XLINKS MOROCCO-UK POWER PROJECT

Preliminary Environmental Information Report

Volume 1, Chapter 3: Project Description

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Glossary

Term	Meaning
Alverdiscott Substation	The existing National Grid Electricity Transmission substation at Alverdiscott, Devon, which comprises 400 kV and 132 kV electrical substation equipment.
Alverdiscott Substation Connection Development	The development required at the existing Alverdiscott Substation site, which is envisaged to include development of a new 400 kV substation, and other extension modification works to be confirmed by National Grid Electricity Transmission.
Alverdiscott Substation site	The National Grid Electricity Transmission substation site within which the Alverdiscott Substation sits.
Applicant	Xlinks 1 Limited.
Bipole	A Bipole system is an electrical transmission system that comprises two Direct Current conductors of opposite polarity.
Biodiversity Net Gain	An approach to development that leaves biodiversity in a better state than before. Where a development has an impact on biodiversity, developers are encouraged to provide an increase in appropriate natural habitat and ecological features over and above that being affected to ensure that the current loss of biodiversity through development will be halted and ecological networks can be restored.
Climate change	A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.
Construction Traffic Management Plan	A document detailing the construction traffic routes for heavy goods vehicles and personnel travel, protocols for delivery of Abnormal Indivisible Loads to site, measures for road cleaning and sustainable site travel measures.
Converter Site	The Converter Site is proposed to be located to the immediate west of the existing Alverdiscott Substation site in north Devon. The Converter Site would contain two converter stations (known as Bipole 1 and Bipole 2) and associated infrastructure, buildings and landscaping.
Converter station	Part of an electrical transmission and distribution system. Converter stations convert electricity from Direct Current to Alternating Current, or vice versa.
Development Consent Order	An order made under the Planning Act 2008, as amended, granting development consent.
Earthworks	Covers the processes of soil-stripping, ground-levelling, excavation, and landscaping, as defined by the Institute of Air Quality Management.
Environmental Impact Assessment	The process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process.
HVAC Cables	The High Voltage Alternating Current (HVAC) Cables which would bring electricity from the converter stations to the new Alverdiscott Substation Connection Development.
HVDC Cables	The High Voltage Direct Current (HVDC) Cables which would bring electricity to the converter stations from the Moroccan converter stations.
Intertidal area	The area between Mean High Water Springs and Mean Low Water Springs.

Term	Meaning
Landfall	The proposed area in which the offshore cables make landfall in the United Kingdom (come on shore) and the transitional area between the offshore cabling and the onshore cabling. This term applies to the entire landfall area at Cornborough Range, Devon, between Mean Low Water Springs and the Transition Joint Bay inclusive of all construction works, including the offshore and onshore cable routes, and landfall compound(s).
Marine Conservation Zone(s)	Marine Conservation Zones are marine nature reserves and are areas that protect a range of nationally important, rare or threatened habitats and species.
Maximum design scenario	The realistic worst case scenario, selected on a topic-specific and impact specific basis, from a range of potential parameters for the Proposed Development.
Mean High Water Springs (MHWS)	The height of mean high water during spring tides in a year.
Mean Low Water Springs (MLWS)	The height of mean low water during spring tides in a year.
National Grid Electricity System Operator (NGESO)	National Grid Electricity System Operator (NGESO) operates the national electricity transmission network across Great Britain. NGESO does not distribute electricity to individual premises, but its role in the wholesale market is vital to ensure a reliable, secure and quality supply to all.
National Grid Electricity Transmission (NGET)	National Grid Electricity Transmission (NGET) owns and maintains the electricity transmission network in England and Wales.
National Policy Statements	The current national policy statements published by the Department for Energy Security and Net Zero in 2023.
Offshore Cable Corridor	The proposed corridor within which the offshore High Voltage Direct Current cables will be located, which is situated within the United Kingdom Exclusive Economic Zone.
Onshore Infrastructure Area	The proposed infrastructure area within the Proposed Development Draft Order Limits landward of the transition joint bays, which contains the onshore HVDC Cables, Converter Site, the Alverdiscott Substation Connection Development, highway works, utility diversions and onshore HVAC Cables.
Onshore HVDC Cable Corridor	The proposed corridor within which the onshore High Voltage Direct Current cables would be located.
Planning Inspectorate	The agency responsible for operating the planning process for applications for development consent under the Planning Act 2008.
Preliminary Environmental Information Report	A report that provides preliminary environmental information in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. This is information that enables consultees to understand the likely significant environmental effects of a project and which helps to inform consultation responses.
Proposed Development	The element of the Xlinks Morocco-UK Power Project within the UK, which includes the offshore cables (from the UK Exclusive Economic Zone to landfall), landfall site, onshore Direct Current and Alternating Current cables, converter stations, road upgrade works and, based on current assumptions, the Alverdiscott Substation Connection Development.
Proposed Development Draft Order Limits	The area within which all offshore and onshore components of the Proposed Development are proposed to be located, including areas required on a temporary basis during construction (such as construction compounds).
Special Area of Conservation	A site designation specified in the Conservation of Habitats and Species Regulations 2017. Each site is designated for one or more of the habitats and species listed in the Regulations. The legislation requires a

Term	Meaning
	management plan to be prepared and implemented for each Special Area of Conservation to ensure the favourable conservation status of the habitats or species for which it was designated. In combination with Special Protection Areas and Ramsar sites, these sites contribute to the national site network.
Special Protection Area	A site designation specified in the Conservation of Habitats and Species Regulations 2017, classified for rare and vulnerable birds, and for regularly occurring migratory species. Special Protection Areas contribute to the national site network.
The national grid	The network of power transmission lines which connect substations and power stations across Great Britain to points of demand. The network ensures that electricity can be transmitted across the country to meet power demands.
Exclusive Economic Zone	An area of the sea, which is under territorial ownership of a single state.
Utility Diversions	Works required by statutory utility providers to re-route infrastructure around the Proposed Development.
Xlinks Morocco-UK Power Project	The overall scheme from Morocco to the national grid, including all onshore and offshore elements of the transmission network and the generation site in Morocco (referred to as the 'Project').

Acronyms

Acronym	Meaning
AC	Alternating Current
AIS	Air Insulated Switchgear
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
BNG	Biodiversity Net Gain
CBS	Cement Bonded Sand
CEMP	Construction Environment Management Plan
CTMP	Construction Traffic Management Plan
Defra	Department of Agriculture, Fisheries and Food
DC	Direct Current
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EPS	European Protected Species
ES	Environmental Statement
FSC	Forest Stewardship Council
FTE	Full Time Equivalent
GB	Great Britain
GIS	Gas Insulated Switchgear
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicle
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current

Acronym	Meaning
LEMP	Landscape and Ecology Management Plan
LNR	Local Nature Reserve
MAFF	Ministry of Agriculture, Fisheries and Food
MCZ	Marine Conservation Zone
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
NGET	National Grid Electricity Transmission
OHL	Overhead Lines
OS	Ordnance Survey
SSSI	Site of Special Scientific Interest
SAC	Special Area of Conservation
SPA	Special Protection Area
TJB	Transition Joint Bay
TW	Terrestrial Waters
UK	United Kingdom
UXO	Unexploded Ordnance
VSC	Voltage Source Converter

Acronyms

Acronym	Meaning
m	Metre
m^2	Square metre
m^3	Cubic metre
mm	Millimetre
kV	Kilovolt
GW	Gigawatt
GWh	Gigawatt hour
ha	Hectares
km	Kilometre
km^2	Square kilometre

3 PROJECT DESCRIPTION

3.1 Introduction

3.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) provides a description of the United Kingdom (UK) elements of the Xlinks Morocco-UK Power Project (the 'Project'). The UK (within the UK Exclusive Economic Zone (EEZ)) elements of the Project are referred to in this chapter as the 'Proposed Development'.

3.1.2 This chapter summarises the key components of infrastructure (both onshore and offshore) for the Proposed Development, as well as a description of the activities associated with their construction, operation and maintenance and eventual decommissioning. The below description has been informed by preliminary design information and by the current understanding of the receiving environment, based on survey and desk study work undertaken to date.

3.1.3 The Proposed Development comprises two converter stations to the immediate west of the existing Alverdiscott Substation, onshore High Voltage Direct Current (HVDC) and High Voltage Alternating Current (HVAC) cables, the landfall site at Cornborough Range, offshore HVDC Cables (from the UK EEZ to landfall) and, based on current assumptions, the Alverdiscott Substation Connection Development. It also includes temporary utility connections, permanent utility diversions at and adjacent to the Converter Site, and highway improvements to facilitate construction and operation of the Proposed Development. Mitigation and enhancement measures to be adopted as part of the Proposed Development are detailed within Volume 1, Appendix 3.1: Draft Mitigation Schedule. A summary of the key components of the Proposed Development is provided in **section 3.5**.

3.2 Maximum Design Scenario Approach

3.2.1 At this stage of the EIA and consenting process, the project description of the Proposed Development is indicative. It is often the case that where consent is applied for and obtained before detailed design commences, there may be design elements that are unknown to an applicant at the time of application.

3.2.2 In such cases, a Project Design Envelope (PDE) approach (also known as the Rochdale Envelope approach) may be used. The PDE approach defines a design envelope and parameters within which the final design will sit. It allows flexibility for elements that will require more detailed design subsequent to submission of the PEIR or Environmental Statement (ES), such as siting of infrastructure and construction methods. It also allows the findings of the consultation process and feedback from statutory and non-statutory stakeholders to be considered during the design process. Therefore, the PDE approach has been adopted for the EIA process, allowing for the Proposed Development to be assessed on the basis of maximum project design parameters (i.e., a reasonable worst case scenario). This approach provides flexibility, while ensuring all potentially significant effects are assessed within the EIA process and reported in the PEIR and ES.

3.2.3 The adoption of this approach allows a meaningful EIA to take place by defining a 'maximum design scenario' on which to base the identification of likely environmental effects. The maximum design scenario is the scenario that would give rise to the greatest impact (and subsequent effect). By identifying the maximum design scenario for any given impact, it can be concluded that the impact (and therefore the resulting effect) would be no greater for any other design scenario.

3.2.4 Furthermore, this approach utilises a ‘Limit of Deviation’ in order to provide a proportionate degree of flexibility to accommodate any changes before the final alignment and design of the Proposed Development (i.e. due to issues highlighted by the EIA process and consultation). The Draft Order Limits define the maximum extent within which the development works can be carried out, allowing for a realistic worst-case assessment. For example, in relation to the offshore and onshore cables, the Draft Order Limits identify the extent of the limits of deviation within which the cables may be installed, allowing for flexibility in final routing to avoid any identified utilities or features (e.g. gas mains, archaeology, important habitats, etc.).

3.2.5 The use of the PDE approach has been recognised in the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) (DESNZ, 2023a), the NPS for Renewable Energy Infrastructure (NPS EN-3) (DESNZ, 2023b) and the NPS for Electricity Networks Infrastructure (NPS EN-5) (DESNZ, 2023c).

3.2.6 This chapter describes the maximum design scenario for the Proposed Development, taking into account the policy set out in the NPSs and the advice in the Planning Inspectorate’s Advice Note Nine (Planning Inspectorate, 2018). The maximum design scenario described within this chapter has been designed to:

- take into account site selection and design refinement work undertaken to date (see Volume 1, Chapter 4: Site Selection and Alternatives, of the PEIR); and
- include sufficient flexibility to accommodate future stages of design refinement.

3.2.7 The design described within this chapter will continue to be refined, taking into account the findings of the ongoing EIA process, further surveys and engagement with stakeholders. Refined design parameters will be presented in the ES and draft Development Consent Order (DCO) that will accompany the application for development consent. The final design for the Proposed Development will be finalised after development consent has been granted, from within the parameters set out in the project description chapter of the ES and the DCO.

3.3 Location

3.3.1 The Proposed Development would be located within the Draft Order Limits shown on Figure 1.1 (See Volume 1, Figures). The Proposed Development Draft Order Limits is approximately 207 km^2 in area.

3.3.2 The onshore elements of the Proposed Development are proposed to be located within the Onshore Infrastructure Area, which lies within the local authority area of Torridge District Council and Devon County Council, in north Devon (See Volume 1, Figure 3.1). The Onshore Infrastructure Area comprises all permanent and temporary components in the onshore section of the Proposed Development. This includes the Converter Site and connection to the national grid, the Alverdiscott Substation Connection Development, utility connections and diversions, permanent highways improvements as well as temporary highways alterations during construction, Onshore HVDC Cable Corridor, HVAC Cables, temporary compounds and haul roads, and landfall.

3.3.3 The offshore elements of the Proposed Development, which includes the Offshore Cable Corridor, are proposed to be located within the Bristol Channel and Celtic Sea, extending from the Landfall to the limit of UK EEZ, south west of the UK (See Volume 1, Figure 3.2).

3.3.4 The following provides further details on the location of the Converter Site (in which both of the proposed converter stations will be located), the Alverdiscott Substation Connection Development, HVAC Cables, Onshore HVDC Cable Corridor, landfall and the offshore cable corridor.

3.4 Consultation Undertaken to Date

3.4.1 In January 2024, the Applicant submitted a Scoping Report to the Planning Inspectorate, which described the approach to assessment of any likely significant effects for the construction and operation and maintenance phases of the Proposed Development.

3.4.2 Following consultation with the appropriate statutory bodies, the Planning Inspectorate (on behalf of the Secretary of State) provided a Scoping Opinion on 7 March 2024. Key issues raised during the scoping process are set out in **Table 3.1**, together with details of how these issues have been addressed within the PEIR.

Table 3.1: Summary of scoping responses

Comment	How and Where Addressed in the PEIR
Planning Inspectorate	
'*The Applicant should make every attempt to narrow the range of options and explain clearly in the ES which elements of the Proposed Development have yet to be finalised and provide the reasons.* *It is noted that the Scoping Report refers interchangeably to 'maximum design scenario' and 'Project Design Envelope' (PDE) when referencing the use of the Rochdale Envelope approach. The terminology used in the ES should be consistent. The ES should also ensure consistency throughout the ES and any other relevant assessments supporting the application from which the ES draws.* *The Inspectorate advises that flexibility in design should only be sought where absolutely necessary, in the interests of a proportionate ES based on the most realistic and refined PDE possible. The ES should assess the worst case that could potentially be built out in accordance with the Authorised Development of the Development Consent Order (DCO) being applied for*.'	The approach is set out in **section 3.2**, based on guidance presented in the NPSs and Advice Note 9 (Planning Inspectorate, 2018). This chapter of the PEIR sets out the maximum design parameters for the elements of the Proposed Development. Each topic chapter in Volumes 2, 3 and 4 of this PEIR sets out the maximum design scenario for that topic. Through an iterative site selection process and design process, along with non-statutory consultation, the Applicant has looked to refine the range of options, where possible. The site selection and design evolution is presented within Volume 1, Chapter 4: Needs and Alternatives, of the PEIR. Some flexibility is retained at the PEIR stage as the design process remains ongoing. The design will be refined for the ES and application for development consent, where practicable.
'*The ES should clearly describe the works relating to any overhead lines and structures, where included, and include an assessment of any likely significant effects from such works*.'	The Proposed Development does not propose the installation of any new overhead lines (OHLs), however, it would include the re-positioning of existing OHLs as detailed within **paragraph 3.7.41**. Discussions with statutory undertakers regarding the potential route options of the OHLs are ongoing at the PEIR stage.
'*It is unclear from the Scoping Report if the two convertor stations would be constructed concurrently*	The description of the construction activities and programme is detailed within **section 3.6**. This is

Comment	How and Where Addressed in the PEIR
or consecutively, and if consecutively, whether there would be a period of no construction in between. The ES should clearly state the anticipated construction programme used for the assessment and ensure aspect chapters are consistent in this regard.'	supported by an indicative construction programme presented within **Plate 3.1**, which shows the approximate timeframes and overlap between each element of the Proposed Development.
'*The ES should clearly describe the elements of the project to be included in the DCO application. The Applicant should reduce the options for the Proposed Development as far as possible (see also the Inspectorate's comment above regarding flexibility at ID 2.1.2).* *Where included in the DCO, the ES should clearly set out the worst case parameters for the assessment and include an assessment of the likely effects of the proposed Alverdiscott Substation Connection Development in the relevant aspect chapters, for example in relation to landscape and visual impacts*.'	The key elements of the Proposed Development are summarised within **section 3.5**. This chapter of the PEIR sets out the design parameters for each element of the Proposed Development, including the Alverdiscott Substation Connection Development. Each topic chapter in Volumes 2, 3 and 4 of this PEIR sets out the maximum design scenario for that topic.
'*The ES should describe the range of burial depths that have been considered as part of the assessment and the degree of confidence in these parameters. It should establish the parameters likely to result in the maximum adverse effects and include an assessment of these to determine likely significance of effects*.'	This chapter presents the burial depths that have been considered as part of the assessment. **Table 3.9** details the approximate trench depth of the onshore HVDC Cable and HVAC Cable trenches, whilst **Table 3.14** includes the cable burial depth for the Offshore Cable Corridor. Each topic chapter in Volumes 2, 3 and 4 of this PEIR sets out the maximum design scenario for that topic, including the consideration of burial depths, where relevant.
'*The ES should clearly identify the quantities of dredged material and likely method and location for disposal. Any likely significant effects from offshore waste collection and disposal, including dredging or dredge disposal, should be assessed*.'	The management of any offshore waste generated via grapnel runs would be undertaken via the final offshore CEMP (draft offshore CEMP presented as Volume 1, Appendix 3.3 of this PEIR). Any disposal of dredged materials from the HDD exit pits (if required) would be under deemed marine licence - further consultations will be undertaken with the MMO at ES stage. Full details of the HDD dredged material quantities (if relevant and once finalised) will be presented at ES stage.
'*It is unclear from Table 4.8.2 if any of the proposed management plans (such as the Biosecurity Plan, Marine Mammal Mitigation Protocol) and assessments listed in this table would be provided in outline with the DCO application. The Inspectorate notes reference at Section 4.10 to an outline Offshore Construction Environmental Management Plans (CEMP) to be provided with the DCO application; however, it is unclear at this stage what outline plans would be provided for the offshore environment*.'	The Outline Offshore CEMP will be provided at outline stage with the DCO application (draft provided as Volume 1, Appendix 3.3 of this PEIR). Note the PEIR assessment has confirmed that a Marine Mammal Mitigation Protocol (MMMP) is not required. Key embedded mitigation measures and how they will be secured are outlined within **Table 3.16: Offshore embedded mitigation measures**, which include measures that are part of the design (primary mitigation) and also those measures required to meet other legislative requirements or standard practices (tertiary mitigation). Further mitigation measures are provided within individual topic chapters and in Volume 1, Appendix 3.1: Draft Mitigation Schedule.
'*Any measures relied upon in the ES should be*	Key embedded mitigation measures and how they

