometres
LAT	Lowest Astronomical Tide
LV	Low voltage
MD	Marine Directorate
MD-LOT	Marine Directorate - Licensing and Operations Team
MCA	Maritime Coastguard Agency
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMMP	Marine Mammal Mitigation Protocol
MV	Medium voltage
NLB	Northern Lighthouse Board
OAA	Option Agreement Area
OnTDA	Onshore Transmission Development Area

Term	Definition
OSP	Offshore Substation Platform
O&M	Operation and maintenance
PDE	Project Design Envelope
PLGR	Pre-lay grapnel run
ROV	Remotely Operated Vehicle
SAC	Special Areas of Conservation
SCADA	Supervisory Control and Data Acquisition
SFF	Scottish Fishermen's Federation
SPR	ScottishPower Renewables
SSSI	Sites of Special Scientific Interest
UK	United Kingdom
UXO	Unexploded Ordnance
WDA	Windfarm Development Area
WTG	Wind Turbine Generator

GLOSSARY OF TERMS

Term	Definition
Bathymetry	Topography of the seabed.
Cable protection	Protective measure to minimise the effects of scour and hazards along the offshore cables (e.g. to prevent cable exposure or snagging of vessel anchors or fishing gear), as well as for protecting these cables at infrastructure crossing points.
Combined Assessment	A whole-Project assessment considering interactions between the Windfarm Development Area, Offshore Export Cable Corridor and Onshore Transmission Development Area (i.e. considering impact interactions and additive effects to determine if any effects would be materially elevated from those assessed for the Windfarm Development Area-alone assessment). Due to long delays in securing confirmation of the Project's grid connection location, the level of detail available for the Offshore Export Cable Corridor and Onshore Transmission Development Area is limited and therefore the assessment is commensurate with the level of detail available at the time of carrying out the assessment. Within the upcoming Offshore Export Cable Corridor and Onshore Transmission Development Area consent applications, their respective scoping and Environmental Impact Assessment Report / Environmental Report will take account of all likely effects predicted within the WDA EIA and present updated combined assessments using the latest available information covering all aspects of the Project.
Cumulative Effects Assessment	Assessment of likely significant effects resulting from the incremental change caused by other past, present and reasonably foreseeable projects / activities together with the Project. This is separate to combined effects arising between the Project's separate Development Areas.
Development Area	Application boundary for consenting purposes which, for the Project, consists of a Windfarm Development Area, Offshore Export Cable Corridor, and Onshore Transmission Development Area. Separate consent and marine licence applications will be submitted for each Development Area where applicable.
EIA Scoping Windfarm Development Area (WDA) Boundary	The 510 km 2 WDA boundary presented at the Project's EIA Scoping Stage.
Embedded mitigation measure	Mitigation measures, including industry good practice measures, that are directly incorporated into the design for the MachairWind Windfarm Development Area to avoid or reduce environmental effects.
Environmental Impact Assessment (EIA)	The process of evaluating the likely significant environmental effects of a proposed development over and above the existing circumstances (or 'baseline').
Environmental Impact Assessment (EIA) Regulations	A collective term referring to The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 and The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017.
Greenhouse gas	A gas in the Earth's atmosphere that traps heat by absorbing and emitting infrared radiation, a process known as the greenhouse effect. Also known by the collective shorthand "carbon".

Term	Definition
Highest astronomical tide (HAT)	The highest level that can be expected to occur under average meteorological conditions and under any combination of astronomical conditions.
Holistic Network Design (HND) process	An integrated approach for connecting 23 GW of offshore wind (including from ScotWind projects) to Great Britain providing a recommended offshore and onshore design for a 2030 electricity network, that facilitates the Government's ambition for 50 GW of offshore wind by 2030. The recommended design in the HND has equally considered four objectives to make sure the most appropriate approach is taken forwards, including: cost to consumer, deliverability and operability, impact on environment; and impact on local communities.
Inter-array cables (IACs)	Armoured cable containing electrical and fibre optic cores which link the wind turbine generators to each other and to the offshore substation platform(s).
Landfall	The area from Mean Low Water Springs to a transition bay(s), where the offshore export cable(s) come ashore.
Lowest Astronomical Tide (LAT)	The lowest level that can be expected to occur under average meteorological conditions and under any combination of astronomical conditions.
MachairWind Offshore Windfarm	An offshore windfarm capable of exporting around 2 GW of renewable energy to the National Electricity Transmission System. MachairWind Offshore Windfarm comprises three Development Areas: • The WDA – located on the west coast of Scotland to the northwest of Islay and west of Colonsay; • The Offshore Export Cable Corridor – a preliminary boundary extending from the WDA to mean high water springs at a landfall location near Girvan, South Ayrshire; and • The Onshore Transmission Development Area – a preliminary boundary which extends landward from mean low water springs and includes the land required for the landfall of the offshore export cables and their route up to but not including the proposed high voltage direct current switching station which will be developed and constructed by Transmission Owner, ScottishPower Transmission. Separate consent and licence applications will be submitted for each Development Area.
Mean High Water Springs (MHWS)	The average, over a year, of the heights of two successive high waters during those periods of 24 hours (once every fortnight) when the range of the tide is greatest.
Mean Low Water Springs (MLWS)	The average, over a year, of the heights of two successive low waters during those periods of 24 hours (once every fortnight) when the range of the tide is greatest.
Mean sea level	The average level of the sea taking account of all tidal effects but excluding surge events.
National Electricity Transmission System	The high-voltage electricity power transmission network serving Great Britain which receives electricity from generators (such as offshore windfarms) and transmits that electricity to anywhere on the National Electricity Transmission System to satisfy demand.

Term	Definition
Offshore cables	The collective term for all offshore cables i.e. IACs, offshore substation platform link cables, offshore export cables and associated fibre optic cables.
Offshore ECC infrastructure	The offshore transmission infrastructure located within the boundary of the Offshore Export Cable Corridor, namely the offshore export cable(s).
Offshore export cable	Armoured cable containing electrical cores between the offshore substation platform(s) and landfall. Offshore export cables will include bundled fibre optic cables. The offshore export cables are subject to Marine Licence applications under the Marine (Scotland) Act 2010. The portion of the offshore export cable(s) located within the WDA is assessed as part of this MachairWind WDA EIA and a marine licence application to construct, alter or improve this portion has been submitted alongside the WDA application. A separate marine licence application will be submitted for the portion of the offshore export cable(s) from the WDA boundary to mean high water Mean High Water Springs.
Offshore Export Cable Corridor (ECC)	The preliminary boundary extending from the WDA to mean high water springs near Girvan, South Ayrshire and within which the offshore export cable(s) will be located. A separate marine licence application will be submitted for the offshore export cable(s) located within the Offshore ECC.
Offshore Substation Platform (OSP)	An offshore platform with a fixed foundation located within the WDA which houses electrical equipment such as transformers, switchgear, protection and control systems, and enables the windfarm's renewable electricity to be collected via inter-array cables and exported to the National Electricity Transmission System via offshore export cables.
Offshore Substation Platform (OSP) link cables	Electrical cables which link OSPs (if more than one OSP is required). These cables will include fibre optic cores or bundled fibre optic cables. OSP link cables will be wholly located within the WDA.
Onshore Transmission Development Area (OnTDA)	The preliminary boundary which extends landward from mean low water springs and includes the land required for the landfall of the offshore export cables and their route up to but not including the proposed high voltage direct current switching station which will be developed and constructed by Transmission Owner, ScottishPower Transmission. This Transmission Owner is responsible for consenting the high voltage direct current switching station. Onward connections to the National Electricity Transmission System will be consented by National Grid Electricity Transmission and ScottishPower Transmission. Where relevant, these are considered as part of cumulative effects assessment in the EIA.
OnTDA infrastructure	The onshore transmission infrastructure, for which the Applicant is responsible, that is located primarily within the OnTDA, up to mean low water springs, and includes but is not limited to: landfall(s), onshore export cables, transition joint bays, telecom/SCADA infrastructure including vehicular access, joint bays, link boxes and temporary construction compounds. The OnTDA infrastructure will be subject to a planning application under the Town and Country Planning (Scotland) Act 1997.
Operational life	The operational life is the expected length of time from final commissioning of the WDA until the cessation of commercial operations. This is anticipated to be 35 years.
Option Agreement Area (OAA)	The seabed area awarded to ScottishPower Renewables in January 2022 through the Scotwind leasing round.

Term	Definition
Plan Option	A spatial plan area proposed through the Sectoral Marine Plan for offshore wind energy (as adopted in 2020). As part of the ScotWind leasing round, offshore wind developers submitted bids for Plan Options which, following a successful bid, become OAAs.
Pre-construction works	Pre-construction works are activities undertaken prior to formal commencement of construction. Examples include survey works such as geotechnical and geophysical surveys and seabed preparation activities.
Rochdale Envelope	An approach to environmental assessment which aims to take account of the need for flexibility in the future evolution of the detailed project proposal. The approach is named after two court rulings concerning outline planning applications for a proposed business park in Rochdale.
Safety zones	An area of water around or adjacent to a wind turbine generator or Offshore Substation Platform and associated substructure which is to be constructed, extended, operated or decommissioned, from which certain or all classes of vessels are excluded and within which activities can be regulated for the purpose of securing safety of the wind turbine generator, substructure or vessels in that vicinity, and individuals on both the wind turbine generator, substructure or vessel, in line with Section 95 of the Energy Act 2004.
Scottish Marine Area	The area of Scotland’s territorial sea limit (up to 12 nautical miles from baseline) as defined in the Marine (Scotland) Act 2010.
ScotWind	A Crown Estate Scotland seabed leasing round which enabled developers to apply for propose offshore wind projects and apply for seabed rights to plan and build windfarms in Scottish waters.
Scour protection	Protective measures to avoid sediment being eroded away from the base of the wind turbine generator foundations as a result of the flow of water.
The Applicant	The legal entity submitting consent applications for the MachairWind Offshore Windfarm, namely MachairWind Limited.
The Lighthouse	The Dubh Artach lighthouse.
The Project	MachairWind Offshore Windfarm including all its Development Areas and associated infrastructure.
Transition bay	Connects offshore and onshore export cables at the landfall. The transition bay will be located above mean high water.
WDA infrastructure	The offshore generation and transmission infrastructure located within the WDA including but not limited to: WTGs, WTG fixed foundations (and associated scour protection), OSP(s), OSP fixed foundations (and associated scour protection), IACs, OSP link and offshore export cable(s) and their associated external cable protection (insofar as these are located within the WDA) and fibre optic cables.
WDA restricted build area	Refers to the area within the WDA which is considered unsuitable for the installation of WTG and OSP foundations for engineering and environmental reasons.
Wind Turbine Generator (WTG)	A wind turbine generator which converts wind energy into electrical energy. Each wind turbine generator is a complex system composed of a high number of components. Typically, the main components include the rotor assembly (composed of three blades and a hub); the nacelle (containing a

Term	Definition
	generator, shaft and gearbox, power electronic converter and transformer); and the tower (containing lifting equipment and the switchgear).
Windfarm Development Area (WDA)	The application boundary within the OAA where consent will be sought for the proposed WDA infrastructure. The WDA infrastructure is subject to Section 36 consent and marine licence applications (generation and transmission) which are being applied for separately from the Offshore ECC infrastructure and OnTDA infrastructure.

3 PROJECT DESCRIPTION

3.1 INTRODUCTION

1. This chapter of the Environmental Impact Assessment (EIA) Report (EIAR) provides a description of the Windfarm Development Area (WDA) infrastructure of the MachairWind Offshore Windfarm Project ('the Project') including all construction, operation and maintenance (O&M) and decommissioning activities associated with the WDA. This chapter is informed by the understanding of the WDA site conditions from site-specific survey and design work undertaken by MachairWind Limited ('the Applicant'). The details provided inform and underpin the assessments that have been undertaken and presented in the EIAR. Chapters 7 to 21 should be referred to for details of the worst-case scenarios that apply to each assessment topic.

3.2 FLEXIBILITY AND THE PROJECT DESIGN ENVELOPE

2. The project design envelope approach (also known as the Rochdale Envelope approach) has been adopted for this MachairWind WDA EIAR and is further described in **Chapter 5 EIA Methodology**. This approach is implemented in accordance with current good practice, as described in Marine Scotland Consenting and Licensing Guidance for Offshore Wind, Wave and Tidal Energy Applications (2018) and related guidance outlined by the Marine Directorate (MD) and the Energy Consents Unit (Marine Scotland, 2022). The main requirements of the Marine Scotland (2022) guidance are to develop an "informed and credible" design envelope and to justify the parameters selected in relation to likely environmental effects.

3. The project design envelope described in this chapter provides reasoned values for a series of project design parameters. The information presented outlines the options and flexibility required for the delivery of the Project along with the range of potential design and activity parameters upon which the subsequent impact assessment chapters are based. The detailed design of the Project will be developed and refined within the consented project design envelope prior to construction, with the final design lying within the maximum extent of the consent (where provided).

4. The need for flexibility in the consent is a key aspect of any large development but is particularly significant for offshore wind projects where technology continues to evolve quickly. Therefore, the project design envelope must provide sufficient flexibility to enable the Applicant and its contractors to use the most up to date, efficient and cost-effective technology and techniques in the construction, operation and maintenance and decommissioning of the Project.

3.3 SITE DESCRIPTION

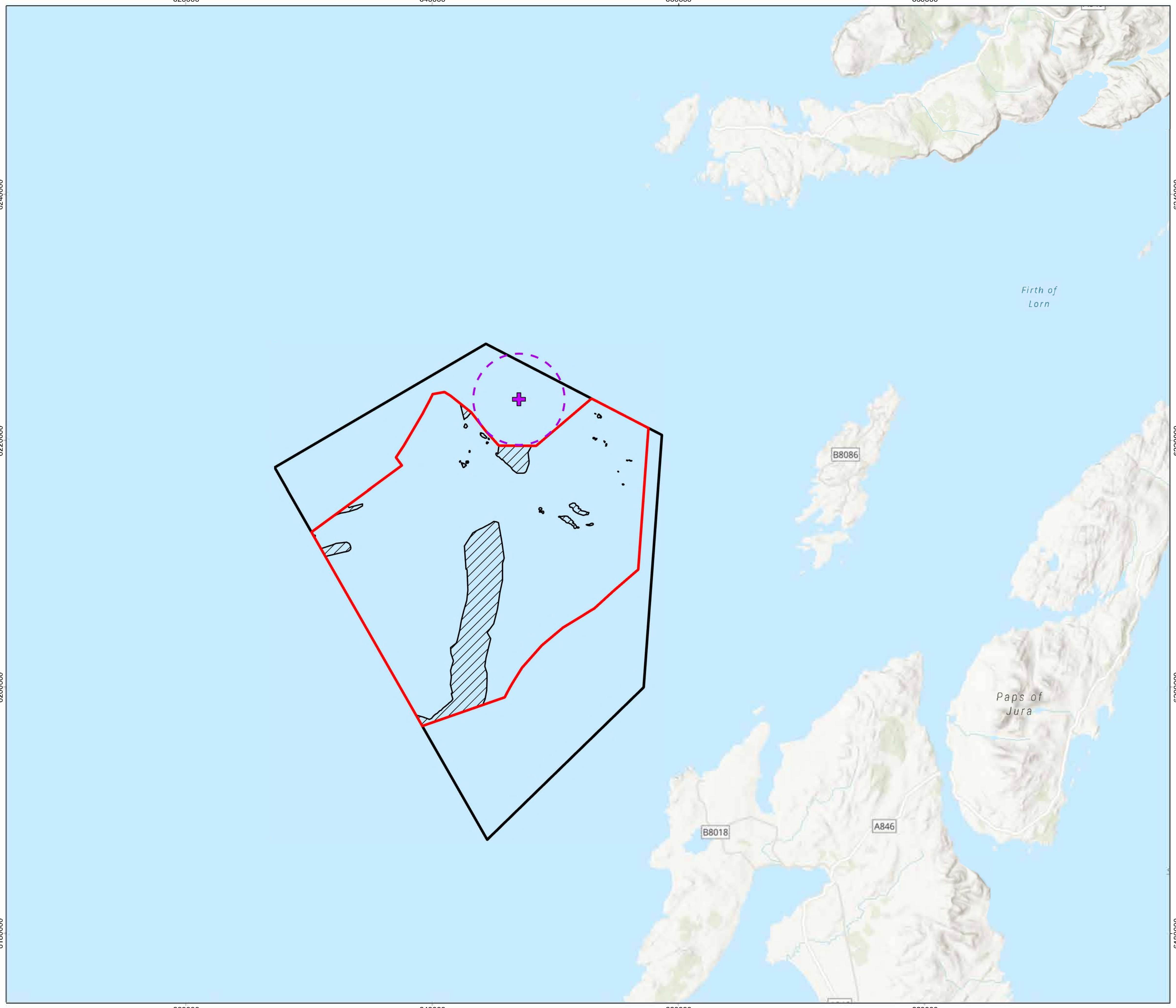
3.3.1 Development Areas Summary

5. As described in **Chapter 1 Introduction**, the Project has been divided into three Development Areas:

- The WDA (**Figure 3.1**);
- The Offshore Export Cable Corridor (ECC) (**Figure 3.2**); and
- The Onshore Transmission Development Area (OnTDA) (**Figure 3.3**).

6. Following delays stemming from the National Electricity System Operator's 2022 Holistic Network Design (HND) process, the grid connection location for the Project was confirmed in August 2025 to be in the vicinity of Girvan, South Ayrshire. Consequently, separate consent / marine licence applications will be sought for the Offshore ECC and OnTDA. It is anticipated that the Project will connect to a new High Voltage Direct Current (HVDC) switching station to be built by the Transmission System Operator near Girvan. Due to the type of HVDC technology that will be used

to transmit power generated from the Project to the grid network, the configuration and design of this infrastructure is in the early stages of development and will require refinement informed by discussions with the relevant Transmission Owners. To ensure a whole Project assessment is undertaken in a manner that is meaningful and proportionate, a set of assumptions have been developed to inform a combined assessment which will enable potential interactions and additive effects between each Development Area to be identified and assessed. These are set out in **Sections 3.7.1 and 3.7.2**.



Option Agreement Area
Windfarm Development Area
Windfarm Development Area Restricted Build Area
Dubh Artach Lighthouse
Dubh Artach Lighthouse (2nm Buffer)

N

0 4 8 12 Kilometres

REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER
2	21/11/2025	AB	GC	MI	PM

DRAWING NUMBER	MCW-DWF-ENV-MAP-RHS-000073		
DATUM	ETRS89	PROJECTION	UTM Zone 29N
SCALE	1:300,000	PAGE SIZE	A3
PROJECT TITLE	MachairWind		

Figure 3.1: WDA Overview

NOT TO BE USED FOR NAVIGATION

Haskoning
Enhancing Society Together
ScottishPower Renewables

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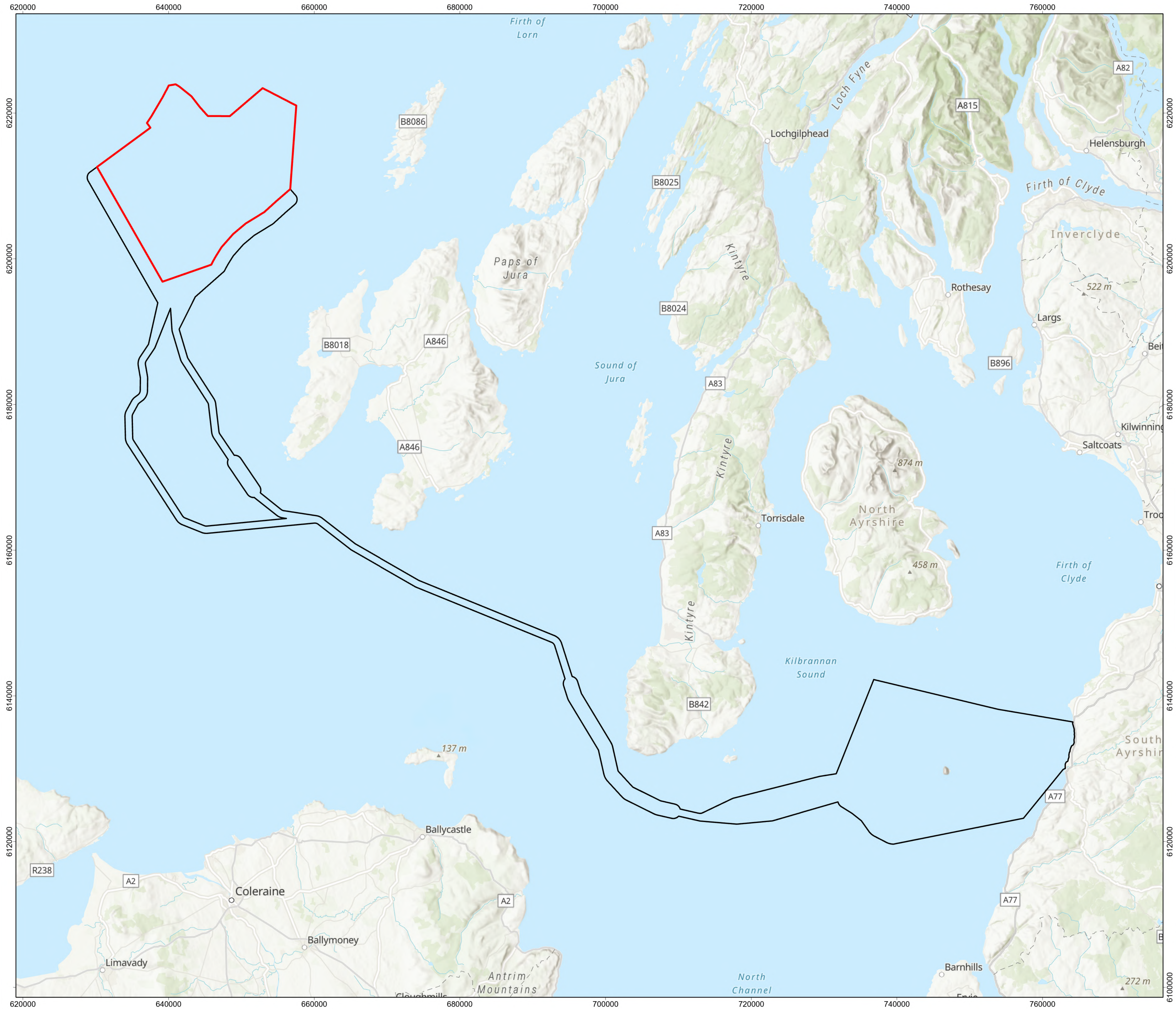