Comment	How and Where Addressed in the PEIR
discussed with relevant consultation bodies, including such as Natural England (NE), in effort to agree the approach. Measures relied upon in the ES should be adequately secured eg through the CEMP(s).'	will be secured are outlined within **Table 3.15** and **Table 3.16**, which include measures that are part of the design (primary mitigation) and also those measures required to meet other legislative requirements or standard practices (tertiary mitigation). Further mitigation measures are provided within individual topic chapters and in Volume 1, Appendix 3.1: Draft Mitigation Schedule.
'*Paragraph 4.12.6 states that an Onshore Decommissioning Plan would be developed in a 'timely manner'. The ES should explain the anticipated timescales for production of the Onshore Decommissioning Plan, whether agreement has been sought with Local Authorities and how it would be secured*.'	Details regarding the anticipated timescales for the production of the Onshore Decommissioning Plan are included within **Table 3.15** and **paragraph 3.14.6** of this chapter.
'*No direct reference is made to the potential requirement for dewatering activities in Section 4 of the Scoping Report, although it is noted that dewatering is referenced as an example activity in Table 7.4.4 and at paragraph 7.5.54 in respect of potential inter-related effects between the hydrology and flood risk chapter and hydrogeology, geology and ground conditions chapter.* *The ES should provide a full description of any such activities and present an assessment of any resulting likely significant effects, where these could arise. The Applicant's attention is directed to the comments of the Environment Agency (EA) at Appendix 2 of this Opinion with regards to dewatering and permits*.'	The potential requirement of dewatering is described within **paragraphs 3.10.48** to **3.10.49**. The potential impact of dewatering activities on reduce groundwater quantity or quality in aquifer units is considered within Volume 2, Chapter 4: Geology, Hydrogeology and Ground Conditions, of the PEIR.
'*The Scoping Report suggests that crossings of sensitive watercourses may be required. The ES should describe the nature of any proposed works within or in proximity of sensitive watercourses (ie main rivers and Ordinary watercourses). Information should be provided regarding the location, scale, and dimensions of any proposed watercourse crossings/ instream structures, as well as the nature of any associated construction works (eg dewatering, trenching, and HDD).*'	Details on the crossing of sensitive watercourses are provided within **paragraphs 3.10.35** to **3.10.37** of this chapter, as well as Volume 1, Appendix 3.4: Onshore Crossing Schedule, of the PEIR. Mitigation measures regarding the crossing of watercourses are included within Volume 1, Appendix 3.2: Outline Onshore Construction Environmental Management Plan, of the PEIR.
'*Where cable protection is required, the Inspectorate advises that the ES should identify the options available and provide an assessment of the likely significant effects that would arise from installation of the selected option (or options if flexibility is sought), including impacts from secondary scouring*.'	The proposed cable protection methods are described in **paragraphs 3.8.54** to **3.8.55** for offshore cables and assessed in the relevant topic chapters in Volume 3 of this PEIR.
'*The Scoping Report states that the offshore cable would be buried, where possible. The ES should include an assessment of the effects of cable protection from methods other than burial, based on the worst case scenario which has been defined for the area of cable protection likely to be required. The Applicant is encouraged to seek to agree cable burial depth and protection measures with relevant consultation bodies and stakeholders*.'	

Comment	How and Where Addressed in the PEIR
Alverdiscott and Huntshaw Parish Council	
'*The security and lighting aspects of the Alverdiscott site which are included in sections 4.6.13, 14 & 23, are felt to require further detail. The area, although not a designated Dark Sky area, does enjoy a high degree of night-time darkness at present. The council feels that both these aspects are to a greater or lesser extent connected, and therefore would enquire as to what extent the lighting would impinge upon this (we note that measures to prevent light spill would be considered), and to what extent the security fencing would be lit*.'	Operational lighting at the Converter Site is described in **paragraphs 3.7.36** to **3.7.38**. Further information and requirements for operational lighting will be secured within the Design Code and/or Outline Lighting Strategy and would be in accordance with the Institute of Lighting Professionals Guidance Notes for the Reduction of Obtrusive Light.
'*Construction Access (sections 4.6.94-97) also gives some concerns. Whilst all major construction traffic appears to have been accommodated, there remains the question of secondary traffic to the site. There are many very narrow lanes turning off the B3232 between St.John's Chapel and Torrington that can provide access to the site from a southerly direction and any increase in traffic on these lanes brought about by additional delivery vans and any workforce living to the south will cause local residents substantial disruption as they travel towards Bideford. Additionally any larger vehicles mistakenly using satnav to reach the site from a southerly direction may be tempted to try to get through these lanes causing major disruption as they risk becoming stranded at various choke points. These local lanes, many of which are single track are already seeing the impact of increased traffic from the new estates being built in the Bideford area. We would strongly recommend that restrictive signage be put in place on all access points from the B3232 to prevent any increase in the number of traffic movements; measures similar to that used on the Barnstaple solar panel site may help but are likely to be insufficient*.'	An Outline Construction Traffic Management Plan (CTMP) will be prepared and submitted with the DCO application. A CTMP will be developed in accordance with the Outline CTMP and will include necessary traffic management measures to be adhered to during the construction phase of the Proposed Development. These management measures will include the restriction of vehicle movements on certain routes, including the B3232.
'*It seems to be unclear as to the time scale for the converter station site, as opposed to the cabling installation from the coast. Could this be more specific, as we have been receiving various comments ranging from eighteen months to six years*.'	Details of the programme for construction are set out in **section 3.6**. This is supported by an indicative construction programme presented within **Plate 3.1**.
Littleham and Landcross Parish Council	
'*For mitigation, the EIA should include opportunities for working with landowners along the cable route to ensure biodiversity net gain. This is a major opportunity to provide a wildlife corridor from the coast to the Torridge and beyond, which should not be missed*.'	Information regarding Biodiversity Net Gain (BNG) is provided in **section 3.11**.

3.5 Key Elements

3.5.1 The key components of the Proposed Development at this stage in the consultation process include the following:

- Onshore elements:
  - Converter Site: the site includes two independent converter stations, known as Bipole 1 and Bipole 2, to convert electricity from DC to AC before transmission to the national grid.
  - Highway improvement works: improvements to the existing road network to facilitate access during construction and operation and maintenance, including road widening, and new or improved junctions.
  - HVAC Cables: these cables connect the Converter Site to the national grid, via the envisaged Alverdiscott Substation Connection Development. The HVAC cables would be situated within the boundaries of the Converter Site and Alverdiscott Substation site.
  - Alverdiscott Substation Connection Development – the anticipated National Grid Electricity Transmission (NGET) 400 kV substation would be located to the immediate east of the existing 400/132 kV facility and would be a replacement for the existing 400 kV infrastructure.
  - HVDC Cables: these cables will link the onshore converter stations to the landfall and will be located within the Onshore HVDC Cable Corridor.
  - Temporary and permanent utility connections: temporary and permanent utility connections to the construction compounds and the Converter Site.
  - Permanent utility diversions: permanent diversion of existing utility services within and adjacent to the Converter Site to facilitate construction and operation of the Converter Site.
  - BNG offsetting: BNG planting, comprising Atlantic rainforest, scrub and species-rich grassland.
- Landfall site:
  - The site where the offshore cables are jointed to the onshore cables. This term applies to the entire landfall area between Mean Low Water Springs (MLWS) and the Transition Joint Bay (TJB). This includes all construction works, including the offshore and onshore cable routes, and landfall compound.
- Offshore elements:
  - Offshore HVDC Cables: The HVDC Cables which would bring electricity from its generation source to the landfall, which are located within the UK EEZ. The offshore HVDC Cables would be situated within the Offshore HVDC Cable Corridor.

3.5.2 The onshore HVDC Cables and the HVAC cables will be completely buried underground for their entire length. It is anticipated that the only visible parts of the Onshore HVDC Cable Corridor would be maintenance covers and above ground cable markers. It is anticipated that the offshore cables would be buried in the seabed or laid on the seabed with protection. No HVAC overhead pylons will be installed as part of the Proposed Development. However, the Proposed Development would require the diversion of existing utilities, including 132 kV overhead lines (OHLs), 11 kV OHLs, gas and water assets.

3.5.3 In addition to the permanent components outlined within **paragraph 3.5.1**, temporary onshore infrastructure would be required for the construction phase, including construction compounds, welfare and site offices, utility connections, haul roads and construction drainage. If decommissioning of the Proposed

Development takes place (see **section 3.14**), similar temporary onshore infrastructure would be required (e.g., decommissioning compounds).

3.5.4 All of the above elements are anticipated to be located within the Proposed Development Draft Order Limits shown in **Figure 1.1** (See Volume 1, Figures). Key summary parameters are presented in **Table 3.2**.

Table 3.2: Key summary parameters for the Proposed Development

Parameter	Maximum Design Scenario
Proposed Development Draft Order Limits area (km^2)	207
Number of converter stations	2
Maximum number of HVAC cables	12
Maximum number of onshore HVDC Cables	4
Maximum number of onshore fibre optic cables	6
Maximum number of offshore HVDC Cables (within the UK EEZ)	4
Maximum number of offshore fibre optic cables (within the UK EEZ)	4
Maximum length of HVAC cable (km)	1.2
Maximum length of onshore HVDC cable (km)	14.5
Maximum length of offshore cable (within the UK EEZ) (km)	370

3.6 Programme

3.6.1 Construction and commissioning of the Project will be timed to meet the available connection dates provided by National Grid Electricity System Operator (NGESO) with the commissioning of Bipole 1 and Bipole 2 anticipated to be 2030 and 2032 respectively[1]. Subject to being granted consent, the earliest date that construction could start would be in 2026.

3.6.2 Consistent with the build-out and commissioning of the generation and transmission infrastructure in Morocco together with the connection dates offered by NGESO, the Proposed Development will be constructed in a single phase that allows for the staggered commissioning of the two bipoles.

3.6.3 The Onshore HVDC Cable Corridor east of the River Torridge together with the establishment of the Converter Site require common access infrastructure and related road improvements and utilities diversions, which will form the first main construction activity.

3.6.4 This may be preceded by advanced enabling works that do not require consents or licences for example habitat creation, geo-environmental and archaeological surveys.

3.6.5 Once the Converter Site has been established, the converter station infrastructure serving Bipole 1 will be commenced first reflecting the earlier connection date followed by Bipole 2 at a suitable stagger in the programme. This means that whilst both converter stations will be built concurrently, but commissioned sequentially. The construction work will be completed in a single phase and there

[1] The Applicant has submitted Modification Applications to NGESO to amend the connection date for Bipole 1 to 2030 (from 2027) and for Bipole 2 to 2032 (from 2030). These are expected to be signed in April 2024.

will be no periods in the programme when construction work at the converter site ceases until both bipoles are commissioned.

3.6.6 Construction and commissioning of the Alverdiscott Substation Connection Development is likely to align with the programme of Bipole 1 commissioning, given the necessity for it to be completed in advance of the first connection date.

3.6.7 The outline conceptual construction programme for the Proposed Development are briefly described below but will be confirmed during detailed design.

Enabling works and main construction start

3.6.8 The initial phase of construction works would be expected to commence in 2026 and would continue through to 2030. The initial phase of construction works would include:

- Enabling works to prepare the land for main construction start which is likely to include but is not limited to:
  - utility connections and diversions;
  - road improvements;
  - new site accesses and related signals/signage;
  - construction drainage;
  - fencing, signing and lighting;
  - establishing compounds and site accommodation;
  - ecological[2] and archaeological mitigation; and
  - tree and hedge removal.

3.6.9 The main construction activity would include the following:

- Cut and fill groundworks for both converter station development platforms at the Converter Site inclusive of screening bund creation.
- Construction and completion of the Onshore HVDC Cable Corridor and landfall for both bipoles including all mitigation and restoration works, except for the landfall (see below).
- Laying of offshore cables serving Bipole 1 including pulling cables through to the landfall TJB and jointing.
- Following the construction of the landfall and jointing of offshore cables for Bipole 1, the landfall compound and associated access will be de-mobilised with the removal of all construction equipment but will remain fenced and secured until the completion of Bipole 2, when further construction work is required at landfall (see **section 3.6**).
- Construction and commissioning of the Bipole 1 converter station including the associated HVAC cable corridor, its own perimeter fencing, security and drainage network.
- Landscape works and Biodiversity Enhancement:

[2] Including works requiring licenses or permits such as habitat removal and protected species exclusion

  – On and off site planting of habitats in accordance with the Landscape and Ecological Management Plan (LEMP) to implement the BNG strategy.
- Alverdiscott Substation Connection Development:
  – Construction of the National Grid connection infrastructure (to be undertaken by NGET) at Alverdiscott Substation inclusive of repositioning OHLs where necessary; and
  – Connection of the HVAC cables following the commissioning of each Converter Station.

Bipole 2 completion

3.6.10 Completion of Bipole 2 will continue at a convenient stagger to accommodate the later connection date offered by NGESO and would include:

- Construction and commissioning of the Bipole 2 converter station including the associated HVAC cable corridor, its own perimeter fencing and drainage network;
- Laying of offshore cables serving Bipole 2 including pulling cables through to the landfall TJB and jointing;
- Restoration of the landfall compound and associated access; and
- Restoration of all other compounds.

3.6.11 Commissioning of Bipole 2 expected to be in 2032.

3.6.12 Therefore, full operation of the Proposed Development is anticipated to occur in 2032, following the commissioning of Bipole 2.

3.6.13 Further details of the likely programme for the Proposed Development are provided in **Table 3.3** and **Plate 3.1**.

Table 3.3: Construction programme for key elements of the Proposed Development

Key Element	Expected Duration (months)
Converter Site	72
HVAC Cables	24[1]
Onshore HVDC Cable Corridor	36
Landfall	24[2]
Offshore Cable Corridor	18[3]
Alverdiscott Substation Connection Development	24

1. The construction and installation of the HVAC cables would occur over two separate periods of 12 months for each bipole, with a space between these periods.

2. Construction works at the landfall comprise an initial 18 months of works, with a space between the second phase of works. The second phase of works at the landfall would continue for a further six months.

3. The installation of the Offshore Cable Corridor within the UK EEZ would take place over three separate periods of 6-months. There would be a space between these construction periods.

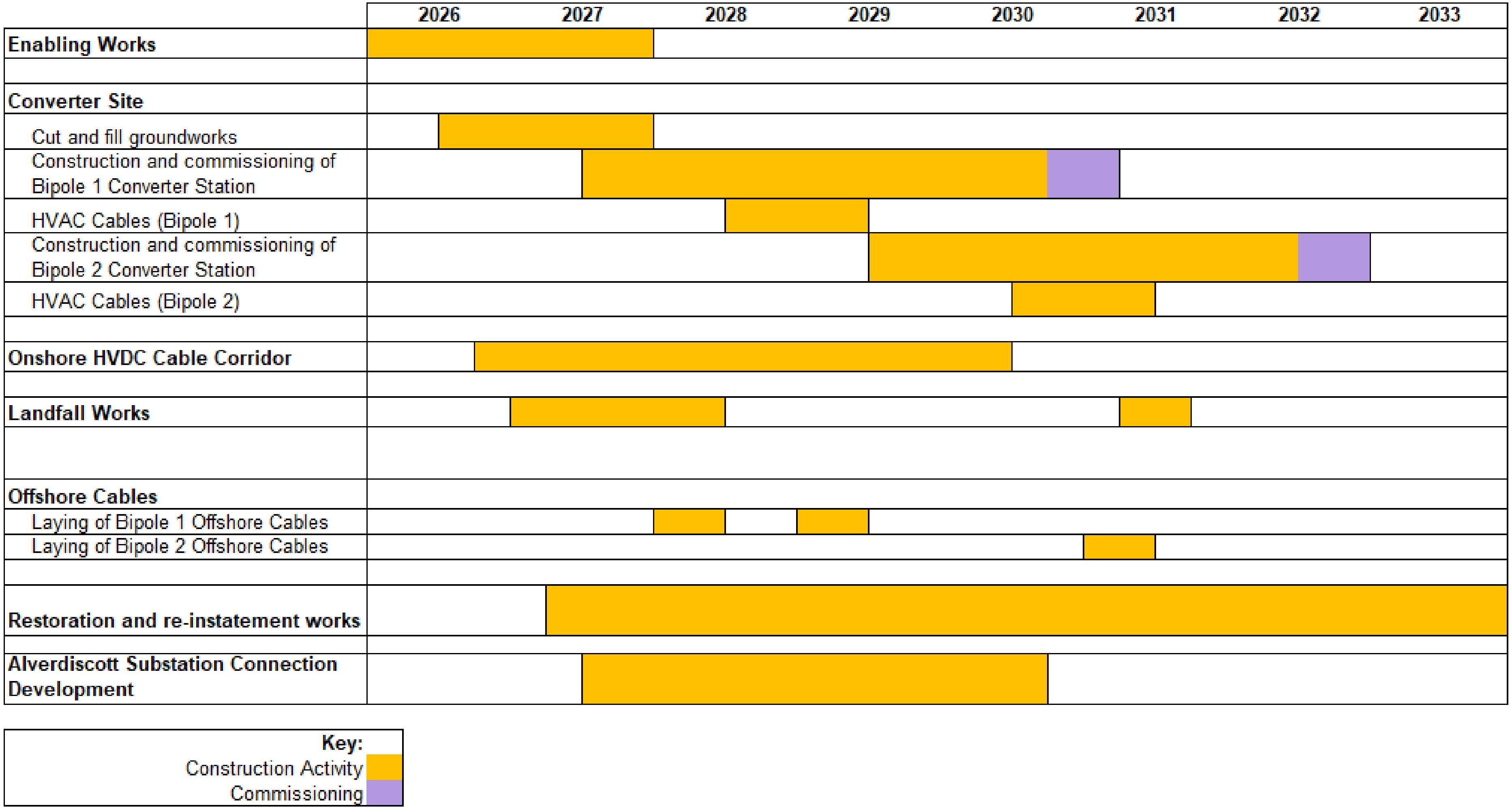

Plate 3.1: Indicative Construction Programme

3.6.14 **Plate 3.1** shows that the 24-month construction period for the Alverdiscott Substation Connection Development could take place within a 39-month period, prior to the commissioning of the Bipole 1 converter station. Discussions with NGET regarding the substation are currently ongoing and the timelines for the construction works will be refined for ES, where possible.

3.6.15 Further detail and/or assumptions for the purposes of the presentation of environmental information is provided, where appropriate, in subsequent sections of this chapter.

3.7 Onshore Elements of the Proposed Development

Introduction

3.7.1 As set out in **paragraph 3.5.1**, the permanent onshore infrastructure for the Proposed Development includes the two converter stations, highway improvement works, and HVDC and HVAC cables which provide connection to both the landfall and national grid, via the Alverdiscott Substation Connection Development, which based on current assumptions, forms part of the Proposed Development. Additionally, the Proposed Development would require the permanent diversion of existing utilities (i.e., 132 kV OHLs, water and gas assets). As part of the construction of the Proposed Development, temporary infrastructure (such as construction access roads and construction compounds) will also be required. This section sets out the design parameters and the proposed installation and construction methods assessed within this PEIR for each of these components.

3.7.2 The onshore infrastructure (i.e., converter stations and associated cables), together with temporary construction facilities (such as haul roads and construction compounds), will be located within the Onshore Infrastructure Area shown on Figure 3.1 (See Volume 1, Figures).

3.7.3 The location and siting of the onshore elements of the Proposed Development described in this section have been informed by a site selection and route refinement process, which is set out within Volume 1, Chapter 4: Need and Alternatives, of the PEIR. This process has considered a wide range of environmental constraints as well as technical and commercial factors. The process of site selection and refinement remains ongoing, and the selected locations for the onshore elements will be presented in the ES.

Converter Site

3.7.4 The proposed converter stations will convert the current of the electricity supplied through the onshore HVDC Cables from DC to AC, to allow a connection to the national grid, via the Alverdiscott Substation Connection Development.

Location

3.7.5 The proposed Converter Site is located across agricultural fields, to the west and northwest of the Alverdiscott Substation and approximately 2.5 km to the east of East-the-Water. The site would include two converter stations, referred to as Bipole 1 and Bipole 2. Bipole 1 is proposed to be located on the east side of

Converter Site, and Bipole 2 is proposed to be sited on the west. The Converter Site centre point grid reference is approximately SS 49720 25300 (See Volume 1, Figure 3.3: Converter Site Location Plan, of the PEIR).

3.7.6 The total area for the proposed Converter Site including associated mitigation and land required for construction occupies approximately 37.3 ha (373,000 m^2). The proposed converter stations would be connected to the national grid via the envisaged Alverdiscott Substation Connection Development, by HVAC cables.

3.7.7 The Converter Site is not located within any statutory or non-statutory designation for landscape, ecology or historic environment. The North Devon National Landscape is located approximately 7.3 km to the west at its closest point.

3.7.8 The closest residential properties to the proposed Converter Site are:

- Properties at Webbery Farm, which is located approximately 200 m north;
- Properties at Higher Kingdon, located approximately 300 m to the west;
- Moorland Cottage, situated approximately 400 m south west;
- The Webbery Manor Estate, situated approximately 500 m north east;
- Residential properties at Woodtown, situated approximately 500 m west;
- Rice Mill Cottage, which is located approximately 520 m north east;
- Residential properties at Lower Kingdon, which are situated approximately 600 m south; and
- Residential properties at Gammaton Moor, approximately 600 m south west.

3.7.9 Land within the Converter Site consists of agricultural land and improved grassland, which is bordered by hedgerows across all boundaries, with two patches of woodland on the south east boundary. It can be noted that existing OHLs pass through the Converter Site. It is anticipated that these OHLs will have to be re-positioned ahead of main construction works.

3.7.10 Ordnance Survey (OS) maps indicate that there are two watercourses located on the east and south east boundary of the Converter Site, which both flow eastwards and connect to an unnamed ordinary watercourse. This watercourse flows in a southerly direction, towards the River Torridge, which is a designated Environment Agency (EA) main river approximately 2.1 km south-west from the Converter Site.

3.7.11 The proposed Converter Site is wholly situated within an area designated as Flood Zone 1, which is an area of low probability of fluvial flooding (less than 1 in 1,000 annual probability). The EAs surface water flood map identifies that the site is wholly located in an area of ‘very low risk’ of surface water flooding (a chance of less than 0.1%).

3.7.12 The surrounding landscape is predominantly agricultural land, with intermittent trees and areas of deciduous woodland. Within the immediate vicinity, there is the Alverdiscott Substation and Cleave Park Solar Farm to the west and south of the Converter Site, respectively. There is no ancient woodland within close proximity to the Proposed Development Draft Order Limits, the closest areas of ancient woodland are as follows:

- Stone Woods (Ancient & Semi-Natural Woodland), which is situated approximately 1.4 km north west;
- Thornpark Copse (Ancient Replanted Woodland), which is located approximately 1.4 km to the south;

- Gustcot Wood consists of both Ancient & Semi-Natural Woodland and Ancient Replanted Woodland, which is approximately 1.6 km south;
- Garnacott Wood (Ancient & Semi-Natural Woodland), which is situated approximately 1.8 km west; and
- Pixey Copse (Ancient & Semi-Natural Woodland), which is located approximately 1.6 km south west.

3.7.13 The closest Scheduled Monuments are an Iron Age enclosure and a Roman marching camp, which are located approximately 160 m west of the Converter Site. Additionally, the Converter Site boundary lies approximately 210 m from the closest listed building at Webbery Barton to the north, which is a Grade II Listed Building.

3.7.14 The topography of the proposed converter site ranges between approximately 140 m Above Ordnance Datum (AOD) in the west to approximately 121 m AOD in the east.

Design

3.7.15 The proposed Converter Site would include two separated converter stations (Bipole 1 and Bipole 2), a main car park, a spare parts building, and a control access building, as well as a temporary construction laydown area during construction (see Volume 1, Figure 3.3: Converter Site Location Plan, of the PEIR). The proposed purpose-built converter stations will contain the electrical equipment required to convert the transmitted electricity from DC to AC, prior to the connection with the national grid. Each converter station would typically comprise the following:

- control building;
- harmonic filter;
- AC switch yard;
- transformers;
- valve hall and reactor building; and
- DC switch yard.

3.7.16 The design of the proposed Converter Site would require cut and fill earthworks to provide a suitable topography for development and landscape (e.g., visual screening) purposes. It would create a level construction platform, in which the converter stations would sit, as well as the creation of bunds to reduce the visual impact of the converter stations. Further information on the cut and fill earthworks is provided within **paragraph 3.7.53**.

3.7.17 The structure and design of the converter station buildings, including the built form and external materials, will be developed alongside consultation and stakeholder feedback. A design code will be developed and provided with the application for development consent.

3.7.18 The converter stations would be connected to the national grid via underground AC cables at an anticipated Alverdiscott Substation Connection Development. At this stage, the NGET works are included within the Proposed Development. The Applicant will continue to engage with NGET on the extent and inclusion of the NGET works within the DCO application. Thus, a conservative approach has been taken to include the Alverdiscott Substation Connection Development within the

EIA assessment for the PEIR. Further information regarding the grid connection is considered within **paragraph 3.7.39**.

3.7.19 The Alverdiscott Substation Connection Development is expected to be situated within the existing Alverdiscott Substation site. At the current stage, the Applicant assumes that the Alverdiscott Substation Connection Development will be within the Draft Order Limits and powers will be taken to consent that development as part of the Applicant's DCO. If NGET decides to seek its own consent or indeed to not locate their substation within the Applicant's Order Limits, then NGET will be under an obligation to describe those environmental effects as appropriate.

3.7.20 The parameters for the Converter Site are provided in **Table 3.4**, which presents the maximum design scenario. The maximum design parameters have been established through the consideration of other converter stations.

Table 3.4: Maximum parameters for Converter Site

Parameter	Maximum Design Scenario
Number of converter stations	2
Height of converter buildings (excluding lightning protection, aerials, etc.) (m)	26
Footprint of converter buildings (m^2)	130,000
Height of lightning protection (m)	30
Permanent footprint of converter site (combined) (m^2), including converter buildings, landscape bunding, planting and drainage.	373,000

Access

3.7.21 The Converter Site would be accessed via the existing Alverdiscott Substation site entrance from the minor road running north south between Gammaton Crossroads and Webbery Barton. The current arrangement of the internal access road would need to be altered to provide access into the Converter Site and independent access to the National Grid site. Other access requirements such as for farming or solar arrays would also be accommodated out with the Converter Site security cordon.

3.7.22 The Proposed Development would also include a replacement NGET access road that would run along the north of the Converter Site boundary.

3.7.23 The proposed Converter Site would comprise internal service roads, which would have a maximum width of 11.5 m.

3.7.24 There would be access for traffic required during normal operation, as the proposed converter stations are likely to be operated 24/7 by staff on-site through shifts. The permanent access arrangements for the operation of the Converter Site are detailed within Volume 1, Figure 3.4, of the PEIR. The Converter Site is anticipated to provide approximately 30 full time-equivalent (FTE) jobs, with up to 15 staff on-site at any one time in the day, reducing to approximately five overnight.

Site Security

3.7.25 The detailed design of the Converter Site would consider guidance and requirements to ensure security of critical national infrastructure, including:

- 'Securing critical national infrastructure: an introduction to UK capability' (UK Defence and Security Exports and Department for Business and Trade, 2023).
- Guidance set out by the National Protective Security Authority (NPSA, 2024).

3.7.26 The Converter Site perimeter would be securely fenced and monitored with security cameras and lighting. Additionally, both converter stations would be separated via a second layer of security fencing as complete electrical separation of each bipole would be required.

3.7.27 Operational access for the Converter Site will be via the site access control building to ensure site security.

Landscape and Ecological Planting

3.7.28 An Outline Landscape and Ecology Management Plan (LEMP) will be prepared and submitted with the DCO application. This plan will be developed alongside consultation and stakeholder feedback. A LEMP will be developed in accordance with the Outline LEMP. The LEMP will provide details of the landscape strategy for the Converter Site, including cut and fill earthworks and wooded bunds, providing screening together with ecological value.

3.7.29 The Outline LEMP would also include details of mitigation planting at the Converter Site, including the number, location, species and details of management and maintenance of planting. Where practical, landscape mitigation planting will be established as early as reasonably practicable in the construction phase.

3.7.30 Additional infill planting would be implemented as necessary to enhance the boundary planting and increase biodiversity. A BNG of at least 10% would be targeted through hedgerow enhancement, boundary planting, woodland planting and creating species-rich grassland, which would have a considerably greater biodiversity value than the existing agricultural landscape. Further details are included within Volume 2, Chapter 1: Ecology and Nature Conservation and Volume 4, Chapter 2: Landscape, Seascape and Visual Impact Assessment, of the PEIR.

Surface Water Drainage

3.7.31 Impermeable areas, for instance the control and ancillary buildings, will require permanent surface drainage.

3.7.32 An Outline Operational Drainage Strategy will be prepared and submitted with the DCO application. The strategy will include measures to ensure that existing discharge rates are maintained. This will include measures to limit discharge rates and attenuate flows to maintain greenfield runoff rates at the converter stations. It will also include measures to control surface water runoff, including measures to prevent flooding of the working areas or surrounding areas and to ensure any runoff is treated appropriately. The outline operational drainage strategy will be developed in line with the latest relevant drainage guidance notes in consultation with the Environment Agency and the Lead Local Flood Authority (LLFA).

3.7.33 Details ensuring appropriate drainage systems are utilised during the construction of the Proposed Development as well as effective drainage strategies for temporary construction compounds will be included within the Onshore Construction Environmental Management Plan(s) (On-CEMP(s)) prior to the commencement of construction.

Foul Drainage

3.7.34 Foul drainage will be collected in one of the following ways:

- mains connection discharge to a local authority sewer system, if available; or
- septic tank located within the Converter Site boundary.

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

Lighting

3.7.36 During the construction phase of the Proposed Development, task specific lighting would be used to reduce the illumination of areas beyond the construction areas. In addition, to prevent light spill, light shield guards would be used.

3.7.37 The operational lighting would be designed to avoid illumination of areas beyond the operational site. This would include directional lighting to minimise overspill into the surrounding landscape. Operational outdoor lighting at the Converter Site boundary would normally be restricted to motion-activated security lighting.

3.7.38 The requirements of operational lighting will be secured within the Design Code and/or Outline Lighting Strategy and would be in accordance with the Institute of Lighting Professionals Guidance Notes for the Reduction of Obtrusive Light. The requirements would include measures to ensure safety and security during operational, whilst minimising impacts on the surrounding landscape.

Grid Connection

3.7.39 The Applicant has a Connection Agreement with NGESO for connection of 3.6 GW into Alverdiscott Substation in two phases of 1.8 GW each. It is anticipated that NGET would utilise land within the existing footprint of the Alverdiscott Substation site to provide this. The existing Alverdiscott Substation site is located within a grassland field, which includes a variety of OHLs crossing the land and connecting to the existing Alverdiscott Substation. An indicative location plan is provided within Volume 1, Figure 3.5: Indicative Alverdiscott Substation Connection Development Location, of the PEIR.

3.7.40 The development required at the existing Alverdiscott Substation site to provide connection to the national grid (referred to as the 'Alverdiscott Substation Connection Development), which is envisaged to include development of a new 400 kV substation, and other extension modification works to be confirmed by NGET is detailed below.

Alverdiscott Substation Connection Development

3.7.41 NGET would undertake works at the Alverdiscott Substation site to accommodate the connection and onward transmission of the Applicant's power. No new OHLs would be required; however, some local diversion and re-connection of existing OHLs may be required. This includes potential diversions or undergrounding of the existing 132 kV and 11 kV OHLs. Discussions with statutory undertakers regarding the potential route options of the OHLs are ongoing. The existing utilities within both the Alverdiscott Substation site and Converter Site are presented within Volume 1, Figure 3.6: Existing Utilities, of the PEIR.

3.7.42 Details of the development parameters required by NGET are currently assumed to form part of the DCO application, subject to further discussion with NGET. Therefore, assessment of the Proposed Development considers a reasonable approximation of the anticipated the Alverdiscott Substation Connection Development, which is detailed below.

3.7.43 In the absence of a confirmed design for the grid connection infrastructure from national grid, the assessment will assume a combination of reasonable worst case parameters. For example, Air Insulated Switchgear (AIS) will require a larger footprint to Gas Insulated Switchgear (GIS) whereas a GIS building of up to 15 m in height is not required for an AIS substation.

3.7.44 The development area for the Alverdiscott Substation Connection Development comprise up to 3.8 ha of land. Within that area it is assumed that the substation itself will occupy a footprint of approximately 2.8 ha, with a maximum height of 15 m, excluding connecting tower structures.

Construction

3.7.45 An overview of the key construction activities associated with the development of the Converter Site is provided below.