Windfarm Development Area

Offshore Export Cable Corridor

N

0 5 10 15 20 Kilometres

2	18/02/2026	AB	GC	PM	CG
REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER

DRAWING NUMBER	MCW-DWF-ENV-MAP-RHS-000116		
DATUM	ETRS89	PROJECTION	UTM Zone 29N
SCALE	1:500,000	PAGE SIZE	A3
PROJECT TITLE	MachairWind		

Figure 3.2: Offshore Export Cable Corridor – the preliminary boundary extending from the WDA to mean high water springs near Girvan, South Ayrshire and within which the offshore export cable(s) will be located

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ScottishPower Renewables

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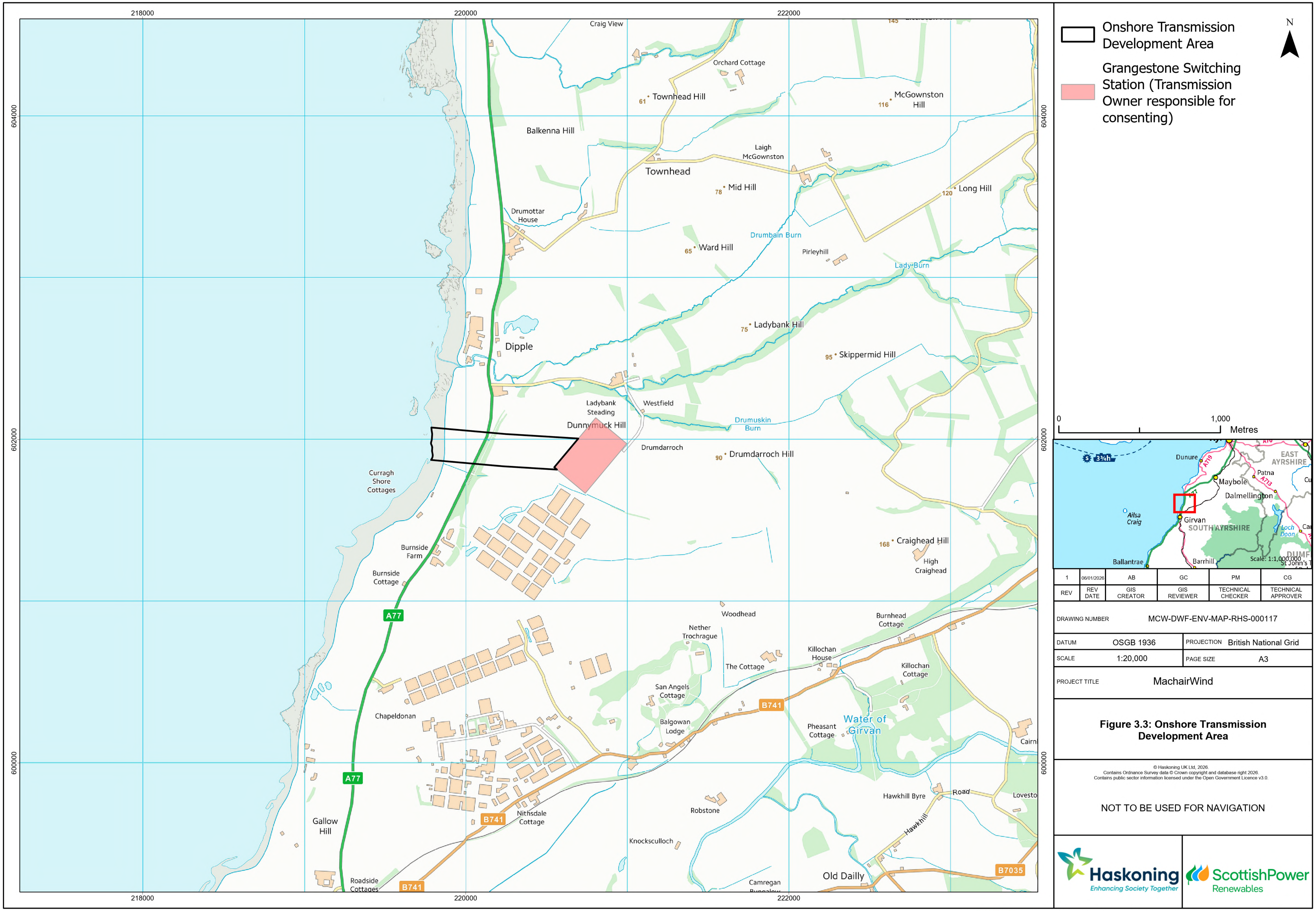

Onshore Transmission Development Area

Grangestone Switching Station (Transmission Owner responsible for consenting)

1	06/01/2026	AB	GC	PM	CG
REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER

DRAWING NUMBER	MCW-DWF-ENV-MAP-RHS-000117
DATUM	OSGB 1936
PROJECTION	British National Grid
SCALE	1:20,000
PAGE SIZE	A3
PROJECT TITLE	MachairWind

Figure 3.3: Onshore Transmission Development Area

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ScottishPower Renewables

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7. This chapter considers the following WDA infrastructure:

- Wind Turbine Generators (WTG) and associated fixed foundations and scour protection;
- Offshore Substation Platforms (OSP) and associated fixed foundations and scour protection;
- Inter-array cables and associated cable protection;
- OSP link cables and associated cable protection; and
- The portion of the offshore export cables located within the WDA, and associated cable protection.

8. Whilst a marine licence application for the Offshore ECC will be submitted separately and at a later date (anticipated 2027), the worst-case proportion of the offshore export cables that lie within the WDA (i.e. up to 200 km for up to four cables), and the associated activities, have been assessed within this WDA EIAR and included within the transmission marine licence alongside OSPs and OSP link cables. As set out in **Chapter 5 EIA Methodology**, each topic-specific chapter contains a combined assessment, insofar as the relevant information is available, of the effects arising from the WDA infrastructure, the Offshore ECC infrastructure and the OnTDA infrastructure.

3.3.2 Windfarm Development Area

9. The WDA is a 448 km^2 area located off the west coast of Scotland (**Figure 3.1**). The approximate distances to the nearest islands, at the closest point, are:

- 12.4 km west of Colonsay;
- 15 km northwest of Islay;
- 20 km southwest of Mull;
- 21 km southwest of Iona; and
- 30 km west of Jura.

10. Water depths within the WDA range from 21.6 m to 81.7 m below Lowest Astronomical Tide (LAT). The bathymetry across the WDA is highly variable in some locations whilst changes in bathymetry are more gradual in others. Towards the east and west of the WDA, bathymetry is similar, approximately between 40 m below LAT and 60 m below LAT. This is divided by a central north-north-east to south-south-west zone of generally lower bathymetry, approximately between 60 m below LAT and 70 m below LAT. The west of the WDA is characterised by sandwaves and a sandbank in the southwest. The maximum sandwave height in this region is approximately 6.6 m with wavelengths generally exceeding 200 m (see **Chapter 7 Marine Physical Environment**).

11. With respect to shallow bedrock, the bedrock towards the north of the WDA consists of undifferentiated rocks, including mudstone, sandstone and limestone (British Geological Survey (BGS), 2023). Across the centre of the WDA (east to west) a greater variety of undifferentiated rocks are present, comprising mudstone, sandstone, limestone, siliciclastic and argillaceous (BGS, 2023). In the south of the WDA, the bedrock is mainly metamorphic (metasedimentary) rocks (see **Chapter 7 Marine Physical Environment**).

3.3.3 Offshore Export Cable Corridor

12. The Offshore ECC (**Figure 3.2**) is the preliminary boundary extending from the WDA to mean high water springs near Girvan, South Ayrshire within which the offshore export cable(s) will be located. It has been defined for the purposes of carrying out a combined assessment of the whole-Project (see **Chapter 5 EIA Methodology**). A separate marine licence application will be submitted for the offshore export cable(s) located within the Offshore ECC.

13. Constraints such as existing infrastructure, cable crossings, existing cable landfalls and environmentally sensitive areas (such as the Ailsa Craig SPA and SSSI) were considered when

determining the northern and southern limits of the boundary. The route of the offshore export cable corridor is indicative and will be subject to refinement based on further desk top studies and stakeholder engagement. A high-level description of the Offshore ECC is provided in **Section 3.7.1**.

3.3.4 Onshore Transmission Development Area

14. The Onshore Transmission Development Area (OnTDA) (**Figure 3.3**) is the preliminary boundary which extends landward from mean low water springs and includes the land required for the landfall of the offshore export cables and their route up to but not including the proposed HVDC switching station which is being developed and constructed by Transmission Owner, ScottishPower Transmission. This Transmission Owner is responsible for consenting the high voltage direct current switching station. Onward connections to the National Electricity Transmission System will be consented by National Grid Energy Transmission and ScottishPower Transmission. Where relevant, these are considered as part of the cumulative effects assessment in the EIA.

15. The OnTDA infrastructure includes but is not limited to: landfall(s), onshore export cables, transition joint bays, telecom/ Supervisory Control and Data Acquisition (SCADA) infrastructure including vehicular access, joint bays, link boxes and temporary construction compounds. The OnTDA infrastructure will be subject to a planning application under the Town and Country Planning (Scotland) Act 1997. A high-level description of the OnTDA is provided in **Section 3.7.2**.

3.4 CONSULTATION

16. The Applicant has undertaken an extensive programme of community and stakeholder consultation to inform the EIA process and the design of the Project. The Pre-Application Consultation Report provides an overview of the consultation undertaken in the context of the wider EIA process, with details of how the Applicant has taken account of the comments received also provided in each assessment topic chapter of the EIAR where relevant. Full details of the consultation process including wider community consultation are presented in the Pre-Application Consultation Report, submitted as part of the Section 36 and Marine Licence applications.

17. Key project design decisions that have been made by the Applicant as a result of the consultation process and feedback received to date include:

- The narrowing of the WTG design envelope, reducing the total maximum number of WTGs from 147 to 144;
- A reduction in the maximum blade tip height from 340 m to 335 m above LAT, slightly reducing the magnitude of change on seascape receptors;
- An increase in the minimum air gap from 22.45 m to 28.4 m above Highest Astronomical Tide (HAT) to reduce collision risk effects on offshore ornithology receptors whilst accounting for metocean conditions at the Project; and
- Removal of gravity base structures (GBS) as a foundation option for WTGs, reducing the maximum seabed footprint and proportion of the water column taken up by Project infrastructure.

18. The consultation outcomes in relation to the Project Description chapter are outlined in **Table 3.1**, which summarises stakeholder feedback, outlines how the Applicant has responded to the feedback received, and details how it has been considered within this chapter.

Table 3.1 Summary of Consultation Relevant to the Project Description

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
1.	Argyll and Bute Council	09 January 2025: Scoping Opinion	I note that under section 17.8 Mitigation Measures, M-8 Cable Plan in Table 17.3 Indicative embedded mitigation measures for infrastructure and other marine users states that the Applicant plans to bury cables to a minimum a target burial depth of 0.5 m. Where under Table 8.8 Potential impacts scoped in or scoped out for benthic ecology of the Scoping Report it states: *Where cables are buried to sufficient depth, significant effects on benthic receptors are not expected. The United Kingdom (UK) National Policy Statement for Renewable Energy Infrastructure (EN-3) states that where cables are buried to 'a depth of at least 1.5 m below the seabed, the applicant should not have to assess the effect of the cables on benthic habitats during the operational phase of the offshore wind farm'. It is currently expected that cables will be buried where practicable, but the target depth will vary depending on the ground conditions encountered. It will therefore be important that cable burial will be at a minimum depth of 1.5 m below the seabed, where environmental conditions allow."*	As described in **Section 3.6.7.5** The purpose of cable burial is to ensure that the cables are protected from damage, either from human activities such as fishing and shipping, or from naturally occurring physical morphology processes acting on the seabed. Cable minimum Depth of Lowering (DoL) (i.e. the distance between mean seabed level and the top surface of the buried cable (**Plate 3.7**) will be between 0.3 m and 3 m but is typically between 1.0 m and 2.0 m in seabed substrates consisting of granular material or soft clay. Where practicable, the Applicant will seek to achieve DoLs of 1.0 m to 2.0 m for all offshore cable types. DoLs of up to 3.0 m may be used for areas experiencing significant seabed mobility or due to an increased external threat, such as crossing shipping lanes. DoLs of 0.3 m may be used for inter-array cables (IACs) in challenging ground conditions such as shallow outcropping rock, due to the inherent protection it provides the cable at a shallower DoL. OSP link cables and offshore export cables would, as far as practicable, have a minimum DoL of 1 m. Otherwise, external cable protection methods would be considered such as concrete mattresses, rock placement, rock bags and nature inclusive design solutions (see **Section 3.6.9** for further details). The preferred method of cable protection is through cable burial. The use of external cable protection methods would be avoided as far as practicable and the Applicant is considering the use of nature inclusive design solutions (see **Section 3.6.7.6** and the **Nature Positive Plan**). **Chapter 8 Benthic Ecology** and **Chapter 9 Fish (Including Basking Shark) and Shellfish**, assess the potential impact from electromagnetic fields (EMF).
2.	Argyll and Bute Council	09 January 2025: Scoping Opinion	Many of the potential impacts of the proposal cannot be determined until further progress has been made on the location for the construction and operational bases. An	**Section 3.6.10** explains the indicative ports which have been considered in the assessments for the relevant chapters of this EIA.

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			O&M strategy will cover all O&M activities required for each infrastructure component and provide information on the expected vessels usage and how these will be implemented throughout the operational lifetime of the Project.	**Section 3.6.14.1** explains the anticipated vessel and helicopter requirements during the O&M phase.
3.	Argyll and Bute Council	09 January 2025: Scoping Opinion	The description of development for the EIAR must include: i. A description of the physical characteristics of the whole development and the full land use requirements during the operational, construction and decommissioning phases; ii. A description of the main characteristics of the production processes, for instance, nature and quantity of the materials used; iii. The risk of accidents, having regard in particular to substances or technologies used; iv. An estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light/flicker, heat, radiation, etc.) resulting from the operation of the development; and v. The estimated cumulative impact of the project with other consented or operation development.	i. This Chapter sets out the physical characteristics and land use requirements during the construction, operation and maintenance and decommissioning phases of the WDA infrastructure. **Chapter 1 Introduction** provides a description of the Project's consenting approach. Due to the early stage of development with respect to the Project's grid connection location it is not possible at this stage to provide a full description of the Offshore ECC and OnTDA however **Sections 3.3.3** and **3.3.4** respectively set out the current position. ii. Details of the nature and quantity (worst-case) of the materials used with respect to the WDA infrastructure is provided in this chapter, **Chapter 19 Greenhouse Gas Assessment** and the Marine Licence application forms. Regarding production processes, given the Project's early phase of development, many of these aspects are yet to be confirmed however **Chapter 19 Greenhouse Gas Assessment** provides worst-case assumptions around potential WDA infrastructure production processes and construction methodologies and their potential impact on greenhouse gas. iii. See **Chapter 21 Major Accidents and Disasters**. iv. See **Chapter 19 Greenhouse Gas Assessment**. Offshore air quality has been scoped out as per the Scoping Report. Similarly, impacts on water quality through the release of contaminants and impacts to water and sediment quality through pollution events have been scoped out as per the

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
				Scoping Report. Underwater noise is assessed in **Chapter 9 Fish (Including Basking Shark) and Shellfish** and **Chapter 10 Marine Mammals and Leatherback Turtle**. Potential impacts from thermal emissions from cables is assessed in **Chapter 8 Benthic Ecology**. There is no pathway for the WDA infrastructure / activities to impact soil pollution, light / flicker or radiation. v. A Cumulative Effects Assessment is provided within each topic-specific chapter of this EIAR, as appropriate.
4.	Iona Community Council	09 January 2025: Scoping Opinion	Present more clearly and upfront the routes and impacts of substations and battery storage required to store and send this power south.	See **Chapter 1 Introduction** for a description of the Project's consenting approach. Due to the early stage of development with respect to the Project's grid connection location, it is not possible at this stage to provide a full description of the Offshore ECC and OnTDA however **Sections 3.3.3** and **3.3.4** respectively set out the current understanding. Additionally, it is not anticipated that there would be any requirement for battery storage infrastructure.
5.	Marine Directorate Licencing and Operations Team (MD-LOT)	09 January 2025: Scoping Opinion	The Scottish Ministers note that the Scoping Report only describes the wind farm development area components of the Proposed Development and that the Developer seeks to obtain a separate Scoping Opinion from MD-LOT, for the associated offshore transmission works, and intends to submit a separate planning application to South Ayrshire Council, for the associated onshore transmission infrastructure, at a later date. For completeness, the Scottish Ministers highlight the requirement for the Developer to obtain a separate Scoping Opinion from South Ayrshire Council for the associated onshore transmission infrastructure. It is essential that sufficient information concerning proposed offshore export cable works and onshore works is included in the wind farm development area EIA Report to understand the cumulative impacts of the	See **Chapter 1 Introduction** for a description of the Project's consenting approach. All infrastructure that will be located within the WDA (i.e. including transmission infrastructure) is assessed within this WDA EIAR. Potential additive or interactional effects from Offshore ECC or OnTDA infrastructure located outside of the WDA is considered within a combined assessment for each topic-specific assessment which is commensurate with the level of detail available at the time of carrying out the assessments. This approach ensures a whole Project assessment is undertaken. Further details are presented in **Chapter 5 EIA Methodology**.

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			Proposed Development. This will ensure that as much information as possible relating to the project as a 'whole' is presented. The EIA Report for the Proposed Development must consider the cumulative impacts with the onshore works.	
6.	MD-LOT	09 January 2025: Scoping Opinion	Section 3.2 of the Scoping Report outlines the Project Design Envelope approach. Although an indicative design envelope has been provided in Tables 3.2 to 3.7 of the Scoping Report, the EIA Report must include a full and detailed description of all options considered within the design envelope. The advice provided in this Scoping Opinion is proportionate to the level of detail provided in the Scoping Report. Further information on the design envelope approach is set out in Sections 2.4.17 to 2.4.20 of the Scoping Opinion below.	A detailed description of the WDA infrastructure and its maximum design envelope is provided in this chapter. WTG and WTG foundation parameters are provided in **Sections 3.6.2** and **3.6.3.3** respectively.
7.	MD-LOT	09 January 2025: Scoping Opinion	Section 3.4.1 of the Scoping Report states that the final WTG design will be defined post consent. The Scottish Ministers advise that the EIA Report must include a full and detailed description of all WTG parameters considered within the design envelope.	
8.	MD-LOT	09 January 2025: Scoping Opinion	Section 3.4.2 of the Scoping Report states that a number of fixed foundation substructure designs are currently being reviewed for the Proposed Development. A design envelope has been provided in Tables 3.3 to 3.6 of the Scoping Report. The Scottish Ministers advise that the EIA Report must include a full and detailed description of all substructure designs considered within the design envelope.	
9.	MD-LOT	09 January 2025: Scoping Opinion	Section 3.4.4 of the Scoping Report outlines that IACs will either be buried below the seabed or will utilise external cable protection such as rock placement and	**Section 3.6.7.5** provides details of cable burial. Also see **I.D. 1** of this table regarding cable burial depths.

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			concrete mattresses once cabling becomes static on the seabed. The EIA Report must provide an estimate of the anticipated likelihood of suitable burial along cable routes and be clear on the range of burial depths that have been considered as part of the assessment. Clear narrative must be provided within the EIA Report to show how this has been estimated prior to the further geophysical and geotechnical surveys being undertaken.	In the absence of detailed geotechnical information and the likely presence of shallow bedrock throughout the WDA, a conservative estimate of up to 10% of offshore cables within the WDA requiring external cable protection where an adequate degree of protection has not been achieved from the burial process has been assumed in the EIA. This has been informed by publicly available datasets (e.g. BGS (2023) and the Project's site investigation surveys alongside experience of projects with similar seabed conditions. Details are provided in **Section 3.6.7.7.4**.
10.	MD-LOT	09 January 2025: Scoping Opinion	Where reliance is placed on a subsequent cable plan or cable burial risk assessment as mitigation, the EIA Report must explain how this measure will mitigate the effects, what measures are proposed for inclusion and the effectiveness and degree of confidence that can be placed on such measure. It is recommended that such plans are included alongside the EIA Report.	An outline Cable Plan has not been submitted with the application however in line with MD-LOT guidance (MD-LOT, 2025) this will be produced post-consent and will describe the technical specification of the offshore cables alongside measures that will be put in place to avoid or reduce the adverse effects of the Project on civilian and military marine navigation. It is also anticipated that the following will be described in the Cable Plan: • Consideration of the potential effect of EMF on civil and military marine navigation and ecological receptors; • Cable burial risk assessment; • Locations and lengths of cable burial and burial depths; • Cable crossing location information; • Micro-siting requirements i.e. of cable routes to avoid, where practicable, potential impacts on sensitive benthic features identified during pre-construction surveys; • External cable protection requirements (including consideration of reduction in navigable depth); and • Details of post-construction cable surveys for asset integrity purposes.
11.	MD-LOT	09 January 2025: Scoping Opinion	Any cable protection to be used to protect the IACs must be assessed in the EIA Report including details on materials, quantities and location. In addition, any	See **I.D. 9** of this table regarding external cable protection.

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			seabed levelling or removal of substances or objects from on or under the seabed, required for installation of IACs will require consideration in the EIA Report and may require a marine licence. Should seabed preparation involve dredging, the EIA Report must identify the quantities of dredged material and identify the likely location for deposit. The Developer may also be required to submit pre-dredge sample analysis, this should include supporting characterisation of the new or existing deposit sites.	A summary of the temporary construction footprints including seabed preparation and sandwave levelling (via dredging or sandwave clearance, using a plough, or similar), is provided in **Section 3.6.1.1**. Any dredged material would be redeposited within the WDA. Regarding boulder clearance, see **I.D. 12** of this table. Sandwave levelling calculations are provided in **Section 3.6.7**. Seabed preparation calculations for WTGs and OSPs are provided in **Sections 3.6.2** and **3.6.4** respectively.
12.	MD-LOT	09 January 2025: Scoping Opinion	Section 3.5.3.1 of the Scoping Report outlines that boulders may be present at the site of the Proposed Development. The EIA Report must provide the anticipated estimate of boulders to be cleared (including how much uncertainty may be associated with the figures presented). Clear narrative must be provided within the EIA Report to show how this has been estimated.	**Section 3.6.7.4.1** notes that where boulders cannot be avoided through micro-siting, they would be relocated to an adjacent area of seabed within the WDA where they do not present an obstacle to the works, and where possible to an area of seabed with similar sediment type and avoiding any known sensitive habitats. If required, boulder clearance would be undertaken by subsea grab or plough. Boulders that present an obstacle to the construction activities would be confirmed by the pre-construction surveys. Where boulders are not able to be micro-sited around, they would be relocated to an adjacent area of seabed within 20 m. As such, the temporary seabed disturbance footprint would be encompassed by the assumed 20 m wide temporary disturbance footprint from cable installation (**Section 3.6.7.4.1**). Similarly, boulders required to be relocated for WTG or OSP foundations would be placed within the maximum temporary seabed disturbance footprints of foundations (**Section 3.6.2.1**). Where boulders are required to be relocated, the Project's Fisheries Liaison Officer (FLO) will liaise with the fishing industry on their locations.
13.	MD-LOT	09 January 2025: Scoping Opinion	Section 3.5 of the Scoping Report provides an overview of the proposed development phases. There is brief	Details on underwater noise are provided in **Section 3.6.5** and on pre-installation works relating to UXO avoidance in **Section 3.6.7.4.2**.