Pre-construction Surveys

3.7.46 Prior to the commencement of the onshore construction works, a number of pre-construction surveys and studies may be required to inform the final detailed design, which may include:

- topographic surveys;
- ecological surveys to update EIA findings if required and to inform any protected species mitigation licence(s) that may be required;
- ground investigations (e.g., geotechnical and ground stability surveys);
- soil surveys;
- drainage surveys; and
- targeted archaeological excavations as may be required to confirm the findings of the EIA process. An onshore Written Scheme of Investigation (WSI) would be developed prior to construction, which would detail the surveys and archaeological mitigation requirements during construction.

Converter Site Construction Compounds

3.7.47 A construction compound is proposed to be located between Gammaton Road and Tennacott Lane, south of East-the-Water. The compound would include park and ride facilities for contractors working at both the Converter Site and the Onshore HVDC Cable Corridor, which would take a number of vehicles off local lanes.

3.7.48 The Converter Site construction compound would be situated within the Converter Site.

3.7.49 **Table 3.5** sets out the anticipated parameters for the construction of the converter stations.

Table 3.5: Maximum design scenario - construction of converter stations

Parameter	Maximum Design Scenario
Construction compound (Gammaton Road) area (m^2)	63,000
Converter construction compound (m^2)	20,000
Duration of construction	72 months

Access

3.7.50 An Outline Construction Traffic Management Plan (CTMP) will be prepared and submitted with the DCO application. This plan will be developed through consultation and stakeholder engagement. A CTMP will be developed in accordance with the Outline CTMP and will include necessary traffic management measures to be adhered to during the construction phase of the Proposed Development.

3.7.51 It is anticipated that construction access to the Converter Site would be routed from the A39, which connects to Barnstaple Road and then Manteo Way. Construction traffic would follow Manteo Way, through East-the-Water to Gammaton Road and connect to the main construction compound between Tennacott Lane and Gammaton Road. From the compound, construction traffic would utilise an off-road haul road that would run adjacent to Gammaton Road and to the minor road leading north from Gammaton Cross towards the Converter Site. This would remove the majority of construction traffic from Gammaton Road/Gammaton Cross.

3.7.52 Some construction traffic would utilise this road during the initial site setup and enabling works, however, following this phase and the development of the haul road, the majority construction vehicles would be routed along the haul road. This will be detailed within the CTMP.

Earthworks

3.7.53 To construct the site on which the converter stations will be built, the existing ground surface will be modified by removing soil from areas and building slopes in others. This is referred to as ‘cut and fill’ operations. The extent of cut and fill required will be determined as the design progresses.

3.7.54 Cut and fill earthworks would be required as it will allow for a level construction platform, in which the converter stations will sit, and provide some visual screening of the buildings (i.e., through the creation of bunds around the converter buildings). This would reduce visual impacts associated with the operation of the converter stations.

3.7.55 The entire area would be stripped of all topsoil and subsoil where required (including any vegetation and loose rocks where necessary). Where waste and excess material is encountered, it would be removed if it is unsuitable for reuse. Once the surface has been cleared, the ‘cut and fill’ operation would begin. Soil would be stored and managed in accordance with the Construction Code of Practice for Sustainable Use of Soils on Construction Sites (Department for the Environment, Food and Rural Affairs (Defra), 2009) or the latest relevant available government guidance.

3.7.56 Excavated material would be utilised where possible, provided the grade and composition is suitable, within the Converter Site for landscaping (i.e. creating mitigation bunds which would reduce the visibility of the converter stations). Where there is excess material, it is anticipated that this material would be converted into products of acceptable quality for use across the Proposed Development (e.g. haul roads and compounds), where feasible. If this is not feasible, or if there is further excess following the development of haul roads and compounds, the remainder would be appropriately transported (with appropriate approvals/ permits) to locations in which it can be either re-used or disposed of at a licensed disposal site. The environmental effects associated with the re-use or disposal of excess excavated material is assessed within the relevant chapters of the PEIR.

Highways Improvements

3.7.57 The Proposed Development would include proposed improvements to the local highway network, which would facilitate access (e.g. for Abnormal Indivisible Loads (AILs)) during both construction and operation and maintenance. The following improvements are proposed on both the public highway and on private land as part of the Proposed Development, noting that the improvements are subject to further detailed design. As such all potential improvements are included below and may be refined through detailed design:

- Cornborough Sewage Treatment Works access road: new junction to provide access to the onshore HVDC Cable Corridor.
- A386: this includes the improvement of an existing junction along the A386 to provide access to the River Torridge horizontal directional drilling (HDD) compound and the haul road along the onshore HVDC cable route west of the river. An additional junction may be required along the A386 dependant on the HDD crossing location.
- Road improvement works at Gammaton Moor, including the following potential options:
  - Widening of Gammaton Road in selective locations to enable full two-way movement of vehicles.
  - A new junction west of Gammaton Moor Crossroads and a new section of public highway connecting Gammaton Road with the unnamed road to Converter Site.
  - Potential relocation of the unnamed road to the Converter Site further to the west to facilitate utility diversions (gas and water) within and adjacent to the Converter Site. This will be confirmed during the detailed design.
  - Asymmetric widening either online or offline of the unnamed road to the Converter Site to enable full two-way running for light vehicles.

3.7.58 The proposed improvements to the local highway network have been considered within the EIA process and associated AIL movements have been assessed in Volume 2, Chapter 5: Traffic and Transport, in accordance with established methodology and in consultation with relevant stakeholders.

3.7.59 The proposed surface access improvements are presented in Volume 1, Figure 3.7: Highways Improvements.

HVDC Cable Corridor

Cable Corridor Location

3.7.60 The onshore HVDC Cables would provide a cable connection between the transition joint pit, at the landfall, and the proposed converter stations. An Onshore HVDC Cable Corridor has been identified, within which the HVDC Cables are proposed to be located, as shown on Figure 3.1 (see Volume 1, Figures).

3.7.61 A single Onshore HVDC Cable Corridor is anticipated for the Proposed Development, which would include the installation of the HVDC Cables in cable circuits (with each circuit typically comprising two power cables and up to three fibre optic cables).

3.7.62 The Onshore HVDC Cable Corridor stretches for approximately 14.5 km and has been divided into seven zones, dictated by existing engineering restrictions (including major roads, rivers, etc.), running from the Converter Site to the landfall. This is summarised below and accompanied by Figure 3.1: Onshore Infrastructure Area (see Volume 1, Figures).

Zone 1 – Alverdiscott Substation and Converter Site to Gammaton Road

3.7.63 The initial section of the Onshore HVDC Cable Corridor is routed from the Converter Site towards the south west. At this location, the HVDC Cables would be installed via two options, which are detailed below.

- HDD (or other trenchless crossings) would be required as the corridor is routed from the Converter Site, allowing the HVDC Cables to pass beneath the area of woodland adjacent to the southern boundary of the Converter Site.
- Open-cut trenching may be utilised, whilst avoiding the area of the woodland adjacent to the southern boundary of the Converter Site. However, this approach would require temporary removal of solar panels in a section of the existing Cleave Solar Farm.

3.7.64 Following this initial trenchless crossing, the Onshore HVDC Cable Corridor would continue south west, crossing two unnamed roads and Gammaton Road before passing to the south of the Bideford and District Angling Club Lake. The Onshore HVDC Cable Corridor then continues adjacent to Gammaton Road, routing towards Bideford.

3.7.65 A haul road would be created from the Converter Site to Gammaton Road for construction vehicles and Abnormal Indivisible Loads (AILs) access. When construction is completed, all land used for haul routes, compounds and other works would be restored to their former condition. The Proposed Development also includes the widening of road sections from Gammaton Cross and along the minor road leading north towards the Converter Site, which is detailed within **section 3.7**.

Zone 2 – Gammaton Moor to the River Torridge

3.7.66 The Onshore HVDC Cable Corridor will continue in the north west direction along Gammaton Road passing on the south and west side of Woodville Farm.

3.7.67 A construction compound would be created on the eastern side of Tennacott Lane, on a triangular area of land to the south of Gammaton Road and Bideford Business Park. This construction compound would include park and ride facilities for contractors working at both the Converter Site and the Onshore HVDC Cable Corridor, which would take a number of vehicles off local lanes.

3.7.68 The Onshore HVDC Cable Corridor would then continue west towards the River Torridge, passing north of Tennacott Farm and April Cottage (also known as Tennacott Lodge) and crossing Tennacott Lane.

3.7.69 The Onshore HVDC Cable Corridor will cross under the River Torridge via HDD. The entry pit of the trenchless crossing would be situated to the east of the Tarka Trail. The Onshore HVDC Cable Corridor would be directed beneath the Tarka Trail, Torridge River and the A386, before emerging to the north of Hallsannery House.

3.7.70 This section of the Onshore HVDC Cable Corridor would avoid the Hallsannery County Wildlife Site and the Kynoch's Foreshore Local Nature Reserve (LNR). There will be no surface works affecting the Tarka Trail and the HDD ducts will be located at a significant depth below the river bed, thus reducing the potential risk of harm to protected species and habitats.

Zone 3 – River Torridge to West Ashridge

3.7.71 The HVDC cable would emerge on the western side of the River Torridge, following this, the cable corridor passes to the west of Hallsannery Farmhouse and south of Ashridge Cottage and then west towards West Ashridge.

Zone 4 – West Ashridge to Littleham

3.7.72 Another HDD will be required to pass a small stream with wooded banks, 290 m south of Jennetts reservoir and to the west of West Ashridge, which feeds into Jennetts reservoir. Once again, HDD compounds would be situated on either side of the HDD corridor.

3.7.73 Following this trenchless crossing, the Onshore HVDC Cable Corridor is routed to the south of Dunn Farm and then continues west, passing between Robin Hill Farm and Littleham.

Zone 5 – Littleham Cross to A39

3.7.74 Littleham Wood is situated to the west of Robin Hill Farm and to the east of Buckland Road, which forms a potential obstacle to the proposed Onshore HVDC Cable Corridor. At this location, there is an option to either HDD beneath the woodland, with associated HDD compounds situated within the Proposed Development Draft Order Limits, or to divert the open cut trenching to the south of Littleham Wood.

3.7.75 The Onshore HVDC Cable Corridor will then pass to the north of Moorhead and continue north west towards Winscott Barton, where the use of HDD could be required to past beneath suspected archaeological assets. The potential effects on archaeological assets are considered within Volume 2, Chapter 2: Historic Environment, of the PEIR.

3.7.76 The Onshore HVDC Cable Corridor continues north towards the A39, where HDD techniques will be required to cross beneath the major road at a section approximately 250 m south west from the Abbotsham Cross roundabout. The A39 construction compound would be located just north of the Abbotsham Cross roundabout, and would be utilised as a general compound and HDD compound (with another HDD compound on the southern side of the A39).

Zone 6 – A39 to Kenwith Stream

3.7.77 From the A39, the Onshore HVDC Cable Corridor continues north, passing to the west of Abbotsham and east of Chapter House towards Kenwith Stream. Minor roads in this zone will be crossed using open trench techniques.

3.7.78 The Onshore HVDC Cable Corridor would require an HDD to cross Kenwith Stream, which is situated just south of Rickard's Down, flowing from south-west to north-east, towards the River Torridge.

Zone 7 – Kenwith Stream to Landfall

3.7.79 The Onshore HVDC Cable Corridor will then run north west towards the south of the Cornborough Sewage Treatment Works where it then diverts west, towards the landfall. The onshore HVDC cable corridor terminates at the buried Transition joint pit at the landfall site (see Volume 1, Figure 3.1).

3.7.80 An access road would be created to the east of Cornborough Sewage Treatment Works which would enable vehicle access to the Onshore HVDC Cable Corridor and site from the B3236.t

Cable Corridor Details

3.7.81 As detailed above, the Onshore HVDC Cable Corridor would include the installation of the HVDC Cables in cable circuits. A circuit containing two HVDC Cables alongside each other forms a bipole. A bipole system is an electrical transmission system that comprises two DC conductors of opposite polarity.

3.7.82 The Onshore HVDC Cable Corridor is currently anticipated to have a maximum temporary width of up to 65 m during construction, within which the permanent cables will be located. This would allow for construction plant access, spoil and materials laydown.

3.7.83 The typical permanent cable corridor width is expected to be 32 m; however, the permanent easement would be wider in some instances. For example, the maximum permanent cable corridor width would be 60 m at HDD locations for the Onshore HVDC Cable Corridor, as the cable ducts are inserted further apart.

3.7.84 The Onshore HVDC Cable Corridor would comprise two bipoles which are each fitted within a trench, giving a total of two trenches. Each bipole trench would include two HVDC Cables and up to three fibreoptic cables, giving a total of up to ten cables for the DC cable corridor. The operating voltage of the power cables is expected to be 525 kV.

3.7.85 The onshore HVDC Cables utilised within the Proposed Development would be the cross-linked polyethylene (XLPE) type with a typical diameter of circa 156 mm. The onshore export cables themselves will consist of copper or aluminium conductors wrapped with various materials for insulation, protection, and sealing.

3.7.86 The proposed Onshore HVDC Cable Corridor will also require access tracks (referred to as 'haul roads') to allow the movement of construction vehicles and the installation of the cable circuits, in addition to other related works such as temporary compounds and laydown areas. Operational access may also be required along the Onshore HVDC Cable Corridor, in the event of any cable faults that require repair or replacement works.

3.7.87 The Onshore HVDC Cable Corridor will be approximately 14.5 km in length. The maximum design parameters for the onshore HVDC Cables are provided in **Table 3.6.**

Table 3.6: Maximum design scenario - HVDC cable corridor

Parameter	Maximum Design Scenario
Length of HVDC cable corridor (km)	14.5
Maximum number of HVDC Cables	4
Maximum number of fibre-optic cables	6
Maximum number of cable trenches	2
Permanent cable corridor width for trenched methods (m)	32
Permanent cable corridor width at HDD locations (m)	60
Maximum voltage (kV)	525
Diameter of power duct (mm)	300
Diameter of fibre optic duct (mm)	110
Diameter of HVDC cable (mm)	156

HVAC Cable Connection

HVAC Cable Connection Location

3.7.88 The connection between the proposed converter stations and the national grid, via Alverdiscott Substation Connection Development, would be achieved by the HVAC cables over a maximum length of 1.2 km.

3.7.89 The HVAC cables would be located within the boundaries of the Converter Site and Alverdiscott Substation site. The HVAC cable corridor would include the installation of HVAC cables in cable circuits (with each circuit typically comprising three power cables). It is anticipated that two cable circuits (six cables), buried across two separate trenches would form one bipole for the AC system, and may include communication cables.

3.7.90 Each HVAC bipole system would be connected to the corresponding converter station (Bipole 1 and Bipole 2) and routed separately towards the Alverdiscott Substation site. However, it is expected that the two corridors would converge prior to connection with the Alverdiscott Substation Connection Development, to the east of the Converter Site. The final routing of each HVAC bipole would be refined with consideration of the final layout of the Converter Site and Alverdiscott Substation Connection Development.

HVAC Cable Connection Details

3.7.91 The cable corridor for the HVAC cables (including both separate corridors) is currently anticipated to have a maximum temporary width of up to 65 m during construction, within which the permanent cables will be located. This would allow for construction plant access, spoil and materials laydown.

3.7.92 The typical permanent cable corridor width is expected to be 15 m for each bipole, resulting in a combined permanent width of 30 m.

3.7.93 The HVAC cables utilised within the Proposed Development would be the XLPE type with a typical diameter of circa 155 mm. The operating voltage of the cables is expected to be 400 kV.

3.7.94 The parameters for the onshore HVAC cables are provided in **Table 3.7**.

Table 3.7: Maximum design scenario - HVAC cable connection route

Parameter	Maximum Design Scenario
Length of HVAC cable connection route (km)	1.2
Maximum number of HVAC cables	12
Maximum number of cable trenches	4
Permanent cable corridor width (m)	30 (15 m for each bipole)
Temporary construction corridor width (m)	65 (32.5 m for each bipole)
Maximum voltage (kV)	400
Diameter of power duct (mm)	300
Diameter of HVAC cables (mm)	155
Type of cable	XLPE

Cable Construction

3.7.95 Cable construction and installation of the onshore cables is anticipated to be undertaken in the following broad sequence. However, some sequencing may differ once the contractor(s) is appointed. Sequencing may vary between the construction and installation of the HVDC Cables and the construction and installation of the HVAC cables. However, variances in sequencing would not alter the assessment of likely significant effects.

1. Completion of any pre-construction surveys.
2. Ecological pre-construction work (for instance, hedgerow removal).
3. Establishment of construction compounds, including temporary utility installation, and new access points from the highway where required.
4. Installation of fencing around the construction areas.
5. Site preparation works, installation of pre-construction drainage, topsoil removal and storage, establishment of temporary compounds, installation of temporary haul roads.
6. HDD works at identified locations (see further detail below).
7. Trench excavation works, installation of backfill materials and installation of ducts and protective tape and tiles.
8. Backfilling of trench to subsoil level.
9. Excavation and construction of joint bays and link boxes along the route. The link boxes include maintenance covers for access.

10. Installation of power and fibre optic cables though installed ducts between joint bays and installation of link boxes and inspection covers.
11. Jointing together of cables at joint bay locations.
12. Removal of construction drainage, removal of haul roads, removal of temporary compounds and fencing.
13. Replacement of topsoil along the cable corridor and reinstatement to previous land use.
14. Removal of temporary access points and planting of any sections of replacement hedgerow.
15. Removal/ reinstatement of construction compounds.

3.7.96 Further detail is provided in the following sections, with details of environmental management measures provided in **section 3.8**.

Pre-construction surveys

3.7.97 Prior to the commencement of the onshore construction works, a number of pre-construction surveys may be required to inform the final detailed design, which may include:

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

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

Temporary Construction Compounds

3.7.99 Construction compounds will be established early in the construction programme. Indicative construction compound locations are shown on Figure 3.8 (See Volume 1, Figures).

3.7.100 Compounds may include central offices, welfare facilities and stores, as well as acting as a staging post and secure storage for equipment and component deliveries, as well as for laydown and storage of materials and plant.

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

3.7.102 Construction compounds will also be required where trenchless techniques, such as HDD are used. HDD operations will require compound to contain the drilling rig, equipment and the drill entry and exit pit. However, most compounds for HDD crossings will be located either side of the haul road and within the 65 m temporary construction corridor.

3.7.103 The following temporary construction compounds may be required:

- Main construction compound: proposed to be situated between Gammaton Road and Tennacott Lane, just south of East-the-Water. The compound would be utilised as the main compound for all construction work across the Onshore HVDC Cable Corridor and Converter Site.
- Secondary construction compound: proposed to be located adjacent to the A39, south west from the Abbotsham Cross roundabout. This compound would also include a HDD compound for the A39 crossing.
- Landfall compound: this compound would be situated at the landfall (Cornborough Range).
- HDD Compounds: detail provided within **paragraph 3.7.102**.
- Converter compound: detail provided within **paragraph 3.7.48**

3.7.104 Where required, temporary utility connections will be constructed for the compounds to provide power, water, foul and communications services. The need for these temporary services will be determined by the contractor prior to compound establishment.

3.7.105 Following the completion of construction, the temporary construction compounds would be removed and the land restored to its former condition.

Table 3.8: Summary of Construction Compounds Parameters

Construction Compound	Maximum Design Scenario		
	Number	Compound Size	Duration
Construction Compound (Gammaton Road)	1	63,000 m^2	72 months
Secondary Construction Compound (A39 Compound)	1	48,000 m^2	36 months
Landfall Compound	1	10,000 m^2	Two periods, for 18 months plus an additional 6 month period.
HDD Compounds	16	10,000 m^2	36 months
Converter Compound	1	20,000 m^2	72 months

Cable Installation – Key Methods

3.7.106 The main construction techniques for the installation of the HVDC and HVAC cables would include the following:

- The Proposed Development would predominantly utilise open cut methods of cable installation.
- The trenchless crossing method called HDD (detailed in **paragraph 3.7.128**) would be utilised in locations where the cable corridor crosses obstacles, such as major roads and woodland. HDD would also be utilised where the Onshore HVDC Cable Corridor crosses certain watercourses, which are detailed in **paragraph 3.7.132**.
- Cable jointing would be required where two cable lengths meet as the length of the cable supplied on the cable drum transport would be approximately 1 km, due to weight limits. This is discussed further in **paragraph 3.7.113**.

3.7.107 Open cut methods of cable installation would involve the excavation of a trench and laying ducts in preparation of cable installation (pulling the cable through previously installed ducts). Cables are installed by winching them into the pre-installed ducts.

3.7.108 Across agricultural land (and excluding joint bays) the HVDC Cables would be buried in underground ducts at an approximate depth of 1.4 m. The maximum burial depth may be exceeded at joint bays and where the route is required to cross beneath features such as pipelines, land drains, highways or rivers using trenchless construction techniques.

3.7.109 The diameter of power (AC and DC) ducts would be approximately 300 mm, whereas the diameter of the fibreoptic cable ducts would be approximately 110 mm.

3.7.110 As the cable corridor would be fully ducted, the cable lengths could be installed following the infill of trenches, which allows for quick trenching and restoration of land to the previous land-use. This would benefit both the environment and landowner.

3.7.111 Following the infilling of the trenches, cables would be installed by winching them into the pre-installed ducts, which have been fitted underground via the methods highlighted above.

3.7.112 The parameters for the onshore cable installation is provided in **Table 3.9**.

Table 3.9: Maximum design scenario - onshore cables installation

Parameter	Maximum Design Scenario	
	HVDC Cable Corridor	HVAC Cable Corridor
Trench width at base (m)	1.6	2.1
Trench width at surface (m)	4.3	4.9
Approximate depth of trench (m)	1.4	1.4
Target trench depth to top of protective tile (m)	0.9	0.9
Trench depth of specialised backfill (m)	0.5	0.5
Width of construction cable corridor (temporary) (m)	65	65 (32.5 m per bipole)
Number of haul roads	1	1
Width of haul road (m) excluding passing bays	7	7
Duration of works (months)	36	24 (two phases of 12-months)

Cable Joint Bays and Link Boxes

3.7.113 Cables would be supplied from the factory on cable drums whose manageable transport dimensions determine the available section length. Where two cable lengths meet, they would need to be jointed together in a joint bay. Joint bays are typically concrete lined pits below ground, that provide a clean and dry environment for jointing sections of cable together.

3.7.114 The key steps are:

- cutting the two cables to be jointed to length;

- stripping back the various layers of sheath, screen and insulation;
- preparing the conductor for jointing and then jointing either by a compression ferrule for copper conductor or by welding for aluminium conductor; and
- assembling a pre-fabricated joint housing around the cables that is then filled with an insulating material such as silicone rubber.

3.7.115 Cable joints would be required approximately every 800 m to 1,100 m along the route.

Joint Bays

3.7.116 The joint bays would be approximately 20 m long, with a width of approximately 5 m and a floor depth of 1.4 m. There will be one joint bay per section for each bipole, therefore 17 joint bays per bipole would be required based on a distance of 800 m between joint bays. Each joint bay will house two HVDC cable joints.

3.7.117 The joint bays are an enlarged version of the standard cable trench with a concrete base installed to facilitate the jointing process and support the joints on completion. The joint bay is backfilled in the same manner as the rest of the route with Cement Bonded Sand (CBS) surround, protective covers and warning tape with indigenous backfill to the surface. Joint bays would not require access during construction, thus they would not include maintenance covers.

3.7.118 In terms of the HVAC section of the cable corridor, it is anticipated due to the relatively short length that no joints will be required. If joint bays are required for the HVAC route, an equivalent of the DC cable joint bay will be installed.

3.7.119 The maximum design parameters for the joint bays is set out in **Table 3.10**. This provides a summary of the parameters for the typical joint bays along the cable corridor, excluding the landfall site.

Table 3.10: Maximum design scenario - joint bays (excluding landfall TJB)

Parameter	Maximum Design Scenario
Number of joint bays	34
Width (m)	20
Length (m)	5
Depth (m)	1.4
Area of joint bay (m^2) (below ground)	100
Volume of material excavated per joint bay (per circuit) (m^3)	140
Nominal Distance between Jointing Bays (m)	800-1,100

Link Boxes

3.7.120 Link boxes are smaller pits compared to joint bays, which house connections between the cable shielding, joints for fibre optic cables and other auxiliary equipment. Link boxes would be situated close to the joint bay locations.

3.7.121 Link boxes allow electrical access to the cable sheath for maintenance testing and fault finding purposes. Therefore, maintenance covers would be required at link box locations, which would be visible during operation. The maintenance covers will be a typical ground level chamber cover to allow access to link boxes.

3.7.122 The parameters for the link boxes is set out in **Table 3.11**.

Table 3.11: Maximum design scenario - link boxes

Parameter	Maximum Design Scenario
Number of link boxes	34
Width (m)	1.5
Length (m)	1.5
Depth (m)	1.4
Area of link box (m^2) (below ground)	2.25
Volume of material excavated per link box (per circuit) (m^3)	3.15
Nominal Distance between link boxes (m)	800-1,100

Cable Protection

3.7.123 Onshore HVDC and HVAC buried cables will be protected from accidental damage by excavation in several ways, typically being a combination as follows:

Warning Tape and Tiles

3.7.124 A continuous length of protective covers (or tiles) made of concrete or similar will sit directly above each cable duct. The covers are typically red in colour and bear warning text. Approximately 100 mm above the covers, a bright yellow band of plastic warning tape will be laid. The exception to this arrangement will be at trenchless crossings.

Above Ground Cable Markers and Signage

3.7.125 Similar to cross country gas pipelines, the buried cables will be marked at road crossings, watercourse crossings and field boundaries by warning markers and/or signs.

3.7.126 Marker posts buried in the ground are typically around 1.1 m long by 0.25 m wide with at least 50% or more of the post visible above ground. They will include signage to indicate the high voltage cable danger with telephone contact information.

Cable Crossings

3.7.127 The Onshore HVDC Cable Corridor will cross existing infrastructure and obstacles such as roads, rivers and other utilities. All major crossings, such as major roads and river crossings will be undertaken using trenchless technologies.

3.7.128 Trenchless crossing methods include auger boring, HDD, thrust boring, and micro-tunnelling. For the purposes of impact assessment, HDD has been assumed for the major crossings detailed within Figure 3.8 (see Volume 1, Figures). This is the ‘reasonable worst case’ assumption of construction effects. However, contractors may select trenchless or trenched crossing techniques at other minor features in order to minimise any disruption caused and thereby lessen any impacts identified as part of the EIA process.

3.7.129 HDD involves drilling underneath the obstacle. HDD can avoid physical disturbance to above-ground or shallow below-ground features by drilling under them but typically has a higher cost than open-cut trenching and is most suited to straight sections. HDD drilling would involve drilling of bores using an HDD rig up to approximately 250 tonnes.

3.7.130 Depending on the size of the duct and the ground conditions encountered, the drilling operations would take place in a series of stages:

- Drill initial small pilot hole.
- The diameter of the pilot hole is enlarged by a larger cutting tool. Bentonite is pumped to the drilling head during the drilling process to stabilise the hole and ensure that it does not collapse.
- The duct is placed inside the borehole and the cable is pulled through. These ducts are either constructed offsite or will be constructed onsite, then pulled through the drilled hole either by the HDD rig or by separate winches.

3.7.131 HDD would generally be undertaken from two temporary construction compounds located either side of each crossing. These compounds would generally be 10,000 m^2 in size and would be suitably located for the drilling works required. Volume 1, Figure 3.8 details the locations of HDD crossings and associated temporary construction compounds.

3.7.132 It is expected that there would be approximately eight trenchless cable crossings via HDD within the onshore section of the Proposed Development, including the HDD at landfall. It is currently proposed that the following features will be crossed by HDD (or other trenchless methodologies):

- The Mermaid's Pool to Rowden Gut Site of Special Scientific Interest (SSSI), situated along the coastline at the landfall, Cornborough Range.
- The following watercourses/woodland:
  - Kenwith Stream, situated just south of Rickard's Down and approximately 300 m north of Abbotsham.
  - Littleham Wood, which includes a small watercourse, situated to the west of Robin Hill Farm and approximately 800 m to the north west of Littleham.
  - A small stream, 290 m south of Jennetts reservoir and to the west of West Ashridge, which feeds into Jennetts reservoir.
  - River Torridge, to the south of Bideford (to note, one HDD will cross both the River Torridge and A386).
- The following major roads:
  - A39, at a section approximately 250 m south west from the Abbotsham Cross roundabout and north west from High Park Farm.
  - A386, to the south of Bideford (as stated above, one HDD will cross both the River Torridge and A386).
- A site of suspected archaeological assets at Winscott Barton.
- There is an option to use HDD (or other trenchless techniques) to cross the unnamed watercourse and associated woodland to the immediate south of the Converter Site.

3.7.133 Where possible, HDD crossings will be undertaken by lower impact methods, in order to minimise construction impacts beyond the immediate location of works. HDD crossings would be undertaken concurrently (at the same time) along the Onshore HVDC Cable Corridor.

3.7.134 The design parameters of the HVDC cable corridor are shown below within **Table 3.12.**

Table 3.12: Summary of the HDD Parameters

Parameters	Maximum Design Scenario
General Details	
Number of HDD Locations	8 (including landfall)
Number of compounds per HDD	2 (located at either end of HDD)
Approximate HDD compound size (m^2)	10,000
Typical (HVDC) HDD Parameters (per HDD)	
Number of HDD drills	6
Number of Power Cable Ducts	6 (including 2 spare ducts)
Number of Fibre Optic Ducts	6
Diameter of Power Cable Ducts (mm)	500
Diameter of Fibre Optic Ducts (mm)	110

Construction Access

3.7.135 During construction, the A39 would be used as the primary artery for construction access, which would connect construction vehicles to the A386, B3236, and Barnstaple Road into Manteo Way (See Volume 1, Figure 3.9). These roads would be utilised for construction traffic before leading vehicles onto temporary haul roads along the cable corridor. Temporary internal haul routes would be constructed along sections of the cable corridor to remove frequent vehicle movements from the public highway. The Access Routes Plan is shown within Volume 1, Figure 3.9.

3.7.136 As there are a number of constraints associated with the narrow roads located within the local area, three main construction compounds along the Onshore HVDC Cable Corridor have been situated in areas easily accessible from the A39, A386 and Manteo Way respectively. This would allow construction vehicles to be directed towards the relevant compounds whilst reducing movements along minor roads. Figure 3.5, Figure 3.6 and Figure 3.1 (See Volume 1, Figures) show the main access points and construction compounds.

3.7.137 A CTMP would be produced prior to the commencement of construction, which would include measures to ensure that construction traffic impacts are minimised (e.g., minimising traffic congestion, restrictions on timing of vehicle movements, etc.). The CTMP would be developed in accordance with the outline CTMP, which is provided as part of the DCO.

3.7.138 It is expected that vehicle types utilising the public highway during construction would include a mixture of cars, vans, articulated heavy goods vehicles (HGVs) and rigid HGVs including concrete trucks. Additionally, vehicle movements generated during the separate cable pull-in and jointing operation would include HGVs bearing winches, cranes, cars and vans. Further details are provided within Volume 2, Chapter 5: Traffic and Transport, of the PEIR.

Abnormal Indivisible Loads (AILs)

3.7.139 Drums of prepared cable shipped to north Devon are AILs on the public highway in terms of both weight and size. AILs will use the same route to the Onshore

HVDC Cable Corridor and same compounds as described above. Access junctions into the compounds will be designed to accommodate the cable drum AILs.

3.7.140 Cable drums are proposed to arrive via sea at Appledore Quay for onward transport to the cable corridor and Converter Site. Routes to site are shown on Volume 1, Figure 3.10.

3.7.141 The AIL routes identified in Figure 3.10 (see Volume 1, Figures) form a separate element to the Onshore Infrastructure Area. It is anticipated that works along the AIL routes, outside of the Onshore Infrastructure Area, would be limited to minor works, such as the removal of bollards, road islands and vegetation. As such, the AIL routes have only been considered within individual topic chapters where there would be potential for likely significant effects.

Restoration of Cable Corridor

3.7.142 As set out in **paragraph 3.7.83**, the permanent corridor width for the HVDC cable corridor would typically be 32 m, however, this would be exceeded at HDD locations where the permanent corridor width would be up to 60 m.

3.7.143 In terms of above ground features, once the installation work is completed, the haul road(s) will be removed and the ground reinstated to its previous use using stored subsoil and topsoil. All temporary construction compounds and temporary fencing will be removed, field drainage and/or irrigation will be reinstated and the land will be restored to its original condition. Where practicable, consideration will be given to early restoration of sections of the Onshore HVDC Cable Corridor.

3.7.144 Hedgerows will be replanted using locally sourced native species, where practicable. Suitably qualified and experienced contractors will be used to undertake the reinstatement, which will be based on restoring the hedge to match the remaining hedgerow at each location. Where appropriate, enhancement (such as planting of additional suitable species) may be undertaken. This would be detailed within the Ecology and Landscape Management Plan, which would be prepared and submitted with the application for development consent.

3.7.145 Joint bays will be completely buried, with the land above reinstated. A standard size manhole cover will be provided on the surface for link boxes for access during the operation and maintenance phase.

Landfall Works

3.7.146 The proposed landfall for the Proposed Development is located at Cornborough Range on the North Devon coast, to the south-west of Cornborough and approximately 4 km west of Bideford. This part of the site lies within the North Devon Coast National Landscape and the Heritage Coast. The Mermaid’s Pool to Rowden Gut Site of Special Scientific Interest (SSSI) is also situated along the coastline.

3.7.147 The landfall at Cornborough Range would be constructed using HDD under the seabed and shoreline, pulling the offshore cables (from the sea towards the land) through underground ducts and connecting to the onshore cables at the TJBs. A brief description of this technique is provided below.

Transition Joint Bays

3.7.148 The offshore cables will be jointed to the onshore cables at two TJBs. The TJBs would be underground chambers constructed of reinforced concrete base, walls and roof, which is then backfilled on completion of the jointing process, which provides a secure and stable environment for the cable joints.

3.7.149 Each TJB at landfall would require an excavation area of approximately 750 m^2 (50 m x 15 m) and would be buried at a maximum approximate depth of 2.5 m. However, the maximum area of concrete slab required for each TJB would be 150 m^2 (30 m x 5 m) with a thickness of 0.3 m, totalling 300 m^2 for both.

3.7.150 The TJBs would not require access during construction, thus they would not include maintenance covers on the surface.

3.7.151 All underground assets will be installed in line with current best practice guidance, which provides guidance on the minimum burial depth in the relevant land-use types (e.g., to allow the ongoing use of the land for agricultural activities).