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			mention of pre-construction surveys and site investigations including geophysical surveys and unexploded ordnance ("UXO") surveys within Section 3.5.2. The Scottish Ministers advise that the EIA Report must describe and assess the environmental effects, including in-combination effects, of the range of surveys which may be required such as geophysical and geotechnical survey activities and UXO clearance. The EIA Report must also include consideration of the options which will be assessed in relation to UXO clearance, the differences amongst them and an assessment of the environmental effects of these options. In this regard, the Scottish Ministers advise that the EIA Report must include a worst case scenario of high order detonation in terms of impact and mitigation, unless there is robust supporting evidence that can be presented to show consistent performance of the preferred low order or deflagration method. The Scottish Ministers refer to the Joint Statement – Marine environment: unexploded ordnance clearance in this regard.	Potential cumulative and in-combination impacts from noise emitting surveys and UXO clearance impacts are assessed in **Chapter 10 Marine Mammals and Leatherback Turtle** and the **Report to Inform Appropriate Assessment**. For UXO, high order clearance is assessed as a worst-case scenario however the expectation is that low order clearance techniques will be used. An assessment based on low-order clearance techniques is provided. **Chapter 9 Fish (Including Basking Shark) and Shellfish** also considers underwater noise impacts from UXO clearance. Potential impacts from vessel activity are assessed in **Chapter 10 Marine Mammals and Leatherback Turtle** and **Chapter 9 Fish (Including Basking Shark) and Shellfish**. It should be noted that UXO clearance works will be the subject of a separate marine licence application(s) prior to the start of construction.
14.	MD-LOT	09 January 2025: Scoping Opinion	The Scottish Ministers, in line with the Transport Scotland advice, advise that the EIA Report should assess the potential impact of the transport of materials on the trunk road network and include an abnormal loads assessment report should WTG components require to be transported by road to ports prior to assembly. This view is supported by Argyll and Bute Council.	As discussed with Transport Scotland and Argyll and Bute Council during a meeting on 10 December 2025, due to the size and volume of the proposed WDA infrastructure, it is anticipated that the overwhelming majority of components will be transported to site by vessel and not on the road network. Transport Scotland requested information regarding the level of project-generated traffic to provide evidence that the level of additional traffic could be managed. The Applicant issued a follow-up email to Transport Scotland and Argyll and Bute Council on 11 February 2026 providing the requested traffic generation information for each of the port types (marshalling

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
				and assembly, marine operations, and operation and maintenance). In response, on 10 March 2026, Transport Scotland agreed that traffic and transport could be scoped out of the WDA EIAR providing the EIAR contained a dedicated section on traffic generation within the Project Description chapter. The predicted traffic generation is set out within **Section 3.6.11**. When it is time to bring forward a planning application for the OnTDA, the potential for impacts associated with traffic and transport will be considered in the application process and consultation will be undertaken with all relevant stakeholders regarding the suitable approach to any assessment.
15.	MD-LOT	09 January 2025: Scoping Opinion	Section 3.5.4 of the Scoping Report details that the operation and maintenance activities will be considered once the infrastructure details are confirmed and an operation and maintenance base for the Proposed Development has been selected. The Scottish Ministers advise that the EIA Report must provide a full description and consideration of the nature and scope of these activities, including the types of activity, their frequency, how activities will be carried out for the Proposed Development and any anticipated cumulative impacts with neighbouring developments. Such proposed activities may require to be permitted by a marine licence issued for the Proposed Development, unless an exemption applies.	Potential impacts during O&M and decommissioning are assessed within topic-specific chapters of the EIA. Further detail on offshore O&M activities and decommissioning is provided in **Sections 3.6.14** and **3.6.16** of this chapter respectively. See **I.D. 2** of this table regarding O&M ports.
16.	MD-LOT	09 January 2025: Scoping Opinion	Section 3.5.5 of the Scoping Report confirms a decommissioning programme will be prepared and submitted to Scottish Ministers in line with the Energy Act 2004 and that further details will be provided in the EIA Report. The EIA Report must include an assessment of potentially significant effects during the decommissioning phase of the Proposed Development.	

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			Any uncertainty on the impacts upon receptors from activities during decommissioning should be clearly explained, along with the implications for the assessment of significant effects.	
17.	MD-LOT	09 January 2025: Scoping Opinion	The EIA Report must provide the estimate of expected residues and emissions, for example drill cuttings where considered, in the design envelope. Specific reference should be made to water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases, where relevant. This information should be provided in a clear and consistent fashion and may be integrated into the relevant aspect assessments.	See **Chapter 19 Greenhouse Gas Assessment** for details of emissions generated during construction. Details of drill arisings from the installation of WTG and OSP foundations is detailed in **Section 3.6.2** and **Section 3.6.4.1** and assessed in **Chapters 7-9**. Offshore air quality has been scoped out as per the Scoping Report. Similarly, impacts on water quality through the release of contaminants and impacts to water and sediment quality through pollution events have been scoped out as per the Scoping Report. Underwater noise is assessed in **Chapter 9 Fish (Including Basking Shark) and Shellfish** and **Chapter 10 Marine Mammals and Leatherback Turtle**. Potential impacts from thermal emissions from cables is assessed in **Chapter 8 Benthic Ecology**. There is no pathway for the WDA infrastructure / activities to impact soil pollution, light / flicker or radiation.
18.	MD-LOT	09 January 2025: Scoping Opinion	The Scottish Ministers were content to consult on the Scoping Report without coordinates included. However, coordinates must be included alongside the EIA Report detailing the outline of the offshore turbine array.	WDA coordinates have been included within the Marine Licence application forms submitted alongside the application.
19.	MD-LOT	09 January 2025: Scoping Opinion	The Scottish Ministers direct the Developer to the NatureScot representation on the need to understand potential impacts holistically at a wider ecosystem scale, rather than just as discrete individual receptor assessments. The Scottish Ministers therefore advise that potential impacts should be given consideration across key trophic levels, particularly in relation to the availability of prey species. Detailed advice on	**Chapter 22 Interrelated Effects and Ecosystem Assessment** considers how potential impacts could act holistically at a wider scale. The potential for multiple effects on a receptor group, as presented within topic-specific chapters, to interact to create inter-related effects is considered alongside the inter-related effects across different trophic levels of the ecosystem, affecting the environment.

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			assessment of across trophic levels is provided in the receptor chapters in Section 5 of the Scoping Opinion.	
20.	MD-LOT	09 January 2025: Scoping Opinion	The Scottish Ministers direct the Developer to the NatureScot representation on the need to understand potential impacts holistically at a wider ecosystem scale, rather than just as discrete individual receptor assessments. The Scottish Ministers therefore advise that potential impacts should be given consideration across key trophic levels, particularly in relation to the availability of prey species. Detailed advice on assessment of across trophic levels is provided in the receptor chapters in Section 5 of the Scoping Opinion.	**Chapter 22 Interrelated Effects and Ecosystem Assessment** considers how potential impacts could act holistically at a wider scale. The potential for multiple effects on a receptor group, as presented within topic-specific chapters, to interact to create inter-related effects is considered alongside the inter-related effects across different trophic levels of the ecosystem, affecting the environment.
21.	MD-LOT	09 January 2025: Scoping Opinion	Regulatory approvals will be required for licensable activities including all construction activities, whether as part of the original construction or any subsequent alteration or improvement, any deposit on, or removal from on or under, the seabed of substances, any dredging and deposit, and any use of explosive substances. Any reference to the 'Proposed Development' in this Scoping Opinion should be taken, as appropriate, to include all activities in connection with the construction, alteration, improvement (including 'changeouts' of components) and decommissioning of the Proposed Development for which a regulatory approval will be needed. The Developer should give consideration to all activities related to the Proposed Development which require regulatory approval and ensure that these are applied for as appropriate.	This chapter describes the maximum design envelope for the WDA infrastructure components and the associated activities for which consents and licences to construct, alter or improve are being sought. It also describes the activities associated with the operation and maintenance and decommissioning phases of the WDA infrastructure. The details provided inform and underpin the assessments that have been undertaken and presented in the EIAR. Chapters 7 to 21 should be referred to for details of the worst-case scenarios that apply to each assessment topic. Detail on decommissioning is provided in **Section 3.6.16** and within individual chapters.
22.	MD-LOT	09 January 2025: Scoping Opinion	The Scottish Ministers note the Developer's intention to apply a 'Design Envelope' approach. Where the details of the Proposed Development cannot be defined precisely, the Developer will apply a worst case	The Applicant has sought to refine the design envelope as far as practicable. Since scoping, gravity base structures have been discounted as a WTG foundation option (significantly reducing worst-case seabed disturbance footprints and volumes of seabed

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			scenario, as set out in Section 3.2 of the Scoping Report. The Scottish Ministers advise that the Developer must make every attempt to narrow the range of options. Where flexibility in the design envelope is required, this must be defined within the EIA Report and the reasons for requiring such flexibility clearly stated. At the time of application, the parameters of the Proposed Development should not be so wide-ranging as to represent effectively different projects. To address any uncertainty, the EIA Report must consider the potential impacts associated with each of the different scenarios. The criteria for selecting the worst case and the most likely scenario, together with the potential impacts arising from these, must also be described. The parameters of the Proposed Development must be clearly and consistently defined in the application for the s.36 consent and marine licences and the accompanying EIA Report.	preparation). Additionally, the maximum WTG tip height has reduced from 340 m to 335 m (mLAT) which will slightly reduce the magnitude of change on seascape receptors. Realistic worst-case scenarios have been applied to WDA infrastructure and associated activities to ensure a flexible approach for the reasons set out at **Paragraph 4** above. Chapters 7 to 21 should be referred to for details of the worst-case scenarios that apply to each assessment topic.
23.	MD-LOT	09 January 2025: Scoping Opinion	The Scottish Ministers will determine the applications based on the worst case scenario. The EIA will reduce the degree of design flexibility required and the detail may be further refined in a Construction Method Statement ("CMS") to be submitted to the Scottish Ministers, for their approval, before works commence. Please note however, the information provided in Section 7 below regarding multi-stage consent and regulatory approval. The CMS will 'freeze' the design of the project and will be reviewed by the Scottish Ministers to ensure that the worst case scenario described in the EIA Report is not exceeded.	Noted. The Applicant has prepared this EIA Report in accordance with the Rochdale Envelope approach described at **Section 3.2** above.

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24.	MD-LOT	09 January 2025: Scoping Opinion	It is a matter for the Developer, in preparing the EIA Report, to consider whether it is possible to robustly assess a range of impacts resulting from a large number of undecided parameters. If the Proposed Development or any associated activities materially change prior to the submission of the EIA Report, the Developer may wish to consider requesting a new scoping opinion.	It should be noted that the WDA Scoping Report did not include a description of OSPs and OSP link cables which are now being assessed in this WDA EIAR and for which a marine licence to construct, alter or improve is being sought. The Applicant discussed this at a meeting with MD-LOT and NatureScot on 10 June 2025 where it was explained that there would be no new impacts as a result of this inclusion and therefore the Scoping Opinion would remain valid. MD-LOT and NatureScot did not raise any concerns regarding this. Additionally, the portion of the offshore export cables that will be located within the WDA has been assessed as part of the WDA-alone assessment in the technical chapters of this EIAR and these are included in the marine licence application for the transmission assets as part of the WDA EIAR.
25.	MD-LOT	09 January 2025: Scoping Opinion	The EIA Regulations require that the EIA Report include 'a description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the Developer, which are relevant to the proposed works and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects'. The Scottish Ministers acknowledge section 3.6 of the Developer's Scoping Report setting out the consideration of alternatives to date together with the planned activities that are proposed to inform the EIA Report further. The Scottish Ministers advise however that these considerations must include how decommissioning has been taken into account within the design options. The Scottish Ministers advise that this must be based on the presumption of as close to full removal as possible of all	Detail on decommissioning is provided in **Section 3.6.16**. Also, see **Chapter 4 Site Selection and Alternatives**.

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			infrastructure and assets and should consider the methods and processes of doing so.	
26.	MD-LOT	09 January 2025: Scoping Opinion	The Scottish Ministers highlight the representation from NatureScot regarding the proposed approach to mitigation and request that consideration is given to ensuring a target cable burial depth of at least 1m to mitigate the effects of EMF on benthic ecology receptors. In addition, the Scottish Ministers direct the Developer to the representation from Argyll and Bute Council with regards to cable burial depth for consideration.	See response at **I.D. 1** of this table and **Chapter 8 Benthic Ecology** and **Chapter 9 Fish (Including Basking Shark) & Shellfish** which provide an assessment of effects from EMF.
27.	Scottish Fishermen's Federation	09 January 2025: Scoping Opinion	SFF notes from sub-section 3.4.2 'Wind Turbine Generation Foundations; (p29) of the SR that the PDE presently incorporates options for fixed foundation, and it is possible that more than one type of foundation could be used across the wind farm development area (WDA). The following 2 foundation design options are currently being considered for WTGs: Monopiles; Jackets on pin piles; Jackets on suction buckets; and Gravity Base Structures (GBS). Our primary concern is the spatial footprint of the WTGs foundation, therefore, SFF would propose to the Applicant to use the monopile design (which has lesser spatial footprint).	Given the early stage of the Project, commitments to a specific WTG foundation type are not able to be made at this stage due to the need for detailed design work to be carried out post-consent in order to secure a more detailed understanding of site conditions. However, since submission of the Scoping Report, GBS foundations for WTGs have been removed from the design envelope following detailed checks on feasibility. As GBS have markedly greater seabed footprint and seabed preparation requirements and take up much more of the water column compared to other foundation types, the worst-case assumptions for relevant topic assessments are reduced compared to what they would have been. Whilst GBS foundations are included as an option for OSPs, since there would only be up to two of these, the overall spatial footprint of the OSP foundations is comparatively small compared to the overall spatial footprint that would be required were WTGs to utilise GBS.
28.	Scottish Fishermen's Federation	09 January 2025: Scoping Opinion	The SFF notes from 'Table 3.7 Indicative design envelope parameters: Inter-Array Cables' (p33) that the maximum width of cable trench will be 5m. However, the SR is not clear about the total width of IAC corridor that would require seabed disturbance (to prepare seabed for cable trench works) and the total seabed	See **I.D. 24** of this table. A marine licence for the OSP link and export cables is now also being applied for as part of the WDA consent application.

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			areas that will be disturbed during seabed preparation for IAC works. The SFF enquire how many metres of seabed would be disturbed on two sides of cable trench and how much of seabed areas would be disturbed for IAC lay work? As the maximum total inter-array cable length will be c.450km, we would request that the impacts of the IAC seabed preparation works on marine environment to be scoped in.	Details of seabed disturbance areas for installation of all cable types (i.e. including IACs, OSP link cables and the portion of the export cable within the WDA) are provided in **Section 3.6.7**. The maximum length of IACs has been increased from 450 km to 529 km following further consideration of worst-case scenarios. The maximum seabed disturbance width (i.e. including any sediment mounds created at either side of the installation tool) is assumed to be 20 m as a worst-case and this is assumed to encompass the potential width of disturbance from seabed preparation activities i.e. boulder clearance and Pre-lay grapnel run (PLGR) however the footprint of sandwave levelling disturbance is assessed as additional disturbance on a precautionary basis. Further detail on cables is provided in **Section 3.6.7**. Potential impacts from the installation of offshore cables have been scoped into the EIAR, as appropriate.
29.	Scottish Fishermen's Federation	09 January 2025: Scoping Opinion	The SFF notes from sections 3.4.4 ‘Inter-array cables’ (p33) that it is likely that IACs will be buried in the seabed from the cable seabed touchdown point at the base of the WTG foundation. Cable protection may be used at the IAC seabed touchdown point at the base of the WTG foundation, at cable or pipeline crossings, or where an adequate degree of protection has not been achieved from the burial process. The primary concern of the SFF is fishermen’s safety, the SFF would appreciate it if the Applicant could make all efforts to reach the required depth of cable burial. The avoidance of using cable protection measures as much as reasonably practical would also be appreciated as the volume of cable protection mass will disrupt the marine habitat and would create a snagging hazard for fishing vessels within the array area.	The preferred method of cable protection is through cable burial which is described in **Section 3.6.7.5**. The use of external cable protection methods would be avoided as far as practicable and the Applicant is considering the use of nature inclusive design solutions (see **Nature Positive Plan**). As a worst-case scenario, it is assumed that up to 10% of the length of each cable will require external cable protection. Further detail on cable protection is provided in **Section 3.6.7.7**. Concrete mattresses would likely only be used on short sections of unburied cable since they are expensive and time-consuming to install. In addition, early and continuous engagement with fishers including on the location of cable protection and crossings would be undertaken in line with Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW) (2025) guidelines. In instances where cable protection is required, procedures would be carried out to ensure that the

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30.	Scottish Fishermen's Federation	09 January 2025: Scoping Opinion	In terms of using cable protections, SFF is opposed to using concrete mattresses, grout/rock bags and sandbags in open waters since they create severe snagging hazards for bottom trawl fishing vessels and static gears. SFF's preferred cable protection measure is rock placement/protection considering industry standard rock size (1"- 5") with a 1:3 profile followed by an over-trawl sweep alongside a long-term monitoring programme.	protection methods used are compatible with fishing activities where feasible and practicable.
31.	Scottish Fishermen's Federation	09 January 2025: Scoping Opinion	In terms of crossing points, as they create obstacles and a snagging hazard to the fishing industry, SFF would suggest that the cable crossing should be avoided as much as possible. Where avoidance of crossings cannot be avoided, the design of cables and pipelines crossing points should be consulted with fishing the industry to ensure their impacts are mitigated.	As described in **Section 3.6.7.7.3**, based upon publicly available data, there are no existing cables or pipelines within the WDA and therefore it is assumed that no third-party cable crossings will be required. See **Chapter 17 Infrastructure and Other Marine Users** for more details. When the Applicant progresses consenting of the Offshore ECC (for which there is likely to be a requirement for cable crossings), cable designs which cross at as close to a perpendicular angle as practicable will be aimed for to reduce the external cable protection requirements. Additionally, the fishing industry will be consulted on the locations of, and approach to, cable/pipeline crossings.
32.	Scottish Fishermen's Federation	09 January 2025: Scoping Opinion	SFF notes from sub-section 3.5.31 (p35) that the Proposed Development pre-construction activities include boulder and UXO clearance. Since the relocation of boulders from their natural positions and re-positioning them creates a snagging hazard for fishing vessels, SFF would suggest avoiding the relocation of boulders as much as possible. However, where boulders relocation is unavoidable, we recommend the new locations/coordinates of the relocated boulders should be recorded and shared with fishermen. 3 Fishermen require geographical readings to decimal of a minute format (3 decimal places	Micro-siting around boulders is preferred to relocation however where relocation is required, the Project's FLO will liaise with the fishing industry on their locations (**Section 3.6.7.4.1**).

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			sufficient) rather than going down to actual seconds and the datum should be WGS84 rather than ED50.	
33.	Scottish Fishermen's Federation	09 January 2025: Scoping Opinion	Where potential UXO are identified, SFF would propose that they may either be avoided (e.g. through re-routing or micro-siting) or deflagrated. UXO detonation at sea is our least preferred option as it will have an adverse impact on fish and shellfish and other marine fauna in the area. Where detonation of UXO is the last resort, we recommend that sufficient mitigation measures (e.g. use of acoustic deterrent device (ADD) …etc) to be undertaken to avoid impact on fishing. The SFF object to relocation of active UXO as they create a safety risk to fishing gears and fishers. However, where passive UXO relocation is unavoidable, we recommend the new locations/coordinates of the relocated UXOs should be recorded and shared with fishermen.	Avoidance of UXO is preferred to deflagration which is preferred to clearance/detonation. Where UXO clearance is unavoidable, all required measures to reduce noise emissions into the surrounding environment will be taken (see **Chapter 10 Marine Mammals and Leatherback Turtle** and **Appendix 9 Draft Marine Mammal Mitigation Protocol** for further details). In the unlikely event that passive UXO are relocated, the positions of these will be provided to fishermen. Additionally, it should be noted that UXO clearance works will be the subject of a separate marine licence application(s) prior to the start of construction.
34.	Scottish Fishermen's Federation	09 January 2025: Scoping Opinion	SFF notes from section 3.4.3 (p33) that Scour material may be required to protect the structural integrity of the fixed WTG foundations from natural hydrodynamic processes. Further information on the scour protection material to be used, if required, will be presented in the EIAR. For fishermen's safety reasons, the SFF objects to the use of concrete mattresses and rock/sand bags in open waters and we propose industry standard graded rocks to be utilised for scour protection.	As described in **Section 3.6.2**, scour protection would likely consist of two gradings of quarried rock: one for the filter layer and one for the armour layer. Rock for the outer armour layer would typically be well graded with d50 = 200mm to 400mm (i.e. half the stones would be less than a specified median (200mm to 400mm diameter) and half would be greater). Other scour protection systems including nature inclusive design systems, frond systems and grouted mattresses are under development in the market and, subject to availability at the time of construction, would be evaluated for the actual design case taken forward. These are included as part of the design envelope. The maximum area and volume requirements for scour protection per foundation are provided in **Section 3.6**.