Horizontal Directional Drilling - Landfall

3.7.152 HDD boreholes will be drilled under the seabed and shoreline, and lined with underground ducts to allow the offshore HVDC Cables to be pulled through (from the sea towards the land) and connected to the onshore HVDC Cables at the transition joint bays.

3.7.153 A borehole would be drilled below ground and beneath the seabed surface for each power cable. A fibre optic cable (FOC) can be installed within the same bore as a power cable. A small pilot borehole would initially be used, which is then enlarged by a larger cutting tool. A duct would be placed inside the borehole, through which the cable is pulled.

3.7.154 The ducts at landfall are slightly larger than the usual typical onshore ducts as the offshore cables are armoured for extra protection from physical damage and would be approximately 400 mm (for DC cables) and 100 mm (for fibre cables) in diameter.

3.7.155 The installation would require a temporary construction compound (approximately 10,000 m^2) and associated temporary utility services, which would contain all necessary plant and equipment plus parking and welfare facilities required for the landfall construction works.

3.7.156 Once the drill is complete, the TJB structures would be completed. As detailed above, up to two TJBs would be required (one per cable circuit).

Landfall Key Parameters

3.7.157 The design parameters of the construction works at landfall are shown below within **Table 3.13**.

Table 3.13: Landfall Works Key Parameters

Infrastructure	Key Parameter	Maximum Design Scenario
Landfall HDD	Number of Power Cable Ducts	8
	Number of Fibre Optic Ducts	4
	Diameter of Power Cable Ducts (mm)	500

Infrastructure	Key Parameter	Maximum Design Scenario
	Diameter of Fibre Ducts (mm)	110
	Indicative length of HDD (m)	2,110
	Number of entry pits	4
	Number of exit pits	4
	Volume of excavated material (m^3) per exit pit	75 m^3 (*5 m x 5 m x 3 m*)
	Temporary construction compound (m^2)	10,000
	Duration of works (months)	18 months (split over two phases)
Transition Joint Bay (TJB)	Number of TJBs	2
	TJB Cover Maximum Depth (m)	2.5
	Volume of excavated material (m^3) per TJB	1,875 (*50 m x 15 m x 2.5 m*)
	Area of TJB (m^2) (per TJB)	150 (*30 m x 5 m*)

3.8 Offshore Elements of the Proposed Development

3.8.1 As set out in **paragraph 3.5.1**, the offshore infrastructure for the Proposed Development includes the HVDC Cables located within the UK EEZ. This section sets out the design parameters and the proposed installation and construction methods for the offshore infrastructure, which form the basis of the PEIR assessments.

3.8.2 The offshore infrastructure (i.e. HVDC Cables) will be located within the Offshore Cable Corridor presented in Figure 3.2 (See Volume 1, Figures).

3.8.3 The location and siting of the offshore elements of the Proposed Development described in this section have been informed by a site selection and route optimisation process, which is set out within Volume 1, Chapter 4: Site Selection and Alternatives, of the PEIR. Multiple desktop studies and marine investigation surveys have been completed and route optimisation had consideration for water depth, seabed features and geohazards, metocean influences, external stakeholders (e.g. seabed leaseholders, general fishing activities, shipping etc) and environmental constraints such as marine protected areas including Special Areas of Conservation (SAC), Special Protection Areas (SPA), and Marine Conservation Zones (MCZ).

Offshore Cable Corridor

3.8.4 The extent of the Offshore Cable Corridor assessed in this PEIR is from the UK EEZ boundary to the landfall site at Cornborough Range on the north Devon coast. The total length of the Offshore Cable Corridor in UK waters is approximately 370 km.

3.8.5 The Offshore Cable Corridor has a nominal width of 500 m extending up to 1,500 m at some crossing locations (where the cable needs to cross existing power and telecoms cables for example) to provide the cables with sufficient space to cross the existing assets as close to 90 degrees as possible (and reduce the footprint of the crossing on the seabed). The Offshore Cable Corridor width is also extended to 1,500 m at the western edge of TCE's Project Development

Area 3 (Offshore Wind Leasing Round 5) to ensure this area can be avoided if necessary.

3.8.6 The Offshore Cable Corridor is consistent with that presented within the EIA Scoping Report. The width of the Offshore Cable Corridor will allow some flexibility for micro-routing of the final cables within it. Flexibility for micro-routing within the Offshore Cable Corridor will be retained until cable installation, to:

- allow for the final precise cable route to adapt to the conditions encountered during construction (noting that extensive seabed characterisation surveys have been undertaken);
- allow potential micro-routing comments from relevant stakeholders to be addressed; and
- allow the flexibility to avoid currently unforeseen hazards (such as potential unexploded ordinance (UXO) identified during cable lay geophysical survey.

Offshore Cable Design

3.8.7 The offshore cables would consist of four 525 kV HVDC marine power cables which would be installed for the majority of the cable route as two bundled pairs (Bipole 1 and Bipole 2). The bundled pairs would be separated into four individual cables approximately 1 km offshore, before the landfall HDD entry points, to allow each cable to be pulled onshore through individual HDD ducts.

3.8.8 Each offshore HVDC cable would have a diameter of approximately 175 mm and an approximate weight of 70 kg/m in air. Each cable pair (forming a bipole) would facilitate the transfer of 1.8 GW to the UK national grid, resulting in a total of 3.6 GW power supply into the UK.

3.8.9 In addition to the four HVDC marine power cables, two fibre optic cables (FOC) would provide a cable monitoring fibre system (DAS and/or DTS). Each FOC would be approximately 35-40 mm in diameter and laid together with the marine cables within a shared trench (one FOC per cable bundle). FOC repeaters would be required approximately every 70 km along the Offshore Cable Corridor (four to five repeaters per bipole). At each repeater location, there would likely be a spur of FOC installed adjacent to the cables for the installation of the repeaters and ongoing maintenance purposes. The spur of FOC at each repeater location would be equal to the water depth at the repeater location.

3.8.10 The FOC spurs would be buried to the same depth as the HVDC Cables in accordance with the CBRA. It is assumed that the FOC spurs would be buried using the same, or less intrusive, methods as the HVDC Cables. The FOC spurs would be buried broadly parallel to the HVDC Cables, within the boundary of the Offshore Cable Corridor taking place soon after the HVDC cable protection works.

3.8.11 At the landfall, the FOCs would be installed alongside an HVDC cable within a HDD duct, i.e. adjacent to one of the power cables within the same HDD duct.

Programme and Installation Schedule

3.8.12 Pre-lay works such as route clearance and boulder removal may take place in 2027 ahead of cable lay and protection works.

3.8.13 Cable lay works for Bipole 1 (first cable bundle) are scheduled to begin in Q1 2028 and it is anticipated that these works would be completed in three sections each taking approximately one month. It is currently envisaged that two sections will be laid in 2028 and a section laid in 2029.

3.8.14 Dates are indicative at this time, and may be influenced by e.g. weather limitations of the CLV.

3.8.15 For Bipole 2 (second cable bundle), offshore works would begin in 2030 and would follow a similar schedule. The landfall HDD works are provisionally scheduled to be undertaken in advance of cable laying.

3.8.16 Burial and protection activities would progress broadly in parallel with the expectation that cable lay and the start of burial would be just a few days apart (noting that burial and protection activities would take longer to complete than the cable lay).

3.8.17 Guard vessels would be provisioned for any periods after the cable has been laid, but has not yet been buried or protected, to minimise the risk of interactions with other marine traffic.

Construction Phase

Horizontal Directional Drilling – Marine Works

3.8.18 The cables would be installed at the landfall using a HDD technique to avoid disturbance of the intertidal zone, the beach and the foreshore including coastal cliffs. This section provides a summary of the marine elements of the HDD works.

3.8.19 The HDD would be undertaken in a land to sea direction. For each borehole, a pilot hole would be drilled (at c. 20 m below seabed level) to within approximately 50 m of the seabed exit points. The drilled bore would then be widened to its full intended diameter before the remainder of the bore is drilled. Redundant drilling fluid and cuttings would be removed and disposed of responsibly from the land-based works.

3.8.20 The primary HDD activity that interacts with the marine environment is the breakthrough, or ‘punchout’, of the drill from underneath the seabed.

3.8.21 During breakthrough, drilling fluid and cuttings would be released into the immediate marine environment. The use of drilling fluids that are on the OSPAR PLONOR list (Pose Little Or No Risk to the environment) would be prioritised to minimise the risk to the marine environment during breakthrough. The volume of drilling fluid and cuttings lost during breakthrough is minimised by the adopted construction approach i.e. the boreholes having already been drilled to their full diameter prior to breakthrough of the seabed and the continuous removal of drilling fluid and cuttings during this operation. Lower drilling fluid flow rates are also used during breakthrough to minimise the loss of drilling fluid.

3.8.22 An excavated trench may be required at HDD exit points on the seabed to remove sediment layers (sand and pebbles) that may jam HDD equipment on breakthrough or prevent subsequent duct installation once the boreholes have been drilled. Localised excavations are expected to be undertaken by either a back-hoe dredger (long arm barge mounted excavator), mass flow excavation (MFE) or a Trailing Suction Hopper Dredger (TSHD). Sediment will be removed from an area of approximately 15 m x 15 m around the exit points.

3.8.23 The project team will engage specifically with the MMO regarding dredge disposal options (to dispose of any dredge arisings associated with the HDD exit pits) e.g.

options such as potential local sediment reuse will be explored. This may be captured in a post DCO condition.

3.8.24 Exit points in the marine environment for the four drills are currently being considered at either 6 m water depth (approximately 540 m offshore), or at 9 m water depth (approximately 1,360 m offshore).

3.8.25 Dependant on the contractor’s final design and depth of the boreholes, there would be up to a 40 m separation between adjacent drill exit points for cables on the same circuit, and approximate 50 m separation between circuits (i.e., all four exit points would be within an area of the seabed of approximately 130 to 150 m wide).

HDD Duct Installation

3.8.26 Following drilling of the four boreholes, ducting would be installed in each bore. Three methods are being considered for the installation of ducting: pulling the ducting from either onshore or offshore or pushing the ducting through the boreholes from onshore.

3.8.27 A pulled installation with a pulling winch onshore requires a complete string of duct to be towed (afloat) from offshore to the HDD exit points and pulled onshore through the boreholes. If the pulling winch is located offshore, then the string of duct can be fabricated at the HDD onshore site as the duct is pulled offshore.

3.8.28 A pushed installation involves the fabrication of the ducts at the HDD onshore site with the ducts fed into the entry points and driven through the boreholes using a pipe thruster. The project design team have rejected any option of moving ducting across the beach, which would effectively be isolated from the HDD works. The choice of the HDD installation method avoids potential impacts to designated sites and the intertidal zone as detailed in **Section 3.9**.

3.8.29 Once in position, the ducts are sealed at each end until ready to receive the cables.

3.8.30 All methods of duct installation require marine vessels, however, the pull method would require additional vessels relative to the push method (as described in Volume 3, Chapter 5: Shipping and Navigation).

Pre-Lay Marine Surveys

3.8.31 The baseline UK marine investigation surveys, that included geophysical surveys, subtidal drop-down video surveys and subtidal grab surveys have been completed and have informed the environmental baseline for this PEIR.

3.8.32 Prior to cable installation, additional ground condition surveys may be required by the Contractor. These are unlikely to be required to further characterise the environmental baseline (given the high resolution baseline data collection already compiled for the Offshore Cable Corridor within UK waters, but may be required for micro-routing purposes or to identify any UXO within the Offshore Cable Corridor that may need to be avoided or cleared. If required, UXO clearance (removal or detonation) would be undertaken by a specialist contractor and any such works would be subject to a separate consenting process at the time such need is identified. The approach to consenting of UXO has been discussed with the MMO, following Scoping Opinion responses, and the MMO confirmed their preference and expectation for separate licensing (separate to the DCO/deemed marine licence). As such, consideration of effects from activities associated with UXO clearance have been excluded from this EIA.

Route Preparation

3.8.33 The marine baseline investigation surveys and any pre power cable laying ground condition survey would inform the requirements for, and extent of, seabed preparation and clearance along the Offshore Cable Corridor in UK waters. Two types of seabed preparation could be required prior to cable installation:

- Clearance of debris and some local seabed features e.g. boulders and sandwaves; and
- Construction of crossing structures over existing in-service cables.

3.8.34 Seabed preparations will not remove materials from the local area i.e. there will be no dredge arisings or similar. Any seabed preparations will be limited to immediate clearance / flattening only.

Seabed Debris

3.8.35 Where deemed necessary, marine debris such as abandoned, lost or discarded fishing gear that may impede the cable installation operations, would be cleared from the cable route prior to installation. This would require a pre-lay grapnel run involving towing a heavy grapnel hook of circa 1 m total width, at a max penetration depth of circa 1 m, along the centre line of each bundled cable pair route to clear debris.

3.8.36 Debris collected during the grapnel run would be recovered on board the vessel for onshore disposal at appropriately licensed disposal facilities.

Out of Service Cables

3.8.37 There are currently 28 crossings of Out of Service (OOS) cables along the UK Offshore Cable Corridor. Subject to discussions with owners of the OOS cables, a section of these OOS cables that cross the route would be cut and recovered to the vessel for onshore disposal at appropriately licensed disposal facilities.

Sandwaves and Large Ripples

3.8.38 Where the baseline marine investigation surveys have identified the presence of areas of mobile sediments (e.g. sandwaves and large sand ripples) that cannot be avoided through micro-routing within the route corridor, these features may need to be removed and the seabed flattened to facilitate burial in more stable sediment.

3.8.39 Two methods are being considered to achieve this:

- Mass flow excavation (MFE); and
- Seabed ‘surface plough’/leveller.

3.8.40 MFE utilises a jetting tool that uses high flow water jets to temporarily displace and suspend sediments for seabed levelling. Based on the provisional assessment of the geophysical survey data, the MFE is anticipated to be needed infrequently, potentially most appropriate to the seabed conditions in Bideford Bay.

3.8.41 Localised seabed levelling, where required, would be undertaken by a surface plough or leveller, with a swath width of 10-20 m wide, which is towed across the seabed to create a flatter profile.

Boulder Clearance

3.8.42 Areas of boulder fields have been identified along the route, which will prevent burial of the cable bundles where they cannot be avoided by micro-routing. In these areas, a pre-lay plough and / or boulder grab may be deployed for boulder clearance purposes, to increase the likelihood of successful burial.

3.8.43 The pre-lay plough has a boulder clearance swath width of 10-15 m. It is anticipated that up to approximately 200 km of the route may need deployment of the pre-lay plough for boulder removal.

Trench Ploughing

3.8.44 The pre-lay plough can also perform pre-cut trenching, to produce an initial trench to enable subsequent cable burial. The pre-lay plough has capability to perform boulder clearance, pre-cut trenching and backfill services (after cable lay). The pre-lay plough can operate in each mode independently or carry out the boulder clearance and pre-cut trenching activities simultaneously. During boulder clearance surface boulders are unearthed and relocated to an outer spoil berm. Siphoned soil from pre-lay plough trenching is relocated to an inner spoil berm to be used to backfill the trench after cable lay.

3.8.45 The profile of the pre-lay plough trench would be 500 mm (w) x 700 mm (d) at its base, with a further 'Y' shaped profile where the cut depth is >700 mm. Where ground conditions allow the pre-lay plough can trench down to the target cable burial depth of approximately 1.5 m.

3.8.46 The disturbance width (swath) of the pre-lay plough in pre-cut trenching and backfill modes is 15 m.

Cable Installation Methods

3.8.47 The HVDC cables would be installed as two bundled pairs from a CLV. The specific CLV(s) that would install the HVDC cables is unknown at this stage and would be determined by the selected Cable Contractor. Based on CLV(s) currently in operation, it is anticipated that two turntables would be mounted on the CLV(s), each holding up to approximately 160 km of HVDC cable. As the CLV travels along the route, the two turntables release cable at the same rate and the two cables are bundled together at the stern of the vessel and fed overboard. An additional cable tank would contain the fibre optic cables, which would be installed as part of the bundle. Tensioners control the cable tension and cameras monitor the cable to ensure it is laid safely on target.

3.8.48 Based on the initial assessment of the geotechnical and geophysical survey data as part of a Burial Assessment Study (BAS) the cables will be buried along the entire route. For 220 km of the route it is anticipated that the cables will be protected by trenching and covered by natural sediments. It is anticipated that additional protection would be required along approximately 150 km of the route.

Cable Burial Method

3.8.49 Burying the cables would provide protection and avoid damage and future entanglement with fishing equipment or other marine users. Burial techniques available include trench ploughing (above), trench jetting, or mechanical trench excavation. The BAS confirms that trench jetting is unsuitable for the majority of the Offshore Cable Corridor, with potential exception of shallow coastal areas in Bideford Bay, or used as a remedial measure to be applied following mechanical trenching. Mechanical trenching (mechanical cutter mounted on a remotely operated vehicle (ROV)) is expected to be the main burial method in UK waters.

3.8.50 Once the cables have been laid on the seabed (by the CLV), the ROV is lowered to the seabed until it straddles the cable bundle lying on the seabed. Where the mechanical cutter is deployed, the tool would lift the cables up above the seabed safely out of the way of the burial tool and would then feed the cables into the trench behind the tool. Where the water jetting ROV is deployed, two jetting legs (also known as swords) would extend down either side of the cable bundle and fluidise the seabed immediately below the cable bundle enabling it to sink under its own weight.