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
35.	Scottish Fishermen's Federation	09 January 2025: Scoping Opinion	SFF notes from section 3.5 (p35), of the SR that the developer is required under Section 105 of the Energy Act 2004 to prepare a Decommissioning Programme for approval by Scottish Ministers. Specific details on the decommissioning activities are not known at this stage of consent but further details will be provided in the Proposed Development EIA Report. To reiterate our safety concern for fishing vessels, SFF would like to see all development related infrastructures are recovered/removed to shore followed by over-trawl sweeps (seabed sweeps using fishing gears). In addition, the seabed should be restored to its pre-development condition post-decommissioning, and the developer/operator should ensure it is safe for fishing operations to fully resume in the area.	Detail on decommissioning is provided in **Section 3.6.16**.
36.	NatureScot	10 June 2025: MD-LOT and NatureScot Microsoft Teams meeting	The MachairWind Offshore WDA comprises the array area only and includes wind turbine generators (WTGs) with associated substructures and inter-array cabling. Our understanding is that separate consents will be sought for the Offshore Transmission Development Area (OfTDA) and Onshore Transmission Development Area (OnTDA) in due course. Whilst we understand that this is due to uncertainty around grid connection options, it does raise concerns that not all potential impacts will be assessed to enable full consideration of the proposal and mitigation options. Therefore, we advise that we expect, at the Section 36 application stage, for both the WDA and OfTDA assessment to be contained within one EIA Report.	The Applicant sent a letter to NatureScot on 20 March 2025 setting out its initial response to NatureScot's Scoping Opinion comments on the Project's consenting strategy. This explained that the key drivers behind the Project's decision to submit separate consent applications for the WDA, Offshore ECC (formerly the OfTDA) and OnTDA stemmed from: • Grid connection uncertainty resulting from lengthy delays to the conclusion of the Holistic Network Design process led by the National Grid Electricity System Operator; • Limitations relating to the validity of ornithological baseline data; and • Existing precedent for separate consent submissions for project development areas. Subsequently, the Applicant held a meeting with MD-LOT and NatureScot on 10 June 2025 to discuss the consenting strategy for the WDA.

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
				The Applicant explained at this meeting that to seek to address NatureScot's concerns, the transmission infrastructure that will be located within the WDA (OSPs, OSP link cables and a portion of the offshore export cable), whilst not described within the Scoping Report, would be included and assessed within the WDA-alone assessment as part of the WDA EIAR consent submission. This ensures that all infrastructure within the boundary of the WDA (i.e. the WDA infrastructure), for which marine licences to construct, alter or improve are being sought as part of the WDA consent application, has been adequately assessed. It was further explained that that there would be no new impacts / likely significant effects as a result of this adjustment and therefore the Scoping Opinion would remain valid (see **Appendix 3 Scoping Validation Report**). MD-LOT and NatureScot did not raise any concerns regarding this. Furthermore, the Scoping Report explained the approach to assessing the interacting and additive effects of the WDA, Offshore ECC and OnTDA. In this EIAR, this is termed the combined assessment. Each chapter includes a whole-Project assessment which considers impact interactions and additive effects to determine if any effects would be materially elevated from those assessed for the WDA-alone assessment and if any new or different likely significant effects would arise. Due to lengthy delays in securing confirmation of the Project's grid connection location, at the time of writing the level of detail available for the Offshore ECC and OnTDA is limited. The assumptions used in the combined assessment are provided in **Section 3.7**. Accordingly, the assessment is commensurate with the level of detail available at the time of carrying out the assessment. Within the upcoming Offshore ECC and OnTDA consent applications, their respective scoping and EIAR / Environmental Report will take account of all likely effects predicted within the WDA EIA and present updated combined assessments

I.D.	Stakeholder	Date/Engagement Activity	Stakeholder Comment	Applicant Response
				using the latest available information covering all aspects of the Project.
37.	Maritime and Coastguard Agency (MCA)	02 July 2025: Shipping and Navigation Hazard Workshop	MCA recommended that the Project undertakes the standardised approach to applying for safety zones.	**Section 3.6.1** sets out the anticipated approach to safety zones.

3.5 OVERVIEW OF THE PROJECT

19. Based on the likely WTGs available at the time the Project enters construction, a project design envelope has been established which includes between 91 of the largest (335 m blade tip height) and 144 of the smallest (280 m blade tip height) WTGs. All WTGs will be located within the WDA (excluding within the WDA restricted build area) [1] which is shown on **Figure 3.1**. **Plate 3.1** provides an overview of the key onshore and offshore Project infrastructure and respective Development Areas.

20. It should be noted that as the Project will only utilise bottom-fixed foundations, all WTGs will be assembled on site and will not be towed from shore, fully assembled. Any installation vessels and equipment will not exceed the height of the maximum blade tip height as detailed in **Table 3.13.** Cranes and installation vessels on site will utilise the appropriate lights and identification systems in line with the Civil Aviation Authority approved regulations at the time of construction.

21. The earliest that WDA construction could commence is anticipated to be in 2030, with the onshore construction works likely to commence first. **Section 3.7** provides an indicative offshore construction programme i.e. for the WDA and Offshore ECC.

[1] Analysis of geophysical survey data collected for the Project identified areas within the WDA that would not be suitable for the installation of WTG / OSP foundations. This included a deep-water trench that is located within the middle of the WDA and additional areas of seabed in water depths greater than 60 m. In addition, areas of shallow bedrock within the eastern section of the WDA were also identified. These areas cumulatively add up to an area of approximately 51 km² and are collectively referred to as the 'WDA Restricted Build Area'.

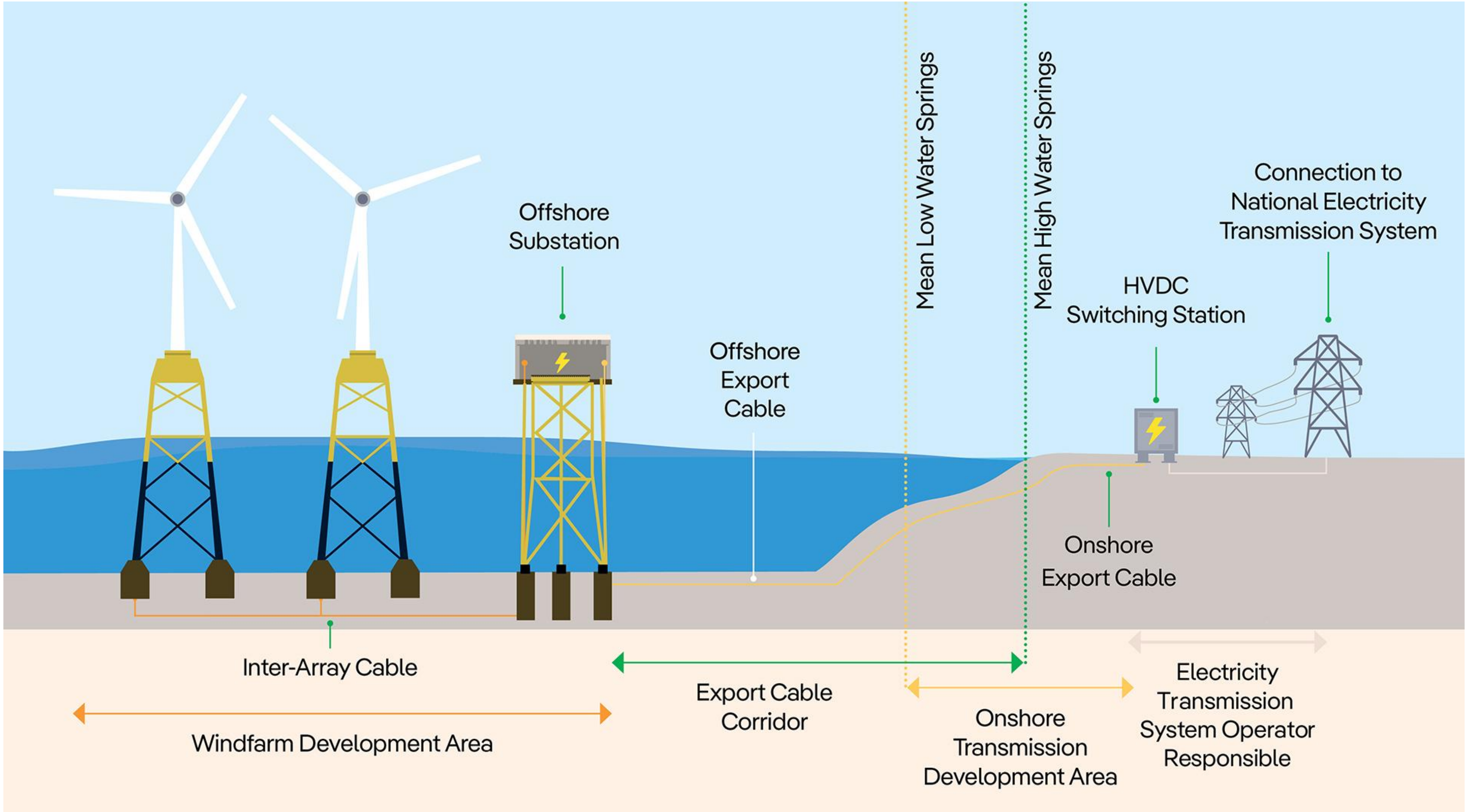

Plate 3.1 Overview of the MachairWind Development Areas

3.5.1 Key Project Components

22. The following section provides an overview of the key WDA infrastructure which is described in further detail in **Section 3.6**.

23. The key offshore components are:

- WTGs and their associated fixed-bottom foundations;
- OSP(s) and their associated fixed-bottom foundations;
- Scour protection around foundations;
- Offshore cables comprising:
  - Offshore export cables (linking the OSPs to the landfall);
  - OSP link cables (linking OSPs together); and
  - IACs (linking the WTGs together and to the OSP(s)).
- External cable protection on offshore cables as required; and
- Fibre optic communications cables integrated or bundled with the offshore cables.

24. It is anticipated that the key components at the landfall could comprise (noting that these are not part of this WDA application):

- Ducts installed under the cliff by Horizontal Directional Drilling (HDD) (or similar) trenchless technique or a trenched solution if feasible for the landfall location; and
- Transition joint bays to house the connection between the offshore and onshore cables.

25. The key OnTDA components could comprise (noting that these are not part of this WDA application):

- Underground onshore export cables housed within ducts running to the onshore switching station;
- Transition joint bays and link boxes installed along the cable corridor;
- Telecom/SCADA infrastructure including vehicular access;
- Joint bays and link boxes; and
- Temporary construction compounds and access routes.

3.6 OFFSHORE PROJECT DESCRIPTION

26. The key characteristics of the offshore components of the Project are summarised in **Table 3.2**.

Table 3.2 WDA Parameters Summary

Indicative Parameters	Values
Lease period (years)	60
Indicative WDA construction duration (years)	5
Anticipated operational life (years)	35
WDA (km^2)	448
WDA restricted build area (km^2)	51
WDA closest distance to shore (Colonsay) (km)	12.4
Maximum water depth in the WDA (m LAT)	81.7
Average water depth in the WDA (m LAT)	53.8
Number of WTGs	91-144
WTG foundation type options	• Monopiles • Pin pile jacket

Indicative Parameters	Values
	• Suction bucket jacket
Maximum length of all inter-array cables (km)	572
Maximum IAC seabed route length (km)	521
Maximum length of one OSP link cable (km)	68
Maximum number of OSP link cables	4
Maximum length of all OSP link cables (km)	272
Maximum number of export cables	4
Maximum length of individual offshore export cables located wholly within the WDA boundary (km)	50
Maximum total length of offshore export cables located wholly within the WDA boundary (km)	200
Maximum number of OSPs located within the WDA	2
OSP foundation type options	• Pin pile jacket • Suction bucket jacket • GBS
Maximum piling hammer energy (kJ)	• Monopiles = 6,600 • Pin piles = 4,400

3.6.1 Maximum Spatial Footprints of Offshore Infrastructure

27. The spatial footprints resulting from construction or decommissioning works (generally assessed as temporary footprints) as well as those utilised for the duration of the lifetime of the Project during O&M are summarised in the following sections. All figures are presented on a worst-case basis e.g. for WTG foundations, the maximum footprint described is that which would result from the installation of up to 144 WTGs with suction bucket jacket foundations (and all with maximum scour protection).

3.6.1.1 Temporary Construction Footprints

28. **Table 3.3** describes the maximum temporary construction footprints within the WDA. This includes seabed preparation for foundation installation and cable installation.

Table 3.3 Worst-case Temporary Construction Footprints in the WDA

Activity	Worst-case scenario description	Footprint (m2)
Seabed preparation – WTGs	144 suction bucket jacket foundations	1,537,600
Jack-up vessel footprint – WTG and OSP installation	3,600 m^2 footprint per WTG (x 144) and OSP installation (x 2)	525,600
Anchoring footprint – WTG and OSP installation	360 m^2 footprint per WTG (x 144) and OSP installation (x 2) for a maximum number of operations per foundation installation of two ((360 x 144 + 360 x 2) x 2)	105,120
Seabed preparation – OSP(s)	2 OSP GBS foundations	53,356
Pre-lay grapnel run (PLGR) (all cables)	PLGR activities would fall within the footprint of the maximum cable disturbance width.	

Activity	Worst-case scenario description	Footprint (m2)
WDA sandwave levelling works	Sandwave levelling associated with IACs. Note it is not anticipated that sandwave levelling would be required for OSP link or export cables however, sufficient redundancy is included within IAC levelling allowance should it be required.*	8,023,400
IAC installation	Up to 521 km seabed route length of IACs, 20 m disturbance width	10,420,000
OSP link cable installation	Up to 272 km of OSP link cables for up to four cables with two cables per trench, 20 m disturbance width	2,720,000
Export cable installation (within the WDA)	Up to 200 km of offshore export cables for up to four cables with two cables per trench, 20 m disturbance width	2,000,000
Total	**-**	**25,385,076**
* For the purposes of securing an adequate sandwave levelling allowance across the generation and transmission assets and their associated marine licences, as proposed in the **Application for Section 36 Consent Cover Letter**, an 8,023,400 m^2 disturbance area has been assessed for all offshore cable types with the individual disturbance areas for each cable type to be agreed through the Development Specification and Layout Plan. If dredging is used, relevant dredge and disposal licences will be applied for, using areas / volumes identified in the Development Specification and Layout Plan. See **Table 3.19** for sandwave levelling volume calculations for which the same principle applies.		

3.6.1.2 Windfarm Development Area Permanent / Long-Term Footprints

29. **Table 3.4** describes the maximum permanent / long term footprints in the WDA. This includes the scour protection associated with foundations and external cable protection for unburied cables and cable crossings.

Table 3.4 Maximum Permanent / Long Term Footprints in the WDA

Infrastructure	Worst-Case Scenario Description	Footprint (m^2)
WTG foundations (including scour protection)	144 suction bucket jacket foundations	5,496,531
OSP foundations (including scour protection)	2 OSPs on GBS foundations	270,000
OSP link cable crossings of IACs	Up to two crossings of 250 m length 18 m width per crossing	9,000
IAC external cable protection (unburied cables)	Up to 10% of cable requiring protection 13 m wide	770,900
OSP link external cable protection (unburied cables)		176,800
Export cable within the WDA external cable protection (unburied cables)		65,000
Total	**-**	**6,705,031**

3.6.1.3 Temporary Operation and Maintenance Footprint

30. **Table 3.5** describes the maximum temporary footprints during O&M in the WDA. This includes the use of jack-up vessels for major component replacement, cable repair and cable reburial works, should they be required.

Table 3.5 Maximum Temporary O&M Footprints in the WDA

Activity	Worst-Case Scenario Description	Footprint (m^2)
Jack-up vessel footprints for major maintenance activities (m^2 over 35-year operational life)	Anticipated number of jack-up events over 35-year operational life = 292. Jack-up vessel footprint = 1,800 m^2. One jack-up event per maintenance activity.	525,600
Cable repair or replacement (m^2 over 35-year operational life)	Maximum disturbance width for all offshore cable repair / replacement events = 5 m assuming use of a jetting tool. • **IACs:** maximum estimated repair / replacement events = 10. Length of replacement cable if cable needs to be cut during repair = 10,000 m. • **OSP link cables:** maximum estimated repair / replacement events = 4. Length of replacement cable if cable needs to be cut during repair = 1,000 m. • **Offshore export cables:** maximum estimated repair / replacement events = 2. Length of replacement cable if cable needs to be cut during repair = 2,000 m.	• IACs = 500,000 • OSP link cables = 20,000 • Export cables = 20,000
Cable reburial (m^2 over 35-year operational life)	Maximum disturbance width for all offshore cable reburial events = 5 m assuming use of a jetting tool. It is assumed that up to 5% of the length of each offshore cable type could require reburial over the Project's operational life: • **IACs** (total length) = 572 km. • **OSP link cables** (based on maximum length of cable trenches as cables bundled) = 13.6 km. • **Offshore export cables** (based on maximum length of cable trenches as cables bundled) = 10 km.	• IACs = 143,000 • OSP link cables = 34,000 • Export cables = 50,000
Total	-	**1,292,600**

3.6.2 Wind Turbine Generator Foundations

31. The following sections describe the WTG foundation types under consideration for the Project i.e. monopiles, pin pile jackets and suction bucket jackets (illustrated in **Plate 3.2**), as well as details of the pre-installation works. WTGs on floating foundations are not under consideration for the Project.

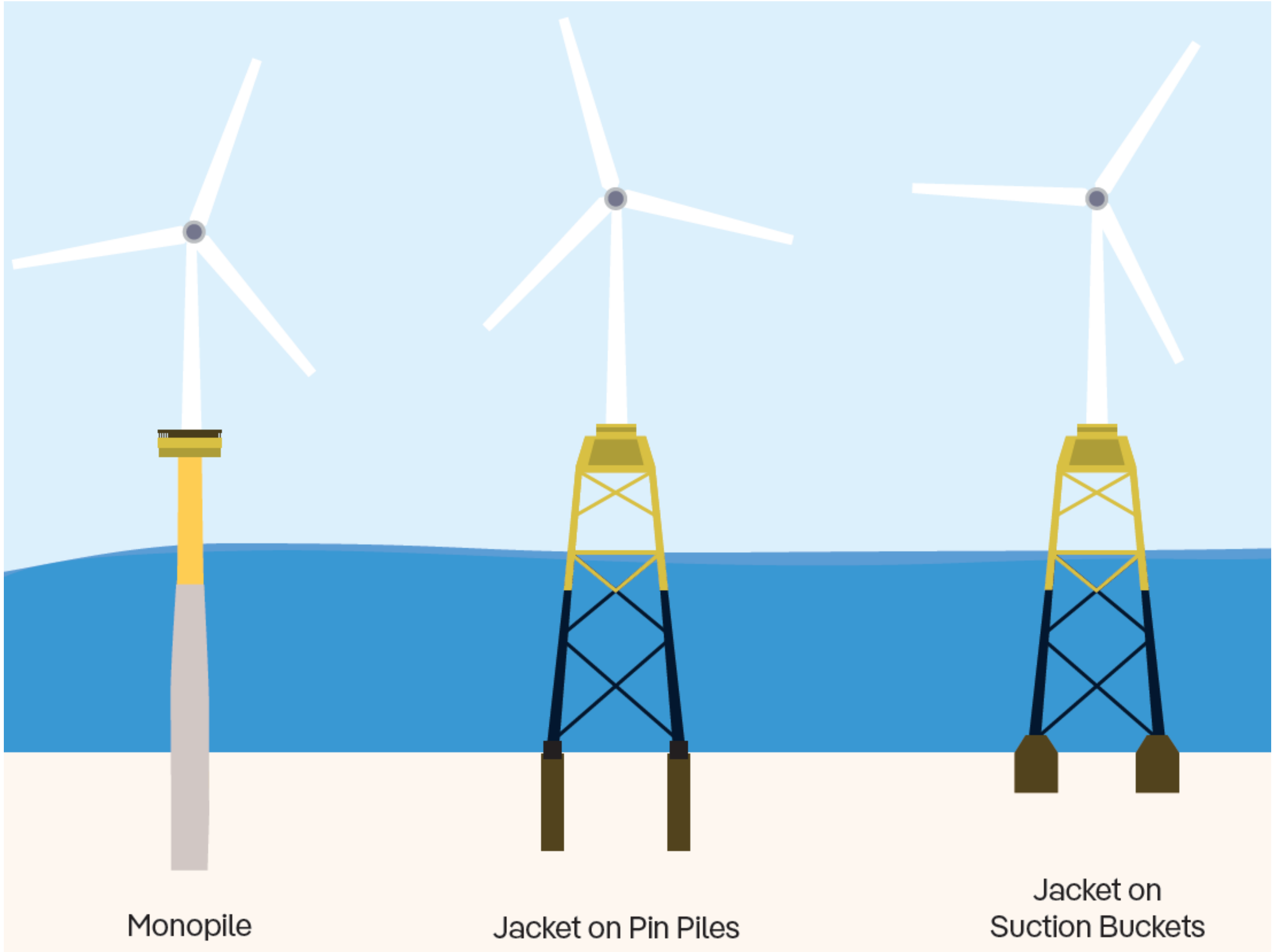

Plate 3.2 WTG Foundation Option Schematics

3.6.2.1 Pre-Installation Works

32. Pre-installation works may include:

- Pre-construction surveys to confirm that the seabed is clear of any obstructions prior to installation activities commencing (including UXO) and to provide information to inform any micro-siting of infrastructure, clearance operations, seabed preparation and for environmental monitoring purposes.
- UXO clearance requirements will be informed by the results of the pre-construction surveys. Micro-siting will be used to avoid UXO where possible, however where this is not the case, clearance may be required to safely remove or deactivate any UXO that present a hazard to the construction activities or the ongoing operation of the Project. Low impact techniques such as low order deflagration will be used except in 'extraordinary circumstances' in accordance with the Marine environment: unexploded ordnance clearance Joint Position Statement (Defra, 2025) and noting that UXO clearance works will be the subject of a separate marine licence application(s) prior to the start of construction.
- Boulder clearance – boulders that present an obstacle to the foundation installation process will be confirmed by the pre-construction surveys. Micro-siting around boulders is the preferred option however where this is not possible, large boulders (in the order of 5 m diameter and 1 m height) will be relocated to an adjacent area of seabed within the WDA where they do not present an obstacle to the works, and where practicable to an area of seabed with similar sediment type and avoiding any known sensitive habitats such as Annex I reef. Boulder clearance will be undertaken by subsea grab or cable plough. Seabed disturbance from boulder clearance during foundation installation would be encompassed by that assumed for seabed preparation for WTG and OSP foundation installation (**Table 3.3**). Where boulders are required to be relocated, the Project's FLO will liaise with the fishing industry on their locations.
- For all foundation types, seabed preparation by sandwave levelling[2] and / or dredging might be required to prepare a flat area of seabed prior to installation.

3.6.2.2 Monopiles

3.6.2.2.1 Overview and Materials

33. Monopile foundations comprise a cylindrical steel pile with a diameter sufficient to transfer loading from the WTG to the seabed (**Plate 3.2 and Plate 3.3**). A cylindrical transition piece (TP) is fitted on top of the monopile and the pile and/or TP may be tapered or change in diameter along their length. The key parameters for monopile foundations are presented in **Table 3.6**.