3.8.51 Cable burial depth would be monitored as the burial tool progresses. Where the target burial depth is not achieved on first pass of the tool, a second pass may be required using e.g. the water jet.

3.8.52 The footprint of the mechanical cutter ROV on the seabed is up to 126 m^2 (10 m width and 12.6 m in length) and the water jet ROV up to 55.2 m^2 (6 m width and 9.2 m length).

3.8.53 The rate of trenching progress typically ranges from c.50 to 400 m per hour.

Additional Cable Protection

3.8.54 The preliminary BAS indicates that there is significant burial risk (due to e.g. hard seabed and / or boulder fields) that may reduce the ability to protect the cables using the ROV tools for approximately 150 km of the total length of the Offshore Cable Corridor. In these areas, the pre-lay plough would pass through prior to cable lay to determine if a trench can be produced, followed by at least one pass of the mechanical cutter after the cable bundles had been surface laid with the aim of producing a trench that can be backfilled back to / close to the seabed surface. In areas where this is not possible, the final option would be for the cable to be covered with a layer of rock protection that extends above the level of the surrounding seabed (a rock berm).

3.8.55 Where required, rock protection would consist of rock ranging from coarse gravel to cobbles and be up to approximately 1 m high above the seabed and up to 7 m wide. Rock berms would be constructed according to best practice e.g. are designed to be overtrawlable.

Cable Crossings

3.8.56 Where the cables cross other in-service cables, the cable would not be buried in a trench. The trench depth would taper to seabed level at a suitable distance from the in-service cable to be crossed and the Proposed Development cable would cross above the in-service cable. The Proposed Development cable would then be buried again on the other side of the in-service cable.

3.8.57 Where the Proposed Development cable crosses in-service cables, whether buried or surface laid, a layer of separation in the form of a pre-lay rock berm or concrete mattresses may be installed over the crossed asset. The Proposed Development cable would then also require protection in the form of a post-lay rock berm. The height of the concrete mattress and rock berm would be approximately 1.4 m above the seabed. The footprint of each crossing would depend on factors such as the crossing angle, The maximum footprint of a cable crossing rock berm on the seabed is indicatively 3,500 m^2 (500 m length and 7 m wide).

3.8.58 It is anticipated that 21 in-service cable crossings would be required. All crossings and crossing agreements would be in line with international standards and best practice.

Cable Burial Depth, Width and Spacing

3.8.59 The intended depth at which the cables would be buried is up to a depth of 1.5 m, subject to a detailed CBRA. The provisional BAS finds an average target depth of 1.5 m, and average minimum depth of 0.8 m (n=42).

3.8.60 The width of the trench in which the cable bundles would be buried typically ranges from 0.5 to 1.5 m. The infrequent cable joints and FOC repeater locations may require additional trench width.

3.8.61 The cable spacing between the two bundled pairs is expected to be between 50 – 180 m (remaining within the 500 m cable corridor at all times). Spacing may be increased to approximately 250 m in certain areas such as areas of high shipping density to reduce the risk of an anchor strike causing a fault to both cable bundles.

Installation Vessels

3.8.62 Cable installation activities would be undertaken on a 24 hour/7 day basis, unless interrupted by weather or other disruptions. This would maximise the available operational weather windows, vessel and equipment time, and minimise navigational impacts on other users of the sea.

3.8.63 A description of likely vessel groups to be utilised during the installation activities of the Proposed Development is provided below:

- Vessels for pre and post-installation surveys;
- Workboats/construction vessels and tugs for all works including route clearance/preparation, trenching, installation of rock protection/concrete mattresses, duct installation, cable pull and floating in, and dive support, depending on requirements. These workboats often deploy ROVs and would utilise geophysical survey and positioning equipment to monitor the progress of the works, and for positioning of any ROVs or other underwater equipment needed to complete the works;
- CLVs for cable laying;
- Guard vessels – as necessary, these would accompany the CLV to maintain surveillance around the worksite ensuring other vessels are kept clear, reducing the risk of collision and to protect the cable prior to burial;
- Rock placement vessel – where rock placement is required for additional cable protection (e.g. at cable crossings), a rock placement vessel may be used.

Such vessels feature a rock storage hopper and equipment by which rock can be placed *in-situ* on the seabed, such as fall pipes; and

- Jack up vessel / multi-cat vessel – for the HDD works (breakthrough, duct push/pull and duct sealing works) near the landfall, jack up vessels would be deployed to enable stable and safe marine works in the tidal environment.

3.8.64 The precise number of vessels to be used is to be determined by the Cable Contractor, however, it is expected that two pre-installation survey vessels, four trenching vessels, two rock placement vessels, one CLV (two for brief periods during changeovers), and 20 guard vessels stationed every 10 nautical miles (nm) would be required.

3.8.65 It is anticipated that a maximum of two jack up / multi-cat vessels would be required for the offshore HDD works.

Offshore Works Design Parameters

3.8.66 The design parameters of the offshore works are provided below in **Table 3.14**.

Table 3.14: Offshore Works Design Parameters

Infrastructure	Key Parameter	Maximum Design Parameter
Offshore Cable Corridor	Length of Offshore Cable Corridor in UK waters	370 km
	Width of Offshore Cable Corridor	500 m (extending up to 1,500 m at some locations to provision for greater micro-routing flexibility e.g. at crossings)
Offshore Cable Design	Number of HVDC marine power cables	4
	Number of FOC	2
	Number of cable bundles or bipoles (one bundle is two HVDC Cables and one FOC)	2
	Number or FOC repeaters	4-5 per bundle (approximately one every 70 km along each bundle in UK waters)
	Number of FOC spurs	4-5 per bundle (at repeater locations)
HDD Marine Works	Number of HDD boreholes	4
	Number of offshore exit pits	4
	Area to be dredged around each exit pit	Approximately 15 m x 15 m
	Exit pit overlying water depth	6 m (approximately 540 m offshore) or 9 m (approximately 1,360 m offshore)
	Separation between exit points for cables on the same circuit	40 m
	Separation between circuits	50 m
	Drilling fluid	Bentonite
Route Preparation	Width of grapnel hook for removal of seabed debris	Approximately 1 m
	Max penetration depth of grapnel hook	Approximately 1 m
	Swath width of 'surface plough' for seabed levelling (where required)	20 m
	Swath width of 'pre-lay plough' for boulder clearance (where required)	10-15 m
	Swath width of 'pre-lay plough' for pre-lay	15 m

Infrastructure	Key Parameter	Maximum Design Parameter
	trenching (where required)	
Cable Installation	Number of cable trenches	2
	Cable burial depth	Target 1.5 m
	Trench width	0.5 – 1.5 m
	Cable trench spacing	50 – 180 m (up to 250 m in certain areas e.g. areas of high shipping density)
	Footprint of mechanical cutter ROV	up to 126 m^2 (10 m width and 12.6 m in length)
	Footprint of water jet ROV	up to 55.2 m^2 (6 m width and 9.2 m length)
	Number of OOS cable crossings	28
	Number of in-service cable crossings	21
	Maximum footprint of in-service cable crossing rock berms	Approximately 3,500 m^2 (500 m length; 7 m wide)
	Cable installation working hours	24 hours / 7 day basis
	Rock berms	Installed as last resort where burial not possible – up to approximately 1 m high
	Expected number of vessels for cable installation	CLV – 1 (briefly 2 at changeovers); trenching vessels – 4; guard vessels – 20; rock placement vessels – 2

3.9 Embedded Mitigation Measures

3.9.1 The EIA Regulations require a description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment. A number of embedded mitigation measures are proposed which form part of the Proposed Development. These include measures that are part of the design itself such as modifications to the location or design aspects and also those measures required to meet other legislative requirements or standard practices.

3.9.2 For the purposes of the EIA process, the mitigation measures proposed as part of the Proposed Development include the following types of mitigation measures (adapted from IEMA, 2016).

- Primary (inherent) mitigation – measures included as part of the project design. IEMA describes these as 'modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project and do not require additional action to be taken'. This includes modifications arising through the iterative design process. These measures will be secured through the consent itself through the description of the project and the parameters secured in the Development Consent Order (DCO). For example, a reduction in footprint or height.
- Secondary (foreseeable) mitigation. IEMA describes these as 'actions that will require further activity in order to achieve the anticipated outcome'. These include measures required to reduce the significance of environmental effects (such as lighting limits) and may be secured through an environmental management plan.
- Tertiary (inexorable) mitigation. IEMA describes these as 'actions that would occur with or without input from the EIA feeding into the design process. These

include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects'. It may be helpful to secure such measures through a Construction Environmental Management Plan or similar.

3.9.3 The following tables provide a list of embedded mitigation measures (primary and tertiary measures) that would be utilised as part of the Proposed Development. Additional mitigation measures, specific to individual topics, are provided within individual topic chapters and in Volume 1, Appendix 3.1: Draft Mitigation Schedule.

Table 3.15: Onshore embedded mitigation measures

<table>
<tr><th>Mitigation Measure</th><th>How will it be Secured?</th></tr>
<tr><td colspan="2">Primary Mitigation</td></tr>
<tr><td>The following infrastructure, sensitive sites/features and recreational resources are proposed to be crossed by Horizontal Directional Drilling (or other trenchless methodologies), as set out within the Onshore Crossing Schedule:
• The Mermaid's Pool to Rowden Gut Site of Special Scientific Interest (SSSI), the beach and the South West Coastal Path, situated along the coastline at the landfall, Cornborough Range.
• The following watercourses/woodland:
– Kenwith Stream, situated just south of Rickard's Down and approximately 300 m north of Abbotsham.
– Littleham Wood, which includes a small watercourse, situated to the west of Robin Hill Farm and approximately 800 m to the north west of Littleham.
– A small stream, 290 m south of Jennetts reservoir and to the west of West Ashridge, which feeds into Jennetts reservoir.
– River Torridge, to the south of Bideford (to note, one HDD will cross the River Torridge, A386 and the Tarka Trail).
• The following major roads:
– A39, at a section approximately 250 m south west from the Abbotsham Cross roundabout and north west from High Park Farm.
– A386, to the south of Bideford (as stated above, one HDD will cross both the River Torridge and A386).
• A site of suspected archaeological assets at Winscott Barton.
There is an option to use HDD (or other trenchless techniques) to cross the unnamed watercourse and associated woodland to the immediate south of the Converter Site.</td><td>Proposed Development design to be provided and secured as a DCO requirement.</td></tr>
<tr><td>The site selection and route refinement process for the Proposed Development has considered the locations of statutory and non-statutory designated sites, recreational resources and special category land. These areas have been avoided where possible through route selection and where this has not been possible, the design of the Proposed Development includes measures to minimise impacts through the use of trenchless construction techniques. For example, at the landfall and to cross the River Torridge.</td><td>To be secured via the DCO Works Plans.</td></tr>
<tr><td>The Onshore HVDC Cables and HVAC Cables would be completely buried underground for the entire length. Joint bays will be completely buried, with the land above reinstated. A maintenance cover will be provided on the surface for link boxes for access during the operation and maintenance phase.</td><td rowspan="4">Proposed Development design to be provided and secured as a DCO requirement.</td></tr>
<tr><td>All temporary working areas for the landfall, Onshore HVDC Cable Corridor, Converter Site, temporary compounds and the Alverdiscott Substation Connection Development will be clearly marked and secured with appropriate fencing.</td></tr>
<tr><td>Haul road(s) will be installed within the temporary working area of the Onshore HVDC Cable Corridor to minimise impacts during construction on agricultural land and reduce the number of construction vehicles on the local road network.</td></tr>
<tr><td>The Onshore HVDC Cables and HVAC Cables will be installed within the respective cable corridors in cable ducts, as opposed to using a direct lay installation method. This allows timely closure of trenches pending later installation (pulling-through) and jointing of cables.</td></tr>
</table>

Mitigation Measure	How will it be Secured?
The main construction compounds along the Onshore HVDC Cable Corridor would be situated in areas easily accessible from the A39, A386 and Manteo Way respectively. This would allow construction vehicles to be directed towards the relevant compounds whilst reducing movements along minor roads.	
The design of the proposed Converter Site would include cut and fill earthworks to provide a suitable development platform for the converter stations whilst utilising the local topography to integrate the buildings in the landscape. Additional visual screening in the form of constructed earth bunds will further reduce the landscape and visual impact of the converter stations.	
The design of the Onshore HVDC Cable Corridor has sought to minimise the impact on mature vegetation, hedgerows and trees both through the site selection and route refinement process and narrowing the route where it crosses important hedgerows (including Devon hedge-banks).	
In all instances where hedgerows and Devon hedge-banks are crossed by the Onshore HVDC Cable Corridor, they will be reinstated on a 'like-for-like' basis. Where feasible, existing hedge-bank materials and root-stock will be stored and re-used to form the reinstated Devon hedge-banks, including viable woody species stools. Hedgerow reinstatement will include replanting with suitable species mixes tailored to replicate and enhance the diversity of the existing hedgerows, using appropriate native species of local provenance. A suitably experienced hedging contractor familiar with creation of Devon hedge-banks will be appointed to complete this work.	
The Proposed Development will commit to providing at least 10% net gain in biodiversity, measured using the Statutory Biodiversity Metric.	
Landscape planting will be provided at the converter stations site to assist with softening and screening the buildings. These measures will be set out in an Outline Landscape and Ecology Master Plan (LEMP) that will be prepared and submitted with the application for consent.	
The design of the converter station buildings would include the following: • Architectural design of converter station buildings. • Use of appropriate materials/colours/finishes for the façades of the converter station buildings. The detailed design of the converter buildings would be developed in consultation with the relevant planning authorities.	A Design Code will be submitted with application and detailed design secured as a Requirement of the DCO.
Tertiary Mitigation	
Following the completion of works, the haul road(s) will be removed and the ground reinstated to its previous use using stored subsoil and topsoil. All temporary construction compounds and temporary fencing will be removed, field drainage and/or irrigation will be reinstated and the land will be restored to its original condition. Where practicable, consideration will be given to early restoration of sections of the Onshore HVDC Cable Corridor.	To be secured as a requirement of the DCO.
An Outline Onshore Construction Environmental Management Plan (On-CEMP) will be prepared and submitted with the application for development consent. A final On-CEMP(s) will be developed in accordance with the Outline On-CEMP. The final On-CEMP(s) will	

Mitigation Measure	How will it be Secured?
incorporate measures to ensure that any potential environmental impacts would be minimised during construction.	
An Outline Construction Traffic Management Plan(s) (CTMP) will be prepared and submitted with the application for development consent. CTMP(s) will be developed in accordance with the Outline CTMP prior to construction and agreed with relevant stakeholders. The CTMP(s) will set out measures to include: • Managing the numbers and routing of HGVs during the construction phase; • Managing the movement of construction worker traffic during the construction phase; • Details of measures to manage the safe passage of HGV traffic via the local highway network; and Details of localised road improvements if and where these may be necessary to facilitate the safe use of the existing road network.	
A Dust Management Plan (DMP) will be incorporated within the On-CEMP(s) in line with the Guidance on the assessment of dust from demolition and construction (IAQM, 2024). A DMP assists in the appropriate management techniques to limit dust soiling from construction and decommissioning activities. An Outline DMP would be provided as part of the Outline On-CEMP.	
An Outline Landscape and Ecology Management Plan (LEMP) will be prepared and submitted with the application for development consent. A LEMP will be developed in accordance with the Outline LEMP. The Outline LEMP will include: • Strengthening and enhancement of existing hedgerow field boundaries within the vicinity of the converter stations and along the HVDC cable corridor. • Using native and locally appropriate plant species around converter stations and at replacement hedgerows along the HVDC cable corridor. Identifying areas where it may be possible to achieve advance planting.	
A draft Onshore Decommissioning Plan would be developed in a timely manner in consultation with the relevant stakeholders and prior to commencement of construction. The Onshore Decommissioning Plan would be updated during the lifetime of the Proposed Development to consider changing best practice and new technologies, in preparation of decommissioning occurring. The approach and methodologies to be implemented would be in accordance with the latest available guidance, legislation and any new technologies at the time of the Proposed Development's decommissioning.	
A Site Waste Management Plan (SWMP) will be developed in accordance with the Outline On-CEMP, with consideration of the latest relevant available guidance.	
An Outline Public Rights of Way (PRoW) Management Plan will be prepared as part of the Outline On-CEMP and submitted as part of the application for the development consent in order to minimise the disturbance to PRoWs, where practicable.	
An Outline Soil Management Plan will be prepared as part of the Outline On-CEMP and submitted as part of the application for the development consent. The final On-CEMP(s) will be developed in accordance with the Outline On-CEMP. The Soil Management Plan will be developed in order to characterise and manage soil materials during construction.	
An Outline Onshore Pollution Prevention Plan (PPP) will form part of the Outline On-CEMP, which will be prepared and submitted with the application for development consent. Onshore PPP(s) will be developed in accordance with the Outline Onshore PPP and	

Mitigation Measure	How will it be Secured?
will include details of emergency spill procedures. Good practice guidance detailed in the Environment Agency's Pollution Prevention Guidance notes (including Pollution Prevention Guidance notes 01, 05, 08 and 21) will be followed where appropriate, or the latest relevant available guidance.	
A Bentonite Breakout Plan will be prepared as part of the Outline On-CEMP and submitted as part of the application for the development consent. On-CEMP(s) will be developed in accordance with the Outline On-CEMP.	