34. A number of secondary structures on the associated TP may be required such as handrails, ladders, working platforms etc. that may be produced from a range of materials such as steel, concrete, aluminium, other metals and composites. The TP may be either steel or concrete.

35. Monopile foundations are usually installed using piling hammer installation techniques. The hammer energy required for monopile installation is dependent on the monopile size and seabed conditions encountered in the WDA.

[2] Sandwave levelling could be done via dredging or sandwave clearance using a plough, or similar.

Plate 3.3 WTG Monopile Foundations from SPR's East Anglia THREE Offshore Windfarm Project

Table 3.6 Monopile Foundation Parameters

Parameter	Smallest WTG	Largest WTG
Maximum monopile diameter (m)	13	15
Maximum area of scour protection per foundation (including structure footprint area) (m^2)	3,318	4,418
Maximum area of scour protection for total foundations (including structure footprint area) (m^2)*	477,836	402,026
Maximum scour protection volume per foundation (m^3) (rock) (based on scour protection depth of 1.5 m)	4,978	6,627
Maximum scour protection volume for total foundations (m^3) (rock) (based on scour protection depth of 1.5 m)*	716,754	603,039
Maximum % requiring scour protection	100	100
Worst-case maximum hammer energy (kilojoule (kJ))	6,600	
*Note that due to rounding of decimal places for per foundation parameters, total values may not correspond to the maximum number of foundations however total values are based on the decimal values and so are accurate.		

3.6.2.2.2 Seabed Preparation

36. In areas where the seabed is level, the monopile foundation may not require significant seabed preparation. However, measures may be required in areas in which sand waves are present to provide a level formation for the installation and to allow scour protection to be placed around the foundation. If a monopile foundation type is adopted, detailed work would be required pre-construction to determine preparation required for each foundation.

37. **Table 3.7** shows the seabed preparation scenarios for one of each of the smallest and largest WTG.

Table 3.7 Estimated Seabed Preparation Parameters for Monopiles.

WTG Model	Maximum Area of Seabed Prepared per foundation / for total foundations (m^2)	Maximum Volume of Sediment Removed per foundation / for total foundations (m^3)
Smallest	2,739 / 394,384	8,675 / 1,249,253
Largest	2,952 / 268,642	9,409 / 856,192
*Note that due to rounding of decimal places for per foundation parameters, total values may not correspond to the maximum number of foundations however total values are based on the decimal values and so are accurate.		

3.6.2.2.3 Installation

38. Steel monopile foundations would typically be installed as follows:

- Installation of scour protection filter layer at the location on the seabed where the monopile will be installed (if required).
- Delivery of monopiles and TP to site by installation vessel. Monopiles can generally be installed with monohull floating construction vessels. Several exist in the market with the required crane capacities of 3,000 – 5,000 tonnes. Large jack-up vessels may also be used; however these have a more limited maximum lifting capacity. It may also be possible to tow floated piles to site using tugs.
- Monopile up-ended by crane to vertical position and lowered to seabed.
- Driving hammer located onto top of pile using craneage, and monopile driven to required depth. Where ground conditions are difficult, it may also be necessary to carry out drilling using drilling equipment operated from the installation vessel before completing the driving.
- Lifting of TP onto top of monopile using craneage from installation vessel, levelling of TP and grouting of connection.
- Installation of scour protection armour layer (if required).

3.6.2.2.3.1 Pile Driving

39. For the piling of monopile foundations, larger hammer energy ranges are more efficient and are likely to reduce the overall installation time and number of blows required to install each pile. However, the actual energy output will be optimised to that required for successful installation. At the time of writing, hammers with energies up to 6,600 kJ are available and it is not expected that energies greater than this would be required at the Project. A drivability assessment will be carried out prior to construction when further information is available regarding the ground conditions, to determine the required piling requirements (e.g. hammer energy and blow rate).

40. Each piling event would commence with a soft-start at a lower hammer energy, followed by a gradual ramp-up for at least 20 minutes to the maximum hammer energy required. The maximum hammer energy is only likely to be required at a few of the piling installation locations.

41. As an alternative to traditional impact piling, the feasibility of vibration piling will also be explored pre-construction. Vibration piling is not yet a proven technique for offshore wind foundations but is included in the design envelope to allow for future technology developments. Even if feasible, it is likely that it could only be used for part of the installation of each pile, with impact piling being required to complete the installation. As such, the worst-case scenario for assessment purposes is reflected by the impact piling parameters.

42. The key impact piling parameters are described in **Table 3.8**. Further information describing the detailed piling parameters used to inform the assessment, including the underwater noise modelling,

are provided in **Chapter 9 Fish (Including Basking Shark) and Shellfish** and **Chapter 10 Marine Mammals and Leatherback Turtle**.

Table 3.8 Monopile Piling Parameters for WTGs

Parameter	Largest WTG
Maximum monopile diameter (m)	15
Maximum hammer energy (kJ)	6,600
Maximum pile penetration depth (m)	45
Maximum piling duration per monopile, (including soft-start and ramp-up, and excluding possible breakdown, drive-drill-drive, refusal, etc.) (minutes)	320

3.6.2.2.3.2 Pile Drilling

43. Whilst pile driving is the most likely installation method, if ground conditions prove to be unsuitable for piling, monopiles may be drilled, or both drilled and driven, into the seabed. Unsuitable ground conditions will be avoided where practicable, to be confirmed through pre-construction survey and a drivability assessment.

44. Given the relatively high potential for shallow bedrock within the WDA, as a worst-case scenario, it is estimated that up to 33% of the WTG locations could need drilling.

45. The drill arisings (spoil) would be disposed of adjacent to the foundation location, above or slightly below the sea surface, from where they would be expected to settle onto the seabed in the immediate vicinity of each foundation (see **Chapter 7 Marine Physical Environment** for further details).

46. The key monopile drilling parameters are described in **Table 3.9**.

Table 3.9 Monopile Foundation Drilling Parameters (WTGs)

Parameter	Smallest WTG	Largest WTG
Maximum monopile diameter (m)	13	15
Maximum proportion of WTGs potentially installed by drilled piling (%)	33.33	33.33
Maximum number of WTGs potentially installed by drilling	48	30
Maximum drill diameter (m)	13	15
Maximum drill penetration depth (m)	45	45
Maximum volume of drill arisings per monopile (m^3)	10,452.67	13,916.27
Maximum volume of drill arisings for total monopiles	501,728	417,488

3.6.2.2.3.3 Scour Protection

47. Monopiles normally require rock installation for scour protection, although the exact requirements will not be confirmed until prior to the start of construction. Purpose-made vessels are used to accurately install rock, which is normally completed using a fall-pipe lay system.

48. Scour protection would likely consist of two gradings of quarried rock: one for the filter layer and one for the armour layer. Rock for the outer armour layer would typically be well graded with d50 = 200mm

to 400mm (i.e. half the stones would be less than a specified median (200mm to 400mm diameter) and half would be greater).

49. Other scour protection systems including nature inclusive design systems (see **Nature Positive Plan** and **Section 3.6.9**), frond systems and grouted mattresses are under development in the market and, subject to availability at the time of construction, would be evaluated for the actual design case taken forward.

50. The maximum area and volume requirements for scour protection per foundation are provided in **Table 3.6**.

3.6.2.3 Jackets

3.6.2.3.1 Overview and Materials

51. Jacket foundations comprise a steel lattice structure with tubular sections and have an integrated transition piece (**Plate 3.2** and **Plate 3.4**). Secondary structures such as handrails, ladders, working platforms etc. may be produced from a range of materials such as steel, concrete, aluminium, other metals and composites.

52. Jacket foundations will have up to four legs with the footing for each leg secured to the seabed with either a single pin pile or one suction bucket.

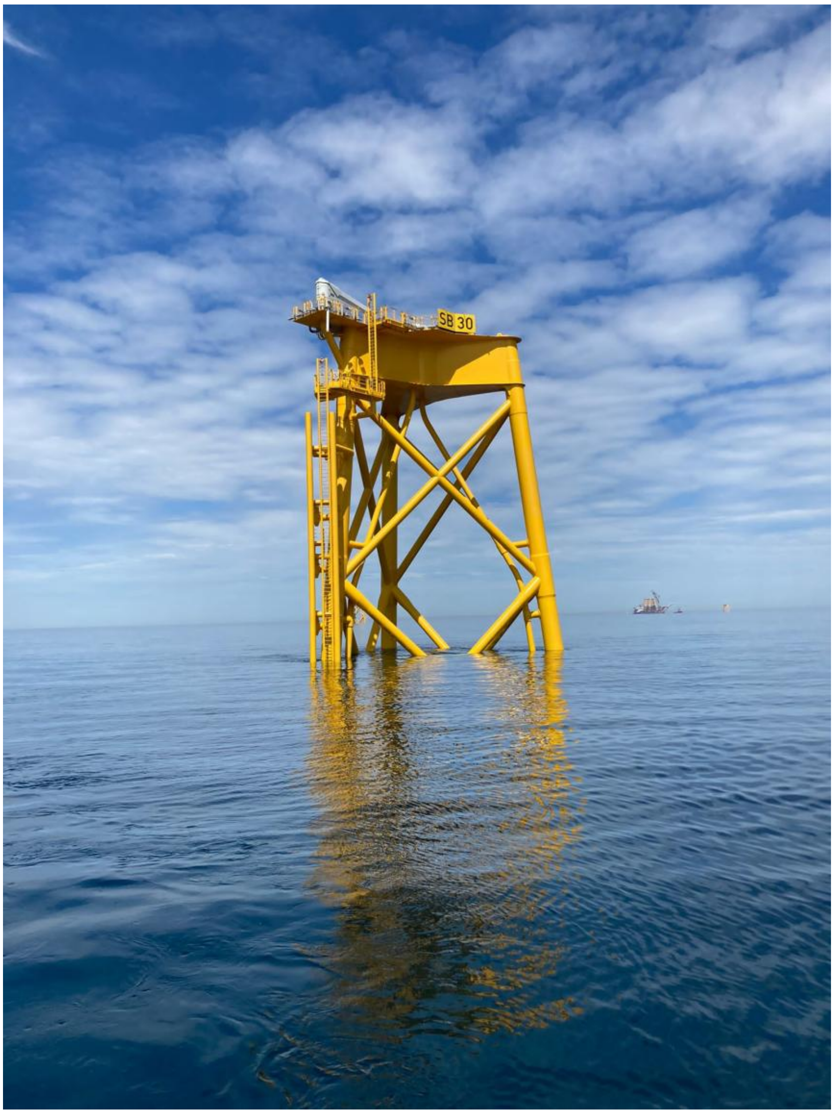

Plate 3.4 WTG Jacket Foundation from SPR's Saint Brieuc Offshore Windfarm Project

53. The key parameters for jacket foundations are presented in **Table 3.10**.

Table 3.10 Jacket Foundation Parameters (WTGs)

Parameter	Smallest WTG	Largest WTG
Maximum jacket leg spacing at seabed (m)	50	50
Maximum sea surface dimensions at LAT (m)	37x35	
Pin pile Jacket		
Maximum number of pin piles per jacket	4	4
Maximum pin pile diameter (m)	4	4.5
Maximum pin pile penetration depth (m)	65	75
Maximum seabed footprint per jacket (based on four pin piles 4 m diameter) excluding scour protection (m^2)	2,500	2,500
Maximum seabed footprint per jacket (m^2) including scour protection	2,714	3,435

Parameter	Smallest WTG	Largest WTG
Maximum seabed footprint for total foundations (m^2) including scour protection*	390,864	312,615
Maximum scour protection volume per pin pile jacket (m^3) (rock) (based on 1.5 m height)	4,072	5,153
Maximum scour protection volume for total foundations (m^3) (rock)	586,297	468,923
Suction Bucket Jacket (parameters conservatively assumed to be the same for the smallest and largest WTG)		
Maximum number of suction buckets per jacket	4	
Maximum suction bucket diameter (m)	15	
Maximum suction bucket penetration depth (m)	30	
Maximum seabed footprint per jacket (m^2) (based on four suction buckets, 15 m diameter), excluding scour protection	4,225	
Maximum seabed footprint per jacket (m^2) including scour protection	38,170	
Maximum seabed footprint for total foundations (m^2) including scour protection*	5,496,531	3,473,502
Maximum scour protection volume per suction bucket jacket (m^3) (rock) (based on 1.5 m height)	57,256	
Maximum scour protection volume for total foundations (m^3) (rock)	8,244,796	5,210,253
*Note that due to rounding of decimal places for per foundation parameters, total values may not correspond to the maximum number of foundations however total values are based on the decimal values and so are accurate.		

3.6.2.3.2 Seabed Preparation

54. Similar to monopiles, in areas where the seabed is level, the jacket foundation may not require significant seabed preparation. However, measures may be required in areas in which sand waves are present to provide a level formation for the installation and to allow scour protection to be placed around the foundation. If a jacket foundation type is adopted, detailed work would be required pre-construction to determine preparation required for each foundation.

3.6.2.3.3 Installation

55. For a pin piled solution, these could be pre-piled (before the jacket structure is placed on the seabed) or post-piled. It is anticipated that pin piles would generally be driven but alternative installation techniques, i.e. drilling or vibration, may be required depending on ground conditions. More novel pile solutions, e.g. screwpiles, would also be considered.

56. For a suction bucket solution, the foundation is secured to the seabed by suction buckets positioned below each leg of the jacket. The suction buckets are hollow steel cylinders which are capped at the top. This foundation design does not require a hammer or drill installation technique. The foundation installation technique instead relies on water being pumped out of each suction bucket while being compressed downwards into the seabed by the weight of the jacket. This creates a pressure differential which enables the embedment of the suction buckets.

57. The pin pile jacket installation method utilising either pile driving or pile drilling is described in the following sections.

3.6.2.3.3.1 Pile Driving

58. The key pile driving parameters for pin piles are described in **Table 3.11**, with further details presented in **Chapter 9 Fish (Including Basking Shark) and Shellfish** and **Chapter 10 Marine Mammals and Leatherback Turtle**.

59. As described for monopiles, the feasibility of vibration piling will also be explored pre-construction, but at the time of writing remains an unproven technique for offshore wind foundations and therefore the worst-case scenario for assessment purposes is impact piling.

Table 3.11 Jacket Foundation Pin Piling Driven Installation Technique Parameters (WTGs)

Parameter	Smallest WTG	Largest WTG
Maximum pin pile diameter (m)	4	4.5
Maximum hammer energy (kJ)	4,400	4,400
Maximum pile penetration depth (m)	65	75
Maximum piling duration per pin pile, (including soft-start and ramp-up, and excluding possible breakdown, drive-drill-drive, refusal, etc.) (minutes)	195	195
Maximum piling duration per jacket (minutes)	760	760

3.6.2.3.3.2 Pile Drilling

60. In the event of drilling being required due to unsuitable ground conditions for pile driving, the jacket pin piles may be drilled or drilled-driven into the seabed. Given the relatively high potential for shallow bedrock within the WDA, as a worst-case scenario, it is estimated that up to 33% of the WTG locations could need drilling.

61. As with monopiles, drill arisings would be disposed of adjacent to the foundation location, above or slightly below the sea surface, from where they would be expected to settle onto the seabed in the immediate vicinity of each foundation (see **Chapter 7 Marine Physical Environment** for further details).

62. The key pin pile drilling parameters are described in **Table 3.12**.

Table 3.12 Jacket Foundation Pin Pile Drilling Parameters (WTGs)

Parameter	Smallest WTG	Largest WTG
Maximum pin pile diameter (m)	4	4.5
Maximum number of WTGs potentially installed by drilling (based on 33%)	48	30
Maximum drill diameter (m)	4.5	5
Maximum drill penetration depth (m)	45	45
Maximum volume of drill arisings per pin pile (m^3) (based on 4.5 m to 5 m drill diameter and up to 45 m continuous drilling depth)	1,252	1,546
Maximum volume of drill arisings per jacket (m^3)	5,008	6,184
Maximum volume of drill arisings for total WTGs (m^3)	240,384	185,706

3.6.2.3.3.3 Scour Protection

63. Scour protection requirements for jacket foundations would be the same or very similar to that described for monopiles in **Section 3.6.2.2.3.3**.

3.6.3 Wind Turbine Generators

64. The WTGs will convert wind energy into electrical energy which will then be exported through the offshore and onshore transmission infrastructure to the National Electricity Transmission System (**Plate 3.5**). WTGs typically incorporate tapered tubular towers and three blades attached to a nacelle housing mechanical and electrical generating equipment. An example of the internal workings of a nacelle is displayed in **Plate 3.5**.

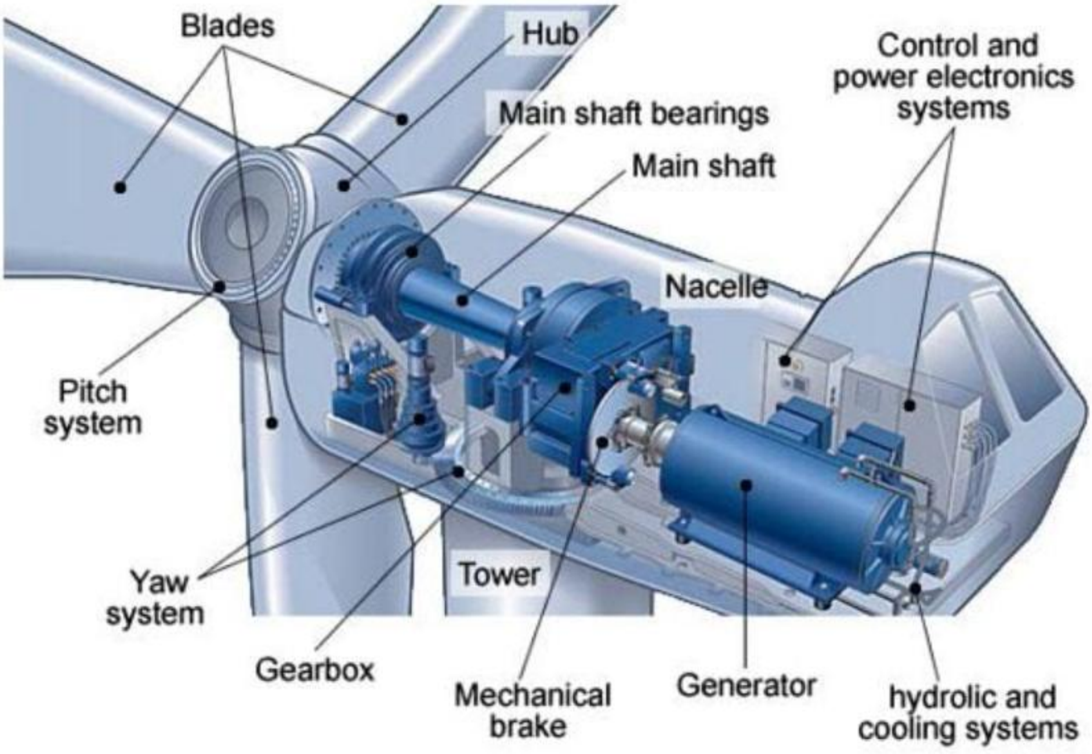

Plate 3.5 Example of the Internal Housing of a WTG Nacelle (Source: Parker Hannifin)

65. The overall layout of the WTGs within the WDA will be informed by offshore site investigation works, wind resource modelling and stakeholder engagement. It will comply with relevant good practice for offshore windfarms in relation to shipping and navigation (i.e. Marine Guidance Note (MGN) 654), fishing interests, offshore health and safety, any relevant aviation interests and will be informed by potential environmental constraints.

66. Based on the likely WTGs available at the time the Project enters construction, a project design envelope has been established which includes between 91 of the largest (335 m blade tip height) and 144 of the smallest (280 m blade tip height) WTGs. This ensures that the impact assessment is undertaken on a range of WTGs which could reasonably be expected to be deployed. The final selection of WTGs will be made once further surveys, technical development and engagement with the supply chain have been undertaken with the final decision being made post-consent.

67. **Table 3.13** provides design parameters for the WTGs. A schematic is provided in **Plate 3.6**.

Table 3.13 WTG Design Envelope Parameters

Parameter	WTG Parameters	
	Smallest WTG	Largest WTG
Maximum number of WTGs	144	91
Maximum rotor diameter (m)	236	290
Maximum rotor swept area per WTG (m^2)	43,743.54	66,051.99
Maximum rotor swept area total WDA (m^2)	6,299,069	6,010,731
Maximum blade tip height (m Lowest Astronomical Tide (LAT))	280	335
Maximum blade tip height (m Mean Sea Level)	277.88	332.88
Minimum blade tip clearance ('Air Gap') (m HAT)	28.4	28.4
Minimum separation distance between WTGs (based on 4 rotor diameters measured from centre of WTG nacelle) (m)	944	1,160

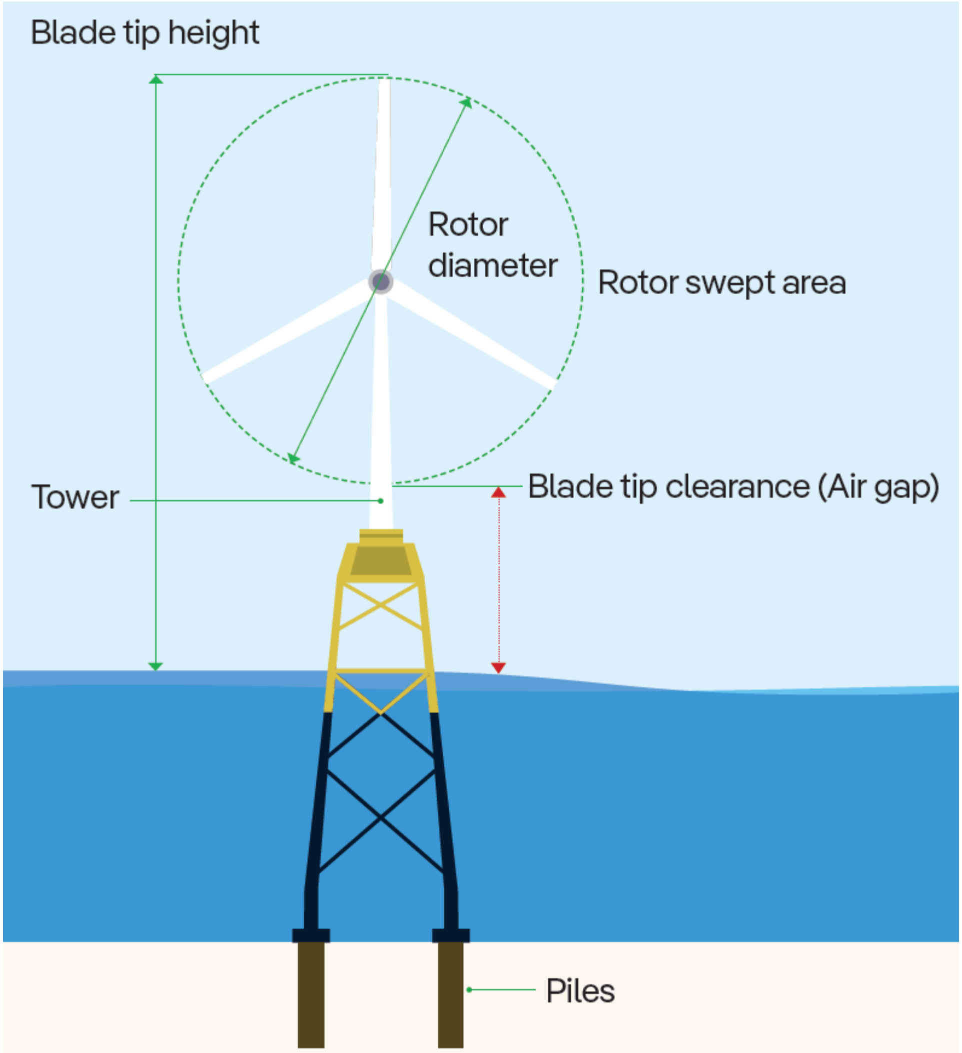

Plate 3.6 Wind Turbine Generator Indicative Schematic

3.6.3.1 Wind Turbine Generator Layout

68. The final WTG layout will not be finalised until completion of detailed pre-construction wind resource studies, site investigations and the selection of the preferred WTGs and their foundations. A layout will be selected from within the consented parameters to optimise energy output and the foundation installation process, accounting for water depths, ground conditions, internal wake effects and any other constraints, Layouts will also have regard to both the overall project objectives and landscape design objectives for the WDA which the Applicant has defined and discussed in collaborative workshops with NatureScot, as outlined within **Chapter 4 Site Selection and Alternatives** and **Appendix 15 Design Strategy** respectively.

69. The wake downstream of a WTG rotor is characterised by decreased wind speed and increased turbulence compared to the flow upstream of the rotor, and wake effects can be detected at a distance of up to 20 rotor diameters. An optimum layout will ensure that the flow in front of a WTG is least affected by wake effects from other WTGs.

70. Flexibility in WTG layout is required at this early stage of the Project because detailed geophysical, geotechnical, environmental and technoeconomic surveys are still required to inform the final foundation locations across the seabed and foundation type. This is based on the ground conditions, environmental sensitivities and any identified constraints on the seabed alongside the available WTG models on the market at that time. These survey results will inform the WTG model selection which will in turn inform refined layouts and confirmation of foundation type. In the pre-construction period, consultation with stakeholders will be undertaken to agree layouts which will consider a range of interests including risk to maritime navigation, benthic ecology or seascape, landscape and visual.

71. For the purposes of some EIA topic assessments (e.g. **Chapter 13 Shipping and Navigation** and **Chapter 16 SLVIA**), a layout is required to assess specific impact pathways and therefore indicative worst-case layouts have been developed. The assumptions upon which these indicative worst-case layouts have been based are described in the respective EIAR chapters.

72. **Appendix 13.1 Navigation Risk Assessment** sets out layout commitments informed by the MCA's MGN 654. The final windfarm layout will be submitted for approval by the MCA in consultation with Northen Lighthouse Board (NLB), secured by condition in the marine licence(s) (see **Chapter 13 Shipping and Navigation** and **Chapter 15 Military and Civil Aviation** for further details).

3.6.3.2 Wind Turbine Generator Installation

73. The precise details of the installation process will be confirmed prior to construction however it will follow one of the methodologies outlined below (details of the pre-installation works are given in relation to the foundations in **Section 3.6.2.1**):

- WTG components will be loaded onto the installation vessel (typically a jack-up vessel or an anchored floating vessel but also potentially a Dynamic Positioning (DP) vessel) at the marshalling base port. Blades, nacelles and towers are likely to be loaded separately.
- The installation vessel will then transit to the WDA and the components will be lifted by the vessel's crane onto the foundation or TP (depending on the foundation type being used). For each WTG, the tower would be installed first, followed by the nacelle, then the blades. Technicians will then fasten components together as they are lifted into place. Each WTG installation is likely to take in the order of one day, assuming no weather delays.
- Alternatively, the WTG components may be loaded onto dedicated transport vessels at the marshalling base and installed by an installation vessel that remains on site throughout the installation campaign.

74. The anticipated duration of the installation campaign for the WTG topsides is three years.

75. Each installation vessel may be assisted by a range of support vessels. These are typically smaller vessels that may be tugs, guard vessels, anchor handling vessels, or similar. These vessels will make the same general movements to, from and around the WDA as the installation vessels that they are supporting. See **Section 3.6.7.5.5** for further details of construction vessel types, numbers and movements.

3.6.3.3 Wind Turbine Generator Oils, Fluids and Materials

76. WTGs and the associated equipment require a number of oils, fluids and other materials for their safe use and operation. Biodegradable oils would be selected where practicable, all chemicals used will be certified to the relevant standard and all WTGs will have provision to retain any spilt fluids within the structure.

77. The required volume of oil and fluids will vary depending on the design i.e. conventional design or gearless, whether one or two or more rotor bearings are used in the design and the amount of redundancy designed into the system. Typical materials used include:

- Yaw grease;
- Yaw gear oil;
- Main bearing grease;
- Transformer (ester oil);
- Cooling fluid (water/glycol);
- Hydraulic oil;
- Pitch lubrication (grease);
- Pitch system hydraulic accumulators (nitrogen);
- Pitch gearbox oil;
- Gearbox oil; and
- Sulphur hexafluoride (SF_6) gas.[3]

3.6.4 Offshore Substation Platforms

78. As the OSP(s) (and OSP link cables, see **Section 3.6.7.2**) will be sited entirely within the WDA, potential impacts associated with their installation and maintenance are considered within this WDA EIAR and a marine licence to construct, alter or improve them is being sought alongside the Section 36 and marine licence applications for the generation infrastructure.

79. There will be up to two OSPs located appropriately to optimise the inter-array, OSP link and export cable lengths. The location of the OSP(s) will be confirmed during the detailed design process post-consent, accounting for the WTG layout, but will be within the WDA and not located on the perimeter of the WTG/OSP layout. Indicative OSP locations have been used for the relevant environmental assessments as noted in the appropriate topic chapters.

80. The inter-array cables from each string of WTGs will be brought to an OSP. At an OSP, the generated power will be transformed to a High Voltage Direct Current (HVDC) of voltage up to ±525kV.

81. The basic OSP design will consist of a topside structure configured in a multiple deck arrangement, with the decks either open with modular equipment, or fully clad. Weather sensitive equipment would be housed accordingly. Equipment and facilities may consist of:

- Medium voltage (MV) to high voltage (HV) step-up power transformers;
- HVDC valve hall;

[3] Noting that SPR's company commitment is to end the installation of SF6 assets where alternatives are available (SPR, undated).

- HV Reactors;
- MV and/or HV switchgear;
- Other electrical power systems including HV, MV and low voltage (LV) cables, Auxiliary, earthing transformers, LV switchgear etc.;
- Instrumentation, metering equipment and control systems;
- Standby generators;
- Large-scale energy storage systems (batteries etc.), plus associated systems;
- Auxiliary and uninterruptible power supply systems;
- Navigation, aviation and safety marking and lighting;
- Helicopter landing facilities;
- Systems for vessel access and/or retrieval;
- Vessel and helicopter refuelling facilities;
- Potable water;
- Black water separation;
- Storage (including stores, fuel, and spares);
- Offshore accommodation and mess facilities;
- Cranes;
- Communication systems and control hub facilities;
- Offshore vessel charging point;
- Indirect seawater cooling system including seawater lift and return caissons;
- HVAC systems;
- Fire fighting systems;
- Electrolysis and chlorination system;
- System to manage contaminated fluids; and
- Drone landing pad.

82. Some of the equipment at the OSP would contain fluids. The key types of fluids that may be used include:

- Diesel fuel for the emergency generators (in diesel storage tanks);
- Oil for the transformers (oil will be monitored and filtered, top-up may be required);
- Engine oil;
- Glycol;
- Sewage and grey water;
- Lead acid contained within batteries; and
- SF_6 and other insulating gas.

83. The OSP design will include self-contained bunds to collect any possible oil spill. Transfer of oil/fuel between the OSP and service vessels will follow good practice procedures, with additional procedures in place should there be a spill to the marine environment (see **Appendix 6 Outline Environmental Management Plan**).

84. Any oil spillage would be collected in a separate oil waste tank. Both oil waste and other wastes (wastewater etc.) would be brought to shore in a secure container and disposed of according to industry best practice procedures.

85. All other waste streams would be processed on the OSP or transferred to shore as required.

86. Design parameters for a single OSP topside are provided in **Table 3.14**.

Table 3.14 OSP Maximum Design Parameters

Parameter	Value
Indicative topside weight (tonnes)	22,000
Maximum topside length (m)	125
Maximum topside width (m)	120
Maximum topside height (excluding crane, helideck and communication mast) (m HAT)	80
Maximum topside height (including crane, helideck and communication mast) (m HAT)	100

3.6.4.1 Offshore Substation Platform Foundations

87. The foundation types that may be used for the OSPs are:

- Pin pile jackets;
- Suction bucket jackets; and
- GBS.

88. Scour protection may be required around the base of the OSP foundations to protect against localised erosion of the seabed. The types of scour protection that could be used and the installation methods are as described for the equivalent WTG foundations (**Section 3.6.3.3**).

89. Jacket OSP foundations will mainly be comprised of steel however it is possible that some secondary structures, such as handrails, gratings and ladders, could be produced using other metals, such as aluminium, or composites. Also, concrete could be used to form the working platform.

90. GBS foundations will be comprised of concrete or reinforced concrete with a thick internal steel lattice structure.

91. The worst-case OSP parameters for each foundation type, including details on hammer energies (relevant to pin pile jackets only), scour protection and seabed preparation, are provided in **Table 3.15**.

Table 3.15 OSP Foundation and Installation Parameters

Parameter	Value
Maximum number of OSPs	2
Pin-pile Jacket	
Maximum number of legs per OSP	8
Maximum number of pin piles	16
Maximum leg diameter (m)	4
Maximum pin pile diameter (m)	4.5
Maximum hammer energy (kJ)	4,400
Maximum drill arisings per OSP (m^3)	24,740
Maximum drill arisings for two OSPs (m^3)	49,480
Maximum piling duration per pin pile, (including soft-start and ramp-up, and excluding possible breakdown, drive-drill-drive, refusal, etc.) (minutes)	195
Maximum piling duration per jacket (minutes) (16 pin piles per OSP)	3,120

Parameter	Value
Maximum seabed footprint per platform (m^2)	12,000
Maximum seabed footprint for total platforms (m^2)	24,000
Maximum prepared seabed area per OSP (m^2)	20,444
Maximum prepared seabed area for total OSPs (m^2)	40,888
Maximum seabed preparation volume per OSP (m^3)	82,037
Maximum seabed preparation volume for total OSPs (m^3)	164,074
Maximum scour protection area per OSP foundation (including pin pile jacket footprint) (m^2)	10,306
Maximum scour protection area for total OSP foundations (including pin pile jacket footprint) (m^2)	20,612
Maximum scour protection volume per OSP pin pile jacket foundation (m^3) (rock)	15,459
Maximum scour protection volume for total pin pile jacket foundations (m^3) (rock)	30,918
Suction Bucket Jacket	
Maximum number of legs per OSP	8
Maximum leg diameter (m)	4
Maximum suction bucket diameter (m)	15
Maximum seabed footprint per platform (m^2)	15,525
Maximum seabed footprint for total platforms (m^2)	31,050
Maximum prepared seabed area per OSP (m^2)	26,578
Maximum prepared seabed area for total OSPs (m^2)	53,156
Maximum seabed preparation volume per OSP (m^3)	109,370
Maximum seabed preparation volume for total OSPs (m^3)	218,740
Maximum scour protection area per OSP (including suction bucket jacket footprint) (m^2)	76,341
Maximum scour protection area for total OSPs (including suction bucket jacket footprint) (m^2)	152,682
Maximum scour protection volume per OSP (m^3) (rock)	114,511
Maximum scour protection volume for total OSPs (m^3) (rock)	229,022
GBS	
Maximum GBS footprint per OSP (m^2)	15,000
Maximum GBS footprint for total OSPs (m^2)	30,000
Maximum prepared seabed area per OSP (m^2)	26,678
Maximum prepared seabed area for total OSPs (m^2)	53,356
Maximum seabed preparation volume per OSP (m^3)	109,870
Maximum seabed preparation volume for total OSPs (m^3)	219,740

Parameter	Value
Maximum scour protection area per OSP (including GBS footprint) (m^2)	120,000
Maximum scour protection area for total OSPs (including GBS footprint) (m^2)	240,000
Maximum scour protection volume per OSP (m^3) (rock)	180,000
Maximum scour protection volume for total OSPs (m^3) (rock)	360,000

3.6.4.2 Offshore Substation Platform Installation

92. Topside installation may be by any of the following methods:

- Crane vessel (or vessels working together) in a single lift;
- Crane vessel (or vessels working together) in separate lifts of deck and sub-modules;
- Rail-skid transfer from a large jack-up; or
- Self-installing.

93. The jacket foundation legs may be fixed to the seabed either with piles or suction buckets, or in the case of GBS, through gravity. Piling of the jacket would be as described for the WTG foundations (**Section 3.6.2.3.3.1**), with the key parameters set out in **Table 3.15**.

94. As with the other piled foundation solutions, in the event of drilling being required, the OSP jacket pin piles may be drilled or drilled-driven into the seabed.

95. As with WTGs, drill arisings would be disposed of adjacent to the foundation location, above or slightly below the sea surface, from where they would be expected to settle onto the seabed in the immediate vicinity of each foundation (see **Chapter 7 Marine Physical Environment** for further details).

3.6.5 Underwater Noise

96. A number of activities during the construction, operation and maintenance and decommissioning of the Project will result in underwater noise. The most significant noise sources are likely to be piling of the foundations and clearance of UXO. An underwater noise modelling study has been undertaken in support of the assessment and is provided in **Appendix 10.1 Underwater Noise Modelling Report**.

3.6.6 Navigation Lighting Requirements and Colour Scheme

97. With respect to lighting and marking, the WTGs and OSP topsides will be designed and constructed to satisfy the requirements of the Civil Aviation Authority, MCA, NLB, and the Ministry of Defence as required.

98. Further details including reference to the relevant guidance and regulations is presented in **Chapter 13 Shipping and Navigation, Chapter 15 Military and Civil Aviation** and **Appendix 13 Outline Vessel Management and Navigational Safety Plan**.

99. The colour scheme for nacelles, blades and towers is expected to be RAL 7035 (light grey) and foundation steelwork RAL 1023 (traffic yellow) from HAT up to a minimum of 15m, to be determined by the relevant requirements and guidance at the time.

3.6.7 Electrical Infrastructure – Offshore Cables

100. The Project's electrical transmission system (OSPs, OSP link cables and export cables) will transmit the power produced by the WTGs to the national electricity transmission system. The transmission

system will be constructed, and the ownership will be transferred to an Offshore Transmission Owner in accordance with applicable rules and regulations in a transaction managed by the Office of Gas and Electricity Markets (Ofgem).

101. The electrical cables that make up the offshore transmission system include:

- Offshore export cables (linking the OSP(s) to the landfall); and
- OSP link cables (linking OSPs together).

102. Each type of offshore cabling is described in the following sections. See **Chapter 1 Introduction** and **Section 3.3.1** regarding the consenting approach for each Development Area and associated infrastructure component.

3.6.7.1 Inter-Array Cables

103. IACs link the WTGs to the OSPs. The cable system design will be based on radial strings from the OSPs connecting multiple WTGs per string. Cable circuits (strings) would be optimised according to the electrical load they are required to carry, with up to three different cable dimensions being used. They would be integrated with fibre optic cables. Each IAC would be installed in its own trench. IAC parameters are set out in **Table 3.23**.

Table 3.16 IAC Parameters

Parameter	Details
Maximum operating voltage (kV)	132
Indicative external cable diameter (mm)	220
Maximum IAC length (km)	572
Maximum IAC temporary disturbance width during installation (including seabed preparation) (m)	20

3.6.7.2 Offshore Substation Platform Link Cables

104. As noted for OSPs (**Section 3.6.4**), the entirety of the OSP link cables will be sited within the WDA and therefore potential impacts associated with their installation and maintenance are considered within this WDA EIAR and a marine licence to construct, alter or improve them is being sought alongside the Section 36 and marine licence applications for the generation infrastructure.

105. If two OSPs are required, up to four OSP link cables would connect OSPs to each other. The OSP link cable voltage would be up to 525 kV, with an indicative external cable diameter of up to 275 mm. They would be integrated with fibre optic cables.

106. Up to two OSP link cables would be bundled together in a single trench.

107. OSP link cable parameters are included in **Table 3.17**.

Table 3.17 OSP Link Cable Parameters

Parameter	Details
Maximum operating voltage (kV)	525
Indicative external cable diameter (mm)	275
Maximum number of OSP link cables	4
Maximum number of trenches	2

Parameter	Details
Maximum length of OSP link cables per cable (km)	68
Maximum length of all OSP link cables within the WDA (km)	272
Maximum OSP link cable temporary disturbance width during installation (including seabed preparation) (m)	20

3.6.7.3 Offshore Export Cables

108. As noted in **Section 3.3.1**, the Offshore ECC is at an early stage of development however worst-case scenarios associated with the portion of the offshore export cables that will be located within the WDA have been defined to ensure that the full suite of impacts and associated activities within the WDA can be assessed within this WDA EIAR.

109. There will be up to four HVDC offshore export cables. Offshore export cables will include fibre optic cores either integrated within the export cable or bounded externally. The power cable voltage would be up to 525 kV with an indicative external cable diameter of up to 160 mm.

110. The total length of offshore export cable that could be located wholly within the WDA is 50 km per cable giving 200 km in total for up to four cables. This has been defined assuming an OSP location in the northeast of the WDA which results in the greatest distance to the landfall location near Girvan, South Ayrshire.

111. Up to two offshore export cables would be bundled together in a single trench.

112. Offshore export cable parameters are included in **Table 3.18**.

Table 3.18 Offshore Export Cable Parameters

Parameter	Details
Landfall location	Girvan, South Ayrshire
Transmission technology	HVDC
Maximum operating voltage (kV)	525
Indicative external cable diameter (mm)	up to 160
Maximum number of offshore export cables	4
Maximum number of trenches	2
Maximum length of offshore export cables within the WDA per cable (km)	50
Maximum length of all offshore export cables within the WDA (km)	200
Maximum offshore export cable temporary disturbance width during installation (including seabed preparation) (m)	20

3.6.7.4 Cable Installation

3.6.7.4.1 Boulder Clearance

113. As noted in **Section 3.6.2.1** for WTG foundation installation, boulders that present an obstacle to construction activities would be confirmed by the pre-construction surveys. In the event that boulders cannot be avoided through micro-siting, they will be relocated to an adjacent area of seabed within the WDA where they do not present an obstacle to the works, and where practicable to an area of

seabed with similar sediment type and avoiding any known sensitive habitats. If required, boulder clearance would be undertaken by subsea grab or plough.

114. Boulders will be relocated to an adjacent area of seabed within 20 m and therefore temporary seabed disturbance footprints have not been included within **Table 3.3** because any disturbance is assumed to be encompassed within the 20 m wide temporary disturbance footprint from cable installation as described in **Section 3.6.7.5.5**.

115. Where boulders are required to be relocated, the Project's FLO will liaise with the fishing industry on their locations.

3.6.7.4.2 Unexploded Ordnance Clearance

116. Specific surveys to identify potential locations of UXO would not be undertaken until after consent is granted. This is to allow more detailed engineering work to be carried out on the cable routes and locations of WTGs to allow a targeted survey for potential UXO to be undertaken.

117. However, a desk study undertaken by RPS (RPS, 2024) provides an indication of the types of UXO with potential to be found within the WDA and the risks of various intrusive activities associated with these. The WDA is located within an area defined as a moderate risk.

118. Detailed pre-construction surveys will be undertaken post-consent to inform detailed project design and identify potential UXO. A marine licence application will be applied for post-consent to allow for the investigation and clearance of any UXO based on accurate information at that time and to ensure appropriate mitigation is put in place (see **Appendix 9 Draft Marine Mammal Mitigation Protocol (MMMP)**).

119. Micro-siting around UXO will be the preferred course of action; however, if that is not practicable, UXO will be cleared using low-order clearance techniques (e.g. deflagration). If repeated attempts to clear UXO using low-order techniques fail, UXO detonation will be undertaken as per the approach described in **Appendix 9 Draft MMMP**.

3.6.7.4.3 Sandwave Levelling

120. Areas of mobile seabed (typically either in sandwaves or megaripples) may present a risk to the cable burial process either by preventing the cable burial tools from operating efficiently or by resulting in exposure and scouring of the cable once installed. In some cases, over time, this could result in the cable being left 'free-spanning' over the seabed. Free spanning cables present a risk to other marine users and result in a large amount of strain being placed on the cables, significantly increasing the chance of their failure and the subsequent need for repair works.

121. To prevent this, cables can be placed where possible in the troughs of sandwaves to the reference seabed level, which would minimise the potential for cables becoming exposed. However, where this is not possible, the alternative is to dredge the top of the sandwaves prior to installation down to the seabed reference level. This process is termed sandwave levelling which could be done via dredging, sandwave clearance using a plough, or similar. If required, it would be completed before the cable is laid on the seabed.

122. There is an assumption that levelling for OSP link and export cables will be avoided however sufficient redundancy is included within IAC levelling budget should this be required. Worst-case sandwave levelling parameters are detailed in **Table 3.19**.

Table 3.19 Worst-case Sandwave Levelling Parameters

Parameter	Value
Length of IAC route requiring sandwave levelling (based on the approximate area of the WDA (excluding the WDA restricted build area) with sandwaves)	22%
Length of IAC route requiring sandwave levelling (km)	114.62
Illustrative width of disturbance (m)	70
Maximum sandwave levelling seabed disturbance footprint within the WDA (m^2)*	8,023,400
Maximum sandwave levelling volume of sediment disturbed within the WDA (m^3)	4,011,700
* For the purposes of securing an adequate sandwave levelling allowance across the generation and transmission assets and their associated marine licences, as proposed in the **Application for Section 36 Consent Cover Letter**, 4,011,700 m^3 has been assessed for all offshore cable types with the individual volumes for each type of cable to be agreed through the Development Specification and Layout Plan. If dredging is used, relevant dredge and disposal licences will be applied for, using volumes identified in the Development Specification and Layout Plan.	