Table 3.16: Offshore embedded mitigation measures

Mitigation Measure	How will it be secured?
Primary Mitigation	
Cable burial - Cables will be buried (where possible) up to 1.5 m below the seabed, subject to a detailed Cable Burial Risk Assessment (CBRA). Only when burial is not possible will additional protection be installed.	To be secured as a requirement of the DCO.
Cable protection measures - Where possible cable protection structures would be kept level with the seabed, and if above the seabed they would be kept to a maximum of 1 m above seabed level.	
Where crossings of existing in-service cables are required, these will be constructed adhering to international best practice design (and may include concrete mattresses and/or shallow rock berms which are deemed overtrawlable).	
Trench construction and cable Installation will utilise specialist ROVs which will minimise trench width and sediment disturbance (compared to less precise trenching tools).	
Cable lay and burial will be undertaken within close timescales, avoiding any long-term exposed trenching.	
HDD methods will be employed to avoid any direct disturbance of the intertidal, the foreshore and the coastal cliffs.	
Avoidance of known sites of archaeological significance - Mitigation leading to preservation in situ will be advocated and Archaeological Exclusion Zones (recommended of at least 50 m) will be implemented around cultural heritage assets	
To comply with Maritime and Coastguard Agency (MCA) requirements, compass deviation effects will be minimised through cable design and burial, and separation distance between the two trenches. A post-lay compass deviation assessment will be undertaken post-consent, once the detailed design and cable configuration is available, to confirm interference with magnetic position-fixing equipment is within acceptable limits.	
Tertiary Mitigation	
An Offshore CEMP will detail the best practice approach to offshore activities and would implement those measures and environmental commitments identified in the EIA. The following measures will be included in the Offshore CEMP: marine pollution prevention; waste management; marine invasive species; and dropped object procedures. Outline Offshore CEMP will form part of the DCO (with detailed Offshore CEMP finalised by offshore contractor prior to construction).	To be secured as a requirement of the DCO.
In order to reduce the likelihood of introducing Marine Invasive Non-Native Species (MINNS) during all phases of the Proposed	

Mitigation Measure	How will it be secured?
Development, a biosecurity plan will be adhered to with the incorporation of a biosecurity risk assessment.	
A Marine Pollution Contingency Plan (MPCP) will be produced as part of the CEMP and will include measures to minimise the impact of any events as well as compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL).	
To comply with MCA requirements, relevant policy guidance on water depth reduction to be followed during the design and construction of the project. Following further survey and detailed engineering, if areas are identified where external protection is required and the MCA condition of no more than 5% reduction in water depth is not achievable, a location specific review of impacts to shipping and consultation with the MCA will be carried out and additional mitigations agreed as required.	
For compliance with the Ballast Water Management Convention (2017), all ships subject to the Convention will be obliged to conduct ballast water management in accordance with the contractual provisions and those within the Convention.	
Appointment of a Fisheries Liaison Officer (FLO) which will support ongoing liaison and ensure clear communication between the Applicant and commercial fisheries during the construction phase.	
For compliance with the requirements of MARPOL, all project vessels with a gross tonnage (GT) above 400 tonnes would require a Shipboard Oil Pollution Emergency Plan (SOPEP) detailing the emergency actions to be taken in the event of an oil spill.	
The cable will be clearly marked on Admiralty Charts with associated note/warning about anchoring, trawling or seabed preparation.	
Bentonite will be used during HDD as a best practice drill lubricant. Bentonite acts as a clay platelet grout, effectively sealing fractures. Furthermore, the use of a HDD drill fluid system that allows for the monitoring of pressure loss and therefore allows for the rapid identification of potential break outs will be utilised.	
Additional unknown or unexpected cultural heritage and marine heritage receptors identified during the project stages will be reported utilising the project specific Protocol for Archaeological Discoveries (PAD), which will form part of the offshore CEMP. Site-specific Written Schemes of Investigation (WSIs) will be produced to inform specific investigation activities to record cultural heritage assets and subsequently the production of a post-excavation report.	
A Marine Pollution Contingency Plan (MPCP) will be produced as part of the CEMP and will include measures to minimise the impact of any events as well as compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL).	
Compliance with international legislation, both for Project vessels and third-party vessels. This includes the COLREGs and SOLAS.	
Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated safety/clearance zones and advisory passing distances will be given via Notices to Mariners, supported by Radio Navigational Warnings, NAVTEX and / or broadcast warnings as appropriate.	
The Vessel Management Plan (VMP) will confirm the types and numbers of vessels that would be engaged on the Proposed Development and consider vessel coordination including indicative transit route planning. The VMP will include protocols for vessel communications, lighting and maintenance of ”safe” distances (which will be monitored by guard vessels during the construction period).	

3.10 Onshore Construction Environmental Management (including landfall)

Introduction

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

3.10.2 Key environmental principles and measures during construction of the onshore works are set out in this section. Details of all mitigation measures proposed at this stage of the EIA process are provided within Volume 1, Appendix 3.1: Draft Mitigation Schedule, of the PEIR.

Construction Environmental Management

3.10.3 Construction of the Proposed Development would be managed through the CEMP(s) that set out the principles of good environmental management to be followed in order to avoid or minimise environmental impacts. This includes principles for the management of construction noise, dust, traffic, materials storage and waste management, drainage and ecological protection.

3.10.4 An Outline Onshore CEMP (On-CEMP) has been developed and will be submitted with the DCO application (See Volume 1, Appendix 3.2: Outline Onshore Construction Environmental Management Plan). The Outline On-CEMP would be developed into a final On-CEMP(s), which would be agreed with Torridge District Council prior to the commencement of construction. The final On-CEMP(s) shall include the measures set out in the Outline On-CEMP, together with any further detail available at that time.

3.10.5 The final On-CEMP(s) would be supported by detailed Construction Method Statements to be produced by the lead construction contractor(s), which would provide method statements for construction activities detailing how the requirements for the final On-CEMP(s) are met.

3.10.6 In a similar manner, a CTMP(s) would be produced by onshore main works Contractors prior to the commencement of construction, based on the Outline CTMP which will be developed and provided as part of the application for development consent.

Construction Working Hours

3.10.7 Normal construction working hours would be Monday to Friday 07:00-19:00 and Saturday 07:00-13:00. However, some operations may require work to take place outside these times. For example, abnormal indivisible loads (AIL) may be encouraged or required to travel overnight and crossings of roads may be constructed overnight to minimise disruption to traffic.

3.10.8 In certain circumstances, specific works may have to be undertaken on a continuous working basis (00:00 to 00:00, Monday to Sunday). During this period, the contractor may undertake activities that require continuous working hours, which will be notified to the relevant local authority in writing. Where relevant, Section 61 (of the Control of Pollution Act 1974) consents will be obtained. These activities include, but may not be limited to:

- HDD (or other trenchless technology) operations. These activities may require 24-hour machinery operation, dependent on the ground conditions;
- continuous concrete pours;
- converter station component installation;
- oil filling of transformers at the converter stations;
- jointing operations along the Onshore HVDC Cable Corridor; and
- testing and commissioning.

3.10.9 Up to an hour before and after the normal construction working hours, the following activities may be undertaken:

- arrival and departure of the workforce at the site and movement around the main Proposed Development that does not require the use of plant;
- site inspections and safety checks; and
- site housekeeping that does not require the use of plant.

Construction Working Areas and Laydown

3.10.10 The main construction working, and laydown areas would be contained within the Proposed Development site boundaries. Temporary construction compounds would be required along the Onshore HVDC Cable Corridor and at the Converter Site. Details regarding the temporary construction compounds are provided in **paragraphs 3.7.99 to 3.7.105**.

3.10.11 In line with National Highways' water preferred policy (National Highways, 2019) for transporting abnormal loads, it is anticipated that Appledore Quay, Bideford would be used for import and storage of transformers, cable drums and potentially other large items. The AIL routes considered within this PEIR are presented within Volume 1, Figure 3.10.

Construction Fencing

3.10.12 All temporary working areas within the Draft Order Limits, including the Onshore HVDC Cable Corridor, Converter Site (including HVAC cable works), and landfall, will be clearly marked and secured with appropriate fencing to restrict unauthorised access. Security at the Converter Site will be carefully managed during construction commensurate with its state of completion.

3.10.13 Allowances will be made for private land access, livestock crossing and relevant ecological constraints in consultation with individual landowners.

3.10.14 The type of temporary fencing to be used will be dependent on the land use. Fencing will be installed as part of the early construction works and will typically consist of:

- security fencing for temporary construction compounds;
- post and rope for arable land;
- post and rail for horse fields; or

- post mesh and wire/barbed wire for cattle and sheep.

3.10.15 Fencing details will be confirmed during detailed design in consultation with affected landowners

3.10.16 Furthermore, construction compounds may employ hoardings at the perimeter or at task specific locations.

3.10.17 All boundary fences/screens will be maintained in a tidy condition and will be fit for purpose.

3.10.18 All temporary screening and fencing will be removed as soon as reasonably practicable after completion of the works.

3.10.19 Where possible, access to construction areas will be limited to specified entry points and all personnel entries/exits will be recorded for security and health and safety purposes.

3.10.20 Where the haul road meets a public highway, it will be gated or otherwise secured, where feasible and necessary, to prevent unauthorised access. Further details relating to construction traffic will be included within the Outline CTMP, which will be developed and submitted as part of the DCO application.

Lighting

3.10.21 External lighting of the construction areas will be designed and positioned to ensure:

- the necessary levels of lighting for safe working are provided; and
- the light spillage or pollution are minimised to avoid disturbance to nearby residents and wildlife.

3.10.22 In accordance with the Bat Conservation Trust recommendations, lighting will be directed away from features with potential for roosting, foraging and commuting bats.

3.10.23 Lighting during construction will take into account the requirements set out in BS EB 12464-2:2014 (BSI, 2014). Lighting units will be designed to minimise light illumination outside the construction works area. This would be achieved through the use of directional and task orientated lighting which would be fully shielded where possible. In addition, when lighting is not required it would be switched off.

3.10.24 However, outside normal working hours, motion-activated directional security lighting may be used at the Converter Site and where required/on demand for the buried Onshore HVDC Cable Corridor, and at the construction compound areas. This is to ensure the safety and security of the site.

Cable Crossings

Hedgerow Crossings

3.10.25 The design of the Proposed Development has considered the location of important ecological features, such as woodland, important hedgerows, and watercourses.

3.10.26 Design of the Onshore HVDC Cable Corridor has sought to minimise the impact on mature vegetation both through routing choice and narrowing the route where it crosses important hedgerows (including Devon hedgerows). However, where hedgerows and trees are affected by the construction of the Onshore HVDC Cable Corridor they would be removed, except for sections of the route where HDD is proposed (such as beneath substantial areas of woodland, such as Littleham Wood). In addition, hedgerow removal may be required to allow for access and to meet visibility requirements at access points within the construction work areas.

3.10.27 Hedgerows would be removed outside of the bird nesting season so that nesting birds are not disturbed. Hedgerow removal would be carried out under a European Protected Species licence and would utilise a two-phased clearance to ensure the protection of dormice. The Proposed Development would include the full reinstatement of hedges on a "like for like" basis that would be undertaken on completion of cabling works. Where appropriate, hedgerow enhancement would be carried out to improve the habitats and increase biodiversity and outside within the Proposed Development Draft Order Limits.

3.10.28 An Outline LEMP will be developed and submitted with the DCO. The Outline LEMP would include a plan to monitor establishment and progress of newly created habitats (and those areas where reinstatement has been undertaken), along with ongoing management measures to ensure that new habitats fully develop and remain functional into the future. This plan and associated measures will be developed in line with consultation and stakeholder feedback.

3.10.29 As stated above, the typical corridor width will be reduced when crossing important hedgerows (as defined by the Hedgerows Regulations 1997) or where other constraints create a 'pinch point'. The reduced width will be achieved through engineering techniques such as:

- using lower thermal resistivity backfill in the cable trench; and/or
- removing spoil to a storage area further up or down the cable corridor (away from the reduced working width location), thereby negating the need to store spoil adjacent to the trenches.

3.10.30 Further details on hedgerow removal are presented in Volume 2, Chapter 1: Onshore Ecology and Nature Conservation, of the PEIR.

Road Crossings

3.10.31 Where the Onshore HVDC Cable Corridor crosses local roads and private accesses, access to properties and settlements will be retained. Where diversions on the existing road network are readily available, temporary road closures may be undertaken.

3.10.32 Road closures will be phased in order to ensure that access is retained to all villages and properties.

3.10.33 A temporary construction haul road would be constructed within the Onshore HVDC Cable Corridor to enable access along the corridor from the temporary construction compounds. In instances where the haul road crosses sections of the existing road network, measures will be implemented through the CTMP to manage the road crossings.

3.10.34 HDD would be required for the crossing of major roads (e.g. A39), as detailed within **paragraph 3.7.127**.

Watercourse Crossings

3.10.35 As detailed within **paragraph 3.7.112**, the Proposed Development includes the crossing of the following watercourses via HDD (or other trenchless methodologies):

- Kenwith Stream;
- an unnamed watercourse within Littleham Wood;
- an unnamed watercourse 290 m south of Jennetts Reservoir and to the west of West Ashridge, which feeds into Jennetts Reservoir; and
- the River Torridge.

3.10.36 The Proposed Development also includes an option to cross an unnamed watercourse (situated within an area of woodland), to the immediate south of the Converter Site, via HDD.

3.10.37 However, where required, trenched techniques may be used for the crossing of field drains, ditches and small streams. In these instances, measures will be implemented to protect water quality and flow and these will be detailed within the Outline On-CEMP.

Woodland Crossings

3.10.38 As part of the site selection process, the design of the Proposed Development has considered the locations of woodland, mature and protected trees (e.g. veteran trees), as well as other ecologically sensitive habitats. This has involved the avoidance of woodland areas, as far as possible.

3.10.39 The following areas of woodland are situated within the Proposed Development Draft Order Limits:

- Littleham Wood – At this location, the Onshore HVDC Cable Corridor would be routed to the south of the woodland, or an HDD (or other trenchless methodology) to pass beneath the area to avoid significant impacts on Littleham Wood.
- Wooded area associated with the unnamed watercourse that flows into Jennetts Reservoir, to the west of West Ashridge – At this location, an HDD would be required to pass beneath the watercourse and wooded banks.
- Lodge Plantation Unconfirmed Wildlife Site (UWS), to the immediate east of the River Torridge – At this location, an HDD would be routed beneath the River Torridge, Tarka Trail and the Lodge Plantation UWS. Construction working areas associated with this crossing would be located outside of any designated areas.
- Woodland areas to the immediate south of the Converter Site – At this location, flexibility has been retained as the design process remains ongoing at the PEIR stage. The design considers two potential options to use trenchless methods (beneath the woodland) or open-cut trenching (routed around the woodland). In both instances, the patches of woodland would be avoided during detailed routing.

Construction Workforce and Access

3.10.40 Access would be required for HGVs, AILs for certain items (drill rigs, transformers, cable drums, large cranes or construction plant) and for construction workforce traffic. Cable corridor construction traffic would enter and leave at the main compound locations before moving along the route on purpose built temporary haul roads.

3.10.41 Access to the Converter Site during construction may similarly utilise the Onshore HVDC Cable Corridor in addition to the minor road network depending upon the sequencing of the proposed road widening.

3.10.42 The construction workforce is expected to be up to 400 FTE workers, for a construction programme of up to 72 months. As detailed previously, the construction programme would be divided into two overlapping phases.

3.10.43 This would be managed through CTMP(s), which would be agreed with Torridge District Council prior to the commencement of construction. Construction workforce traffic would use the A39 as far as possible to minimise travel along local roads. However, some local roads would need to be used to reach some parts of the cable corridor. Temporary internal haul routes would be constructed along sections off the cable route to remove frequent vehicle movements from the public highway.

3.10.44 Measures will be implemented to minimise dust, mud and debris associated with the movement of construction vehicles. These measures would be implemented through the final CEMPs.

3.10.45 On completion of construction, temporary vehicle accesses will be reinstated to the original highway.

Construction Drainage

3.10.46 The construction phase would incorporate pollution prevention and flood response measures to ensure that the potential for any temporary effects on water quality or flood risk are reduced as far as practicable.

3.10.47 Such measures would be implemented through the CEMP(s) and associated Construction Method Statements, including but not limited to the following:

- installation of suitable facilities to remove material (e.g., mud and dust) from wheels;
- use of sediment fences along existing watercourses/waterbodies when working nearby to reduce sediment load;
- covers for lorries transporting materials to/from site to prevent releases of dust/sediment to watercourses/drains;
- bulk storage areas to be secured and provided with secondary containment (in accordance with the Oil Storage Regulations and best practice);
- storage of oils and chemicals away from existing watercourses, including drainage ditches or ponds;
- concrete to be stored and handled appropriately to prevent release to drains;
- treatment of any runoff water that gathers in the trenches would be pumped via settling tanks or ponds to remove any sediment;

- obtain consent/permit for any works (e.g., discharge of surface water, dewatering, etc.) that may affect surface water and/or groundwater. The conditions of the consent will be specified to ensure that construction does not result in significant alteration