3.6.7.4.4 Pre-Lay Grapnel Run

123. Before cable-laying operations commence, it must be ensured that the route is free from obstructions such as discarded fishing gear, anchors or abandoned cables, wires and ropes that may be identified as part of the pre-construction surveys. A survey vessel would be used to undertake a PLGR to clear such identified debris. The width of seabed disturbance along the PLGR is estimated to be up to 6 m, which would be encompassed by the maximum 20 m footprint of cable installation works – see **Table 3.3**.

3.6.7.5 Cable Burial

124. The purpose of cable burial is to ensure that the cables are protected from damage, either from human activities such as fishing and shipping, or from naturally occurring physical morphology processes acting on the seabed. Cable minimum Depth of Lowering (DoL) (i.e. the distance between mean seabed level and the top surface of the buried cable (**Plate 3.7**) will be between 0.3 m and 3 m but is typically between 1.0 m and 2.0 m in seabed substrates consisting of granular material or soft clay. Where practicable, the Applicant will seek to achieve DoLs of 1.0 m to 2.0 m for all offshore cable types. DoLs of up to 3.0 m may be used for areas experiencing significant seabed mobility or due to an increased external threat, such as crossing shipping lanes. DoLs of 0.3 m may be used for IACs in challenging ground conditions such as shallow outcropping rock, due to the inherent protection it provides the cable at a shallower DoL. OSP link cables and offshore export cables would, as far as practicable, have a minimum DoL of 1 m. Otherwise, external cable protection methods would be considered such as concrete mattresses, rock placement, rock bags and nature inclusive design solutions (see **Section 3.6.7.6** for further details).

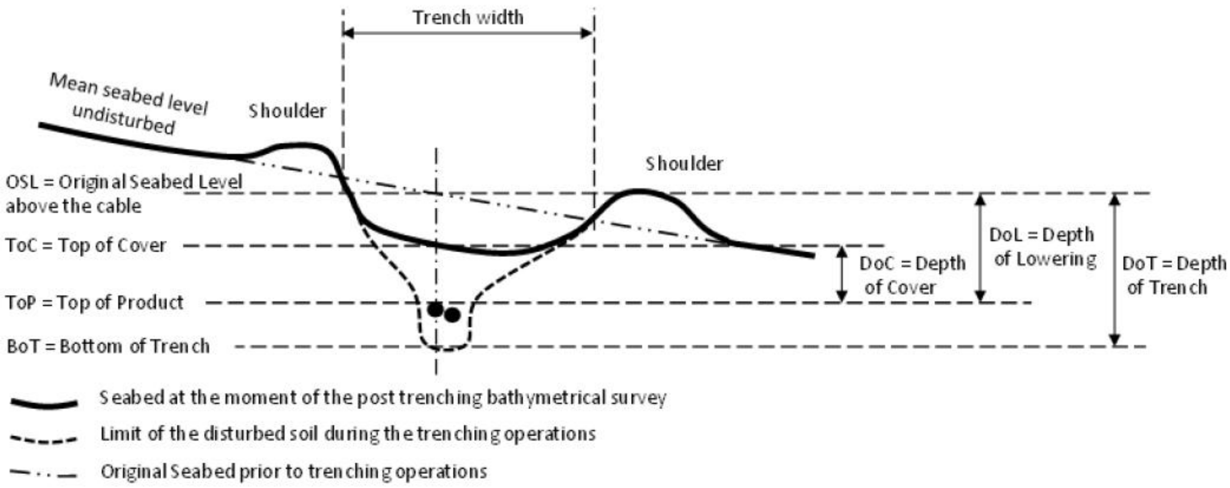

Plate 3.7 Depth of Lowering Measurement

125. In the post-consent phase, the Applicant will develop preliminary cable routes as well as perform detailed geotechnical and geophysical investigations to understand the seabed topography and soil characteristics of the site. The Applicant will then employ services of an independent consultant to develop a Cable Burial Risk Assessment in line with Carbon Trust (2015) to assess site specific risks considering existing human activities and site soil characteristics. In addition, a seabed mobility study will be provided if applicable using mobile site data and cable route design. These studies will be used to establish the required minimum DoL of each cable to provide a reasonable level of protection for the lifetime of the Project. The seabed mobility study will highlight any sections of the cable subject to exposure to be maintained during operation of the Project.

126. The DoL remains subject to revision within the design envelope following update of the above studies and assessments as the detailed cable routes are developed or completion of detailed pre-construction geotechnical and geophysical investigations.

127. Burial of the offshore cables will be through any of ploughing, jetting, mechanical trenching, hybrid jetting and cutting tool or mass / controlled flow excavator. The dimensions of the cable trenches (where applicable) and the overall seabed footprint affected by the burial process will depend on the installation method. Details are provided in **Section 3.6.7.5.5**.

3.6.7.5.1 Cable Burial by Ploughing

128. A plough uses a share to cut through the seabed, while burying the cable behind it. Ploughs can be used as a pre-trench tool (i.e. the cables are laid into a trench for later backfilling), a post-lay burial tool (i.e. the cable is first laid in position on the seabed before being backfilled) or, more commonly, as a simultaneous lay and burial tool (**Plate 3.8**). Ploughing tools are pulled directly by a surface vessel. The plough lowers the cable into the seabed as it moves. Indicative dimensions of a large plough are 15 m x 6.5 m x 7 m.

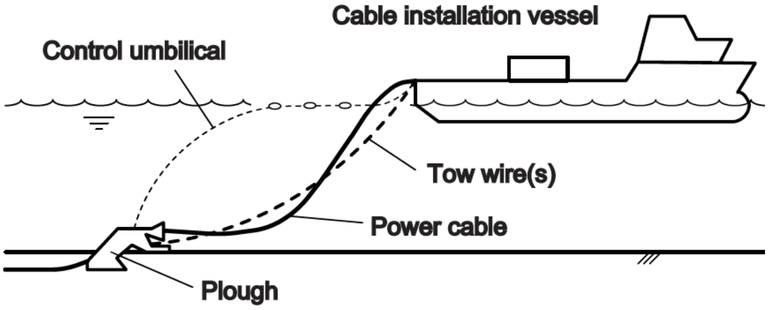

Plate 3.8 Simultaneous Lay and Burial - Plough

129. There are two types of plough: displacement and non-displacement. The difference is important in terms of understanding the effect on the seabed. Displacement ploughs are typically used to pre-cut a trench, creating a trench that remains open for subsequent cable installation. A second backfilling pass of the plough is then undertaken to bury the cable. By contrast, a non-displacement plough is designed to trench and bury the cable in a single simultaneous lay and plough operation, consequently causing less disturbance on the seabed. The plough may be fitted with additional equipment to help improve performance in certain soils, for example water jets for burying in sand.

130. The rate of burial using a plough depends on factors including bathymetry, ground conditions and the required towing tension. An indicative burial rate by ploughing is 150-300 m/h.

131. There may be locations where other methods to bury and protect the cable are required even where ploughing is used as the primary burial tool e.g. for any jointing cable loops and where ploughing would be unable to negotiate obstacles or cable crossings.

3.6.7.5.2 Cable burial by Jetting

132. Jetting uses a combination of high pressure and low pressure water to fluidise the seabed for sufficient length to allow the cable to reach the base of the trench through gravity. Jetting may be undertaken either as a separate operation on a cable that has been pre-laid on the seabed (**Plate 3.9**), or by simultaneously laying and jetting. Jetting is performed from a self-propelled subsea vehicle.

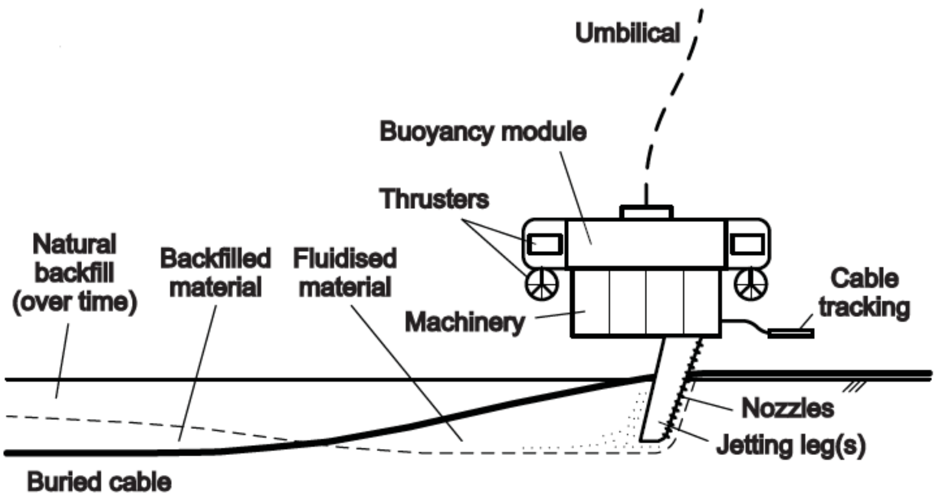

Plate 3.9 Post Lay Burial - Jetting

Indicative dimensions of a large jetting vehicle are 5 m x 4.2 m x 3 m. An indicative burial rate by jetting is 150-300 m/h.

3.6.7.5.3 Cable burial by Mechanical Cutting

133. Mechanical cutting tools are either equipped with cutting chain or cutting wheel picks to penetrate through stiff to hard clay soil types and in certain occasions bedrocks. Mechanical trenching can either be used to perform a pre-lay trench or to bury the cable post-lay, see **Plate 3.10**. Indicative dimensions of a cutting tool are 8 m x 6.5 m x 5.5 m. An indicative burial rate by cutting is 75-150 m/h.

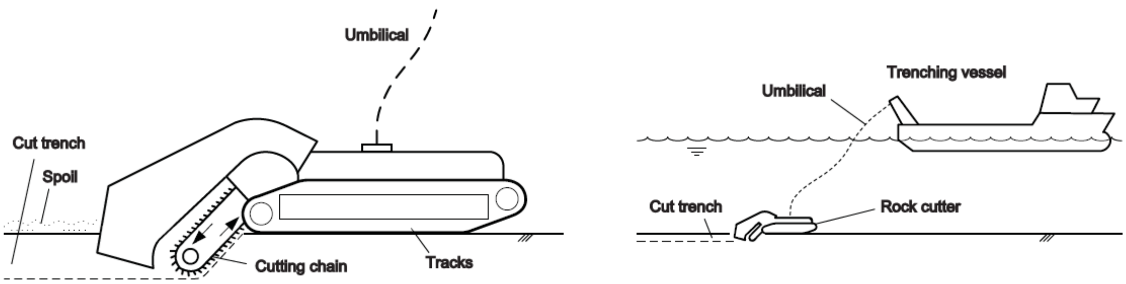

Plate 3.10 Pre-Lay Chain Cutting

3.6.7.5.4 Mass / Controlled Flow Excavator

134. Controlled flow excavation is a remotely operated subsea tool suspended in the water column above the cable from the parent vessel, which directs a variably controlled flow of water at low to high water pressures depending upon the nature of the seabed being excavated, the variable water flow, which is controlled by the operator, is directed vertically downwards at the area to be excavated. When the water flow meets the seabed, it breaks up the soil surface and raises it into suspension. The suspended particles are dispersed into the surrounding water column and carried from the site according to the prevailing current or tide. In still water conditions dispersal is more local and berms are potentially formed around the excavation.

135. Controlled flow excavation is primarily used for cable de-burial although may be used to trench small sections of cable in shallower water where it is not possible to deploy other trenchers. It is suitable where the seabed deposits comprise unconsolidated sand, gravel, mud, silt and soft to firm clay.

136. An indicative burial rate would be similar to that for jetting i.e. 150-450 m/h.

3.6.7.5.5 Trench Sizes

137. The maximum temporary disturbance width for IAC, OSP link cable and offshore export cable installation would be up to 20 m which includes the sediment mounds created either side of the trench and the width of the tool. This disturbance width encompasses boulder clearance, PLGR and trenching works. The respective indicative trench widths are as follows:

- Pre-lay ploughing 6.0 m;
- Post-lay ploughing 0.5 m;
- Jet trenching 1.5 m; and
- Mechanical cutting 1.0 m.

138. The footprint for sandwave levelling[4] (where required) would be additional to this, as described in **Section 3.6.7.4.3**.

3.6.7.6 Inter-Array Cable Installation

139. Since it is not possible to bury the IACs in close proximity to the WTGs and OSPs due to the scour protection that will be installed, the cables would be surface laid with cable protection on the approach to each foundation. An allowance of up to 50 m of cable protection is included for this purpose, although for the purposes of the environmental assessments, it is assumed this is within the footprint of the foundation scour protection. The installation of an IAC into a WTG or OSP foundation is described below.

140. Each section of cable will be laid from the cable lay vessel either from a static coil or a revolving carousel, turntable or drum. The cable will be pulled into the foundation via a J-tube (or alternative cable entry system) and hung-off inside the foundation structure before being connected to the electrical system. A typical methodology for installing the cable into a J-tube is:

- Mobilisation of a specialist cable installation vessel to site.
- A DP operated vessel will take up station adjacent to a foundation. The cable end will be connected to a pre-installed messenger wire at the foundation. The messenger wire will be recovered by a Remotely Operated Vehicle (ROV). The messenger wire will then allow the cable to be pulled into the foundation from a temporary pre-installed winch arrangement at the foundation. An ROV will be used to monitor the cable entering the J-tube or cable entry system.
- When the first cable end is pulled in with required overlength, the cable is secured with a temporary hang-off arrangement and cable installation continues towards the foundation for the second end pull-in and hang-off. Separate teams will be mobilised for installing permanent hang-off of the cable and terminate the cable cores and fibre optic cables.
- Second end cable pull-in, hang-off and termination will in principle be similar to the first end, except for overboarding of the last end of the cable from the installation vessel that will be by means of a quadrant.
- The same principle for cable installation is applicable for foundations without a J-tube. The main differences are the interface between the cable protection system and the foundation entry; without a J-tube the cable is free hanging inside the foundation structure.

3.6.7.7 External Cable Protection

3.6.7.7.1 Need for External Cable Protection

141. There are certain situations where the use of external cable protection may be required. These are:

- Where an adequate degree of protection has not been achieved from the burial process. This may be as a result of challenging grounds conditions, or unforeseen circumstances with the burial process, such as breakdown of the burial tool(s).
- Where the IACs approach the WTGs and OSP(s), as described in **Section 3.6.7.6** (note the corresponding footprint is within the allowance described for scour protection and therefore is not included in **Table 3.4**).
- At cable crossings (**Section 3.6.7.7.3**).
- At the HDD (or similar) trenchless technique exit pits noting this is considered within the WDA EIAR as part of the combined assessment in each of the topic-specific chapters which will be updated using the latest available information within the Offshore ECC EIA.

[4] Sandwave levelling could be done via dredging or sandwave clearance using a plough, or similar.

- If cables become unburied as a result of seabed mobility during the operation of the Project or (where necessary) in the event of making a cable repair (discussed in **Section 3.6.14**).

142. In all cases, the amount of external cable protection will be reduced as far as is practicable with cable burial being the preferred method of cable protection. The seabed footprints of external cable protection requirements for the Project are summarised in **Table 3.21**.

3.6.7.7.2 Types of External Cable Protection

143. A range of external cable protection systems are available and include:

- Rock placement – the laying of loose rock on top of the cable. Use of rock is often preferred as it is well proven to offer excellent protection in the marine environment, is suitable for application over large areas and is relatively simple and cost effective to deploy;
- Concrete mattresses – prefabricated flexible concrete coverings laid on top of the cable. Deployment is slow and therefore mattresses only tend to be used for short sections of cable;
- Frond mattresses – similar to concrete mattresses but the addition of fronds is used to encourage the settlement of sediment over the mattress and the cable underneath. Only suitable in certain hydrodynamic and sedimentary conditions;
- Protective aprons or coverings – solid structures of varying shapes, typically prefabricated in concrete or similar;
- Bagged solutions – including geotextile sand containers, rock-filled gabion bags or nets, and grout bags, filled with material sourced from the site or elsewhere;
- Cable protection system (e.g. Uraduct shell) – a protective shell fixed around the cable usually formed of plastic or metal. Generally used for short spans at crossings or near offshore structures where there is a high risk from falling objects. This technique does not provide protection from damage due to fishing trawls or anchor drags; and
- Cast iron shells – similar to cable protection system described above but made of cast iron.

144. Protection systems may be placed alone or in combination with other types and may be secured to the seabed where necessary. Selection of the appropriate system for use at the Project will be completed at the pre-construction stage once the requirements are better understood.

3.6.7.7.3 Cable Crossings within the Windfarm Development Area

145. Based upon publicly available data, there are no existing cables or pipelines within the WDA however there is potential that OSP link cables will be required to cross IACs and therefore an allowance for up to two crossings within the WDA has been made. **Chapter 17 Infrastructure and Other Marine Users** provides further details on existing infrastructure within the vicinity of the WDA.

146. Cable crossing parameters are provided in **Table 3.20**.

Table 3.20 Cable Crossing Protection Summary

Cables	Protection of unburied cable (m^2 / m^3)
Maximum number of OSP link cable crossings	2
Cable crossing dimensions (m)	250 (l) x 18 (w) x 3 (h)
Cable crossing area per crossing (m^2)	4,500
Cable crossing area for total crossings (m^2)	9,000
Cable crossing volume per crossing (m^3)	13,500
Cable crossing volume for total crossings (m^3)	27,000

3.6.7.7.4 Unburied Cables

147. In the absence of detailed geotechnical information and the likely presence of shallow bedrock throughout the WDA, a conservative assumption has been made that up to 10% of the length of each offshore cable type could require external cable protection where an adequate degree of protection has not been achieved from the burial process. This has been informed by publicly available datasets (e.g. BGS (2023)) and the Project's site investigation surveys alongside experience of projects with similar seabed conditions. In addition, it has been assumed that up to 50 m of IACs could require protection on approach to WTGs. A summary of cable protection requirements is provided in **Table 3.21**.

Table 3.21 Unburied Cable Protection Summary

Cables	Maximum length of cable requiring protection (km)	Protection of unburied cable (m^2 / m^3)	Protection of unburied cable notes
Inter-array	52.1	770,900 / 2,312,700	Based on up to 10% of each cable type requiring cable protection and up to 50 m of IAC on approach to WTGs. Cable protection would be up to 13 m wide and 3 m in height.
OSP Link	13.6	176,800 / 530,400	
Export cable portion within the WDA	5	65,000 / 195,000	
Total	71.5	929,500 / 2,788,500	

3.6.8 Ancillary Infrastructure

148. Ancillary works are likely to form part of the final design of the Project however the requirement and nature of these would be determined at the detailed design phase. Ancillary works may include:

- Temporary landing places, moorings or other means of accommodating vessels in the construction and / or maintenance of the authorised development;
- Buoys, beacons, fenders and other navigational warning or ship impact protection works;
- Charging buoy solutions which may be connected via a dynamic subsea cable to the offshore substation platform or a WTG; and
- Temporary works for the benefit or protection of land or structures affected by the authorised development.

149. Buoys would be required across the WDA, these would be LiDAR, wave or guard buoys. Each buoy would be up to four metres wide and six metres high and would include a lantern suitable for use as a navigational aid.

150. These devices would be attached to the seabed using mooring devices such as common sinkers (small block of heavy material such as concrete, steel, etc.) or anchored by means of regular anchors. They could have one single mooring point or several points (usually up to three), with an anticipated total footprint of $4m^2$.

3.6.9 Nature Inclusive Design

151. The project is committed to pursuing a nature positive approach to development, with a focus on identifying and delivering opportunities for biodiversity enhancement. A **Nature Positive Plan** has been submitted with the application and outlines initial measures and concepts for nature inclusive design and enhancement. This plan will continue to evolve through ongoing engagement with stakeholders to ensure that all feasible opportunities for ecological enhancement are considered throughout the project lifecycle.

3.6.10 Ports

152. At this stage in the Project's development, specific decisions regarding port locations and their roles across its phases – construction (marshalling and assembly, marine operations), and operation and maintenance – have not yet been finalised and will not be confirmed until after consent is granted. Indicative locations have therefore been considered based on where activity is most likely to be concentrated, using available project information and sector knowledge. These locations are illustrative only and do not reflect any formal decisions about site or port selection; however, they have been selected to ensure that reasonable worst-case scenarios can be assessed for the relevant topics, namely:

- **Chapter 20 Climate Change Risk Assessment**;
- **Chapter 11 Offshore Ornithology**;
- **Chapter 10 Marine Mammals and Leatherback Turtle**; and
- **Chapter 18 Socio-Economics**.

153. The indicative ports are as follows:

- Marshalling & Assembly (Construction):
  - Kishorn;
  - Arnish/Stornoway; and
  - Hunterston.
- Marine Operations (Construction):
  - Oban;
  - Port Ellen; and
  - Bendoran (Mull).
- O&M:
  - Campbeltown/ Machrihanish;
  - King George V (Glasgow); and
  - Hunterston.

154. In the event that the Project is consented, and before any decision is made regarding the final ports to be used for the Project, further technical and commercial due diligence will be undertaken in addition to further engagement and consultation with local communities.

3.6.11 Traffic and Transport

155. It should be noted that due to the size and volume of the proposed infrastructure, it is anticipated that the overwhelming majority of Project components will be transported to site by vessel, which will substantially reduce the number of vehicle movements required.

156. However, there will be a number of vehicle trips associated with each port type as a result of staff movements and deliveries. A realistic forecast of anticipated activities has been used to generate likely traffic generation from first principles, as shown in **Table 3.22**, based on SPR's practical experience of constructing and operating a number of offshore windfarms.

Table 3.22 A Summary of Likely Traffic Generation at Each Port Type

Port Type	Potential Ports Identified	On-shore staff trips	Off-shore staff trips	Deliveries
Marshalling and Assembly	Hunterston, Kishorn, Arnish/Stornoway	30 cars per day		Limited, small scale (Large components by sea)
Marine Operations	Oban, Port Ellen, Bendoran	40 cars per day		2-3 per day

Port Type	Potential Ports Identified	On-shore staff trips	Off-shore staff trips	Deliveries
Operations & Maintenance	Campbeltown and Machrihanish, King George V, Hunterston	20 cars Monday to Friday	50 cars every 2 weeks	c. 1 per day on average

157. As shown in **Table 3.22**, the Project would not generate substantial levels of traffic and would therefore not be expected to result in a highway capacity impact at most of the shortlisted ports. However, it is acknowledged that if the chosen location has limited parking provision, for example at some of the smaller or more constrained port locations on the shortlist such as Oban, Port Ellen or Bendoran, this level of additional parking demand may result in the need for mitigation.

158. Available parking would be taken into consideration during the site selection stage and mitigation, whether through further parking provision or travel plan style measures, would be provided where necessary.

159. Typically, access roads to ports would not be considered as highly sensitive, as they are already likely to be regularly used by vehicles serving the port. On this basis, as per the Institute of Environmental Management and Assessment Guidelines on Environmental Assessment of Traffic and Movement, traffic links would be screened by the Rule 1 criteria, i.e. where traffic flows (or the number of HGVs) will increase by 30%.

160. The maximum forecast of 40 cars per day would only constitute a 30% increase if existing daily traffic flows were under 265 movements. This is considered unlikely at the shortlisted locations in question given the existing port activities and through traffic, and therefore effects associated with Traffic and Transport are scoped out of the EIAR, as agreed with Transport Scotland during consultation (see **Table 3.1**).

161. Should the Project receive consent, a Traffic Management Plan (either Construction or Operational as appropriate) would be produced, reflecting the unique nature of the chosen ports and any necessary mitigation. The plans would be agreed with stakeholders prior to use of the relevant port. The Applicant welcomes a condition to secure this.

3.6.12 Construction Vessels and Helicopters

162. A variety of vessels will be used during the construction phase, although the exact number and specification will not be known until much closer to the time of construction. Similarly, the construction port(s) will not be confirmed until nearer the start of construction (**Section 3.6.8**). Helicopters may also be used for crew transfer purposes.

163. **Table 3.23** gives an indication of the maximum construction vessel quantities and related movements to and from port that can be expected on site at any one time. Due to construction sequencing, not all types of vessel will be on site at the same time.

164. A total of 5,699 vessel movements (round trips) is estimated during construction on a worst-case basis. The maximum number of all types of vessels operating within the WDA at any one time during construction is 117 (**Table 3.23**).

Table 3.23 Pre-construction and Construction Vessels (Transit to and from Port Equates to two Movements)

Activity	Vessel type	Indicative maximum number on site at any one time	Indicative vessel round trips
Pre-construction vessels	Site Investigation Survey (Geotechnical & Geophysical) Vessels	4	40
	Support Vessels	4	40
	UXO Clearance Survey Vessels	2	20
	Boulder clearance vessels	2	20
	PLGR vessels	2	20
Foundation Installation	Dredging vessel	6	30
	Tugs and barges storage and transport	16	1100
	Jack-up vessel	3	300
	Dynamic Position Heavy Lift Vessel	5	525
	Support vessels	8	500
WTG Installation	Jack-up vessel	5	300
	Dynamic Position Heavy Lift Vessel	2	200
	Accommodation vessel	3	40
	Windfarm service vessel	3	30
	Support vessels	3	400
OSP Installation	Installation vessel	2	100
	Tug with accommodation barge	2	100
	Supply vessel	2	50
	Support vessels	3	500
Cable Installation	Inter-array cable laying vessel	2	107
	Accommodation vessel	3	42
	IAC-Inspection Service Vessel	3	32
	IAC-Trenching Support Vessel	2	20
	IAC-CTV	3	204
	IAC - Rock placement vessel	2	32
	IAC-LCV (possibly)	2	161
	Export offshore cable laying vessel	2	107
	Export cable nearshore laying vessel	2	50
	Export cable support vessel	2	161
	Export cable pre-trenching/backfilling vessel	2	43

Activity	Vessel type	Indicative maximum number on site at any one time	Indicative vessel round trips
	Export cable - cable jetting vessel	2	43
	Export Cable - survey vessel	2	161
	Export Cable – multi-cat vessel	3	139
	Export Cable - rock placement vessel	2	32
	Workboat	20	190
Total (excluding pre-construction vessels)	-	**117**	**5,699**
Total	-	**n/a**	**5,840**

165. Due to the metocean conditions at the WDA, it is likely that the use of jack-up vessels and anchored vessels will be avoided/minimised however where they are used, they will have a seabed footprint (**Table 3.24**) (these footprints are also incorporated in **Section 3.6.1.1**). For this purpose, it is assumed that there would be one operation for each foundation installation (most likely using anchors) and a further operation for each WTG installation (most likely using a jack-up). Jack-up vessels may have up to six legs, each with a footprint of up to 300 m^2.

166. In the case of monohull floating construction vessels with anchoring, it is likely to be a wire line system with drag/fluke anchors, with up to 12 lines per location. The footprint of each anchor would be up to 6 m in width (approximately 30 m^2), with an anchor line length of up to 1,000 m. There would usually be one anchor pattern per foundation, although re-setting of anchors is sometimes required in the event that they do not hold position (two assumed as a worst-case).

Table 3.24 Construction Vessel Footprints (Foundation, WTG and OSP Installation)

Parameter	Jack-Up	Anchors
Number of legs/anchors	6	12
Footprint area per placement (m^2)	1,800	360
Max. number of operations per foundation installation	n/a	2
Max. number of operations per WTG installation	2	n/a
Max. number of WTG and OSP locations	144 +2 OSPs	144 +2 OSPs
Total footprint (m^2)	**525,600**	**105,120**

3.6.13 Safety Zones

167. **Chapter 2 Policy and Legislation** describes the legislation for establishment of statutory safety zones. It is anticipated that the following safety zones for the WDA will be applied for:

- Temporary (or rolling) 500 m safety zones surrounding the location of all surface piercing structures where construction work is being undertaken by a construction vessel;
- 50 m safety zones around all partially completed or completed surface piercing structures which are not yet fully commissioned during the construction phase; and

- 500 m around any structure where major maintenance is ongoing (major maintenance works are defined within the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007.

168. Statutory decommissioning safety zones will be applied for at that time (as appropriate); however, these are not anticipated to exceed the standard 500 m safety zone.

169. Further information on safety zones is provided in **Chapter 13 Shipping and Navigation**.

3.6.14 Offshore Operation and Maintenance

170. A programme of monitoring and scheduled maintenance would be undertaken through the lifetime of the Project to ensure that all offshore infrastructure is maintained in safe working order and to maximise operational efficiency. The overall operation and maintenance strategy will be finalised once the operation and maintenance base location and technical specification of the Project are known. Therefore, this section provides an overview of the potential scheduled and unscheduled O&M activities within the WDA which are reasonably foreseeable.

171. Operational control of the Project would be through a SCADA system, which would connect each WTG to the onshore control room. This system would enable the remote control of individual WTG, as well as remote interrogation, information transfer and data storage.

172. Surveys, including geophysical survey (most typically multibeam echosounder and/or side scan sonar) alongside remotely operated vehicles, would be performed at regular intervals throughout the operational life of the Project. A typical geophysical survey programme for asset integrity purposes does not require a Marine Licence. The work programme would generally focus on areas of primary interest, for example areas of greatest seabed mobility.

173. Typical general maintenance activities include, but are not limited to:

- WTG inspections and service;
- Oil sampling and/or change;
- Uninterruptible power supply battery change;
- Service and inspections of WTG safety equipment, nacelle crane, service lift, high voltage system, blades;
- OSP inspection/repair;
- Foundation inspection and repair;
- Cable repair and replacement;
- Cable remedial reburial;
- Cable crossing inspection and repair; and
- Unplanned and planned corrective work.

174. Subsea cables are designed for the operational life of the Project, however reactive repairs, replacements or remedial cable reburial work may be required, which are addressed in **Sections 3.6.14.2** and **3.6.14.3**. Major component replacements such as WTG gearboxes may be required during the lifespan of the Project. Other large components (e.g., WTG blades or OSP transformers) are not expected to need replacement frequently during the operational phase, although failure of these components is possible. In the event of major component replacement, a DP vessel is likely to be used however if a jack-up vessel is used this may be required to operate continuously for significant periods to carry out major maintenance activities of this type. For this purpose, it is assumed that there could be up to 280 jack-up vessel round trips over the operational life.

3.6.14.1 Vessel / Helicopter Operations

175. Vessel / helicopter trips to the Project would be required each year to allow for scheduled and unscheduled maintenance activities. **Table 3.25** provides a breakdown of the maximum number of vessels / helicopters that may be required at any one time per year during normal operation (i.e. excluding unforeseeable serial defects) and the anticipated maximum number of vessel movements per year during O&M.

Table 3.25 Anticipated Peak Number of O&M Vessels / Helicopters Required at any One Time and Indicative Annual Vessel / Helicopter Round Trips

Vessel Type	Indicative Peak Numbers of Vessels Required at Any One Time	Indicative Annual Vessel Round Trips
Jack-up vessels	1	8
SOVs	2	48
SOV daughter craft	4	N/A since these are attached to the SOV on transit to the WDA
CTVs	2	360
Cable laying / maintenance vessels	1	1
Geophysical survey vessels	3	6
Helicopter	1	576
Total (excluding helicopters)	13	423
Total (including helicopters)	14	999

3.6.14.2 Cable Repair or Replacement

176. The basic methodology for carrying out a cable repair would involve removal of the damaged or faulty section of the cable, cutting of that section (unless replacing the whole cable), followed by the insertion of a new cable section to be joined to the existing cable. The seabed footprint of cable repair and replacement works is summarised in **Table 3.26**.

177. The section of cable to be repaired would be exposed using techniques such as jetting or mass flow excavation (if buried) and/or removal of any external cable protection. Once the repair is completed, jetting or other suitable methods of trenching would be used to rebury the cable and/or reinstall the external cable protection. In addition, cable protection may require inspection and maintenance during the operational phase of the Project. For the longer OSP link and offshore export cables, an extended cable loop would typically be surface laid onto the seabed close to, and to one side of, the original cable, prior to the cable being protected as described above. As the original cable would be recovered from the trench prior to cutting, it's possible that the length of cable to be re-buried, and any external cable protection (if required), would be greater than the length of cable repaired.

178. For IACs, it may make more sense to replace the entire length of a cable rather than repairing and therefore an allowance of up to 10 km has been assumed as a worst-case. The methodology for cable replacement would be identical to cable installation, with the addition of the removal of the cable from the WTG/OSP structure and seabed before installation of the replacement.

3.6.14.3 Cable Reburial

179. If cables become exposed due to the natural movement of the seabed over the operational life of the Project, it may be necessary to undertake remedial reburial work to ensure that the cables are adequately protected, without the need to resort to the use of external cable protection measures. The need for reburial work would be informed by an ongoing programme of geophysical surveys.

3.6.14.4 Cable Repair, Replacement and Reburial Footprint Summary

180. **Table 3.26** summarises the seabed footprints in relation to cable repair, replacement and reburial works. The footprints are based on a maximum temporary disturbance width of 3 m.

Table 3.26 Footprint of Potential Cable Repair / Replacement and Reburial and Cable Protection Replenishment for the WDA

Parameter	Offshore Cable Type		
	IAC	OSP Link	Offshore Export Cable (Within the WDA)
Cable Repair / Replacement			
Maximum estimated repairs/replacement - lifetime quantity (35 years)	10	4	2
Maximum estimated repairs/replacement seabed disturbance footprint per event (m^2)	Up to 10 km length, 5 m disturbance width = 50,000	Up to 1 km length, 5 m disturbance width = 5,000	Up to 2 km length, 5 m disturbance width = 10,000
Maximum estimated seabed disturbance footprint over Project's operational life (35 years) (m^2)	500,000	20,000	20,000
Maximum estimated area of external cable protection requiring replenishment over the Project's operational life (m^2)*	10% = 77,090	10% = 18,580	10% = 6,500
Cable Reburial			
Maximum estimated reburial - lifetime quantity	5% of worst-case cable length = 28.6 km	5% of worst-case cable trench length = 6.8 km	5% of worst-case cable trench length = 5 km
Maximum estimated seabed disturbance footprint over Project's operational life (35 years) (m^2)	143,000	34,000	25,000
* Note there would be no new area of seabed disturbance from replenishment of external cable protection as it would be on top of existing protection. Therefore, these quantities of cable protection are not included within the relevant assessments of seabed disturbance within this EIAR.			

3.6.15 Life Extension and Repowering

181. The operational life of the Project is expected to be 35 years, during which there will be a requirement for maintenance as described in **Section 3.6.14**. Continued maintenance beyond this 35-year operational period may allow for life extension of the Project in its built-out form. However, once any potential life extension opportunities have been exhausted, repowering may be considered. Repowering could involve the replacement of WTGs and/or foundations with those of a different specification or design, for example to enable the installation of more efficient WTGs. It is very likely

that repowering would result in design scenarios that would fall outside of what has been assessed in this EIA and therefore a new consent (and EIA) would be required. Repowering is therefore not considered as part of this EIA.

3.6.16 Offshore Decommissioning

182. In line with the requirements under Section 105 of the Energy Act 2004 (as amended), described fully in **Chapter 2 Policy and Legislation**, the Applicant will prepare a Decommissioning Programme for approval by the Scottish Ministers in the pre-construction period which will include anticipated costs and financial securities, and consider good industry practice, guidance and legislation relating to decommissioning at the time.

183. At the end of the WDA's operational life, it is expected that all structures above the seabed (except for scour protection and cable protection) will be fully removed where feasible. It is expected that driven piles will be cut at the seabed and left in situ. Removal of some or all of the offshore cables may be undertaken however static portions of these may remain in situ. Scour protection and cable protection are expected to remain in situ although the method of decommissioning is yet to be determined.

184. Legislation, guidance and good practice will be kept under review throughout the operational life of the WDA and will be followed at the time of decommissioning. Environmental conditions and sensitivities will also be considered since removal of structures may result in greater environmental impacts in comparison to leaving in situ. Each topic-specific chapter provides details of the worst-case scenario for decommissioning applicable to the relevant impact being assessed.

185. The decommissioning sequence will generally be the reverse of construction and will involve similar types and numbers of vessels and equipment. The anticipated techniques for the various foundation types are as described below.

3.6.16.1 Foundations

186. Piled foundations (jackets and monopiles) would be cut at the natural level of the seabed following localised jetting or suction around the base of the pile to clear surface sediments and/or scour protection and provide access for the cutting tools. Complete removal of piles from the seabed is not considered to be reasonably practicable at this time, as there is currently no proven, cost-effective technology for their removal. The size of the piles, the penetration depth into the seabed and the weight makes it technically extremely challenging to remove the entire structure, involving safety risks to personnel and significant disturbance to the seabed due to the excavation work that would be required.

187. GBS for OSPs would be decommissioned by removal of their ballast and either floating them (for self-floating/buoyant designs) or lifting them off the seabed. This process may need to be preceded by the clearance of seabed sediments and/or scour protection and grout from the base of the foundation by jetting and/or suction. If a deep skirt has been used around the perimeter of the foundation, the skirt may require cutting. For the removal of ballast, consideration would be given to the options for disposal or re-use of the ballast material.

188. Suction buckets for the WTGs would include similar steps to the GBS for OSPs to clear seabed sediments and/or scour protection from around the base of the foundation. Depending on the precise design, decommissioning may include removal of ballast or the adding of buoyancy aids, connection of pumping equipment to the suction bucket valves, and controlled pumping of water into caisson chambers. The suction bucket would then be expected to rise to the surface as the internal pressure overcomes the side wall friction. Some manipulation from craneage on a suitable vessel may be required as part of this process.

189. For all foundation types, a heavy lift DP vessel or jack-up crane would then be used to lift the foundation onto a vessel for transport to shore.

3.6.16.2 Cables

190. There is no existing statutory requirement for removal of decommissioned cables. Furthermore, removal of buried cables is technically difficult and in some cases it is possible that if attempted, the removal works would cause significantly greater environmental disturbance than leaving them in situ. Techniques are likely to be similar to those considered for the installation, in a reverse process to expose and remove them. Once the cables are exposed, grapples would likely be used to pull the cables onto the decks of cable removal vessels. The cables would then be cut into manageable lengths and returned to shore for recycling.

191. Cables that are not buried, i.e. are exposed, are more likely to be removed to ensure they do not become hazards to other activities such as shipping and fishing. Detailed survey and engineering studies will be required at the time of decommissioning to determine which cables are exposed (or are at risk of future exposure), and therefore the most appropriate course of action.

192. With this in mind it is expected that most IAC, OSP link and offshore export cables will be cut at the ends and left in situ. However, for the purpose of the Section 36 application, for potential impacts where seabed disturbance is the pathway for impact, it has been assumed as a worst-case that all cables will be removed during decommissioning, however any external cable protection will be left in situ. The area of seabed impacted during the removal of the cables could therefore be equal to the area impacted during the installation of the cables.

3.7 OFFSHORE EXPORT CABLE CORRIDOR AND ONSHORE TRANSMISSION DEVELOPMENT AREA ASSUMPTIONS

193. This section sets out the assumptions for the Offshore ECC and OnTDA including their anticipated components and associated construction methods and timelines. These assumptions have informed the combined assessment in individual receptor-topic chapters but are subject to refinement as Offshore ECC and OnTDA consent applications are progressed in due course.

3.7.1 Offshore Export Cable Corridor

194. The Offshore ECC shown in **Figure 3.2** represents the indicative boundary extending from the WDA to mean high water springs, within which the Offshore ECC infrastructure will be located. This boundary is subject to change pending further desk top studies, survey work and stakeholder engagement.

195. After pre-construction surveys, seabed preparation requirements for the Offshore ECC will be confirmed. For the purposes of the combined assessment, it is assumed that UXO clearance, boulder removal, pre-lay grapnel runs, and sandwave levelling[5] may be required, as described for the WDA in **Section 3.6.7.4**. Cable burial would be as described for the WDA in **Section 3.6.7.5**. As for the WDA, external cable protection may be needed where burial is not possible or at cable crossings, several of which will likely be required near landfall.

196. Vessel requirements described in **Sections 3.6.12** and **3.6.14.1** are assumed to apply to the entire length of the offshore export cable to landfall. Given the Offshore ECC length, cables will likely be installed in sections and then jointed.

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[5] Sandwave levelling could be done via dredging or sandwave clearance using a plough, or similar.

197. The proposed timeline for the construction of the Offshore ECC is subject to change as the Project progresses but is expected to commence in the early 2030s. Offshore ECC construction may be undertaken in advance of or in parallel with construction of the WDA infrastructure.

198. **Table 3.27** sets out the assumptions which have informed the combined assessment.

Table 3.27 Offshore ECC Assumptions (Subject to Refinement During Project Development)

Indicative Parameter	Details
Landfall location	Girvan, South Ayrshire
Transmission technology	HVDC
Maximum operating voltage (kV)	525
Indicative external cable diameter (mm)	140 mm – 160 mm
Maximum number of offshore export cables	4
Maximum number of trenches	2
Indicative length of offshore export cables within the Offshore ECC (km)	800 (4 x 200)
Maximum offshore export cable temporary disturbance width during installation (m)	20
Minimum burial depth (m)	1*
Maximum burial depth (m)	3*
Cable crossings	Up to 10 (2 export cable trenches crossing five cables)
* As far as practicable	

3.7.2 Onshore Transmission Development Area

199. The OnTDA is shown on **Figure 3.3** and extends landward from mean low water springs and will include the land required for the landfall of the offshore export cables and their route, up to but not including, the proposed high voltage direct current (HVDC) switching station which is being developed and constructed by the Transmission Owner, SPT. The separate MachairWind WDA, Offshore ECC and OnTDA applications will interface with SPT's and National Grid Energy Transmission's (NGET's) consent applications for the Western Link 2 (WL2) project.

200. A number of sites in the Girvan area were evaluated by SPT for the switching station (SP Energy Networks, 2025). One preferred switching station location and one associated cable corridor have been identified which is situated between the A77 and Grangestone industrial estate.

201. With respect to the landfall, this marks the transition point between the Offshore ECC and OnTDA, where the subsea export cables connect to the underground cables via a buried Transition Joint Pit (TJP). The installation method depends on local coastal conditions. For example, open trenching may be used in areas with soft, gently sloping terrain, while HDD or other trenchless technique is preferred for steep or environmentally sensitive locations and involves drilling from land toward the sea and pulling cables through newly installed ducts. Once the landfall installation is completed, the site will be fully restored with no visible permanent structures. A temporary working area will be needed to accommodate equipment and construction activities.

202. At this stage of the Project development, the following assumptions have been taken forward into the combined assessment:

- Site establishment – this is expected to include but is not limited to construction accesses, temporary construction compounds, construction drainage, topsoil strip and soil management and a construction haul road;
- Cable duct installation – this could be via open cut trenching using construction methods still to be determined, and would include installation of the ducts themselves along with the required duct surround material and subsequent trench backfilling;
- Obstacle crossing(s) – this could be via trenchless crossing methodologies or open cut trenching for minor crossings where trenchless crossings are not feasible;
- Cable installation – this is deemed to include cable pull, cable jointing (including joint bays), link boxes; and
- Reinstatement and site demobilisation.

203. The proposed timeline for the construction of the OnTDA is subject to change as the Project progresses but is expected to commence in the early 2030s.

204. **Table 3.28** sets out the assumptions which have informed the combined assessment.

Table 3.28 OnTDA Assumptions (Subject to Refinement During Project Development)

Indicative Parameter	Details
Approximate cable corridor length (km)	2.6
Cable corridor width (m)	200
Proposed cable installation method	Open cut trenching and trenchless techniques (e.g., HDD) at crossing/sensitive locations
Estimated temporary construction compound footprints (m^2)	• Gross Internal Floor Area Primary/Main = 3,600 • Secondary/Supply = 1,200
Number of transition joint pits (TJP)	6

3.8 OFFSHORE CONSTRUCTION PROGRAMME

205. The earliest any construction works at the WDA would start is assumed to be in 2030. It is anticipated that the maximum offshore construction period would be five years (excluding pre-construction activities such as surveys). The time periods of specific activities would vary and be encompassed within this five-year offshore construction period. **Table 3.29** sets out an indicative construction period.

206. It should be noted that the construction programme is subject to change as it is dependent on numerous factors including consent timeframes, the Project's grid connection date and funding mechanisms. The final design of the Project will also affect the construction programme, as well as weather conditions once construction starts. As such, details of the construction programme are indicative at this stage in order to provide a reasonable and realistic basis for undertaking the environmental assessments.

207. Offshore (seaward of mean low water) working hours during construction are assumed to be 24/7.

Table 3.29 Indicative Offshore Construction Programme

WDA Component	Indicative Programme
Pre-construction activities	To take place ahead of construction Year 1
WTG and OSP foundations (design, manufacture and install)	Years 1-4

WDA Component	Indicative Programme
Inter array cables (design, manufacture and install)	Years 1-4
Export and OSP link cables (design, manufacture and install)	Years 1-4
OSP(s) topsides (design, manufacture and install)	Years 1-4
WTG (design and manufacture)	Years 1-4
WTG (install)	Years 4-5

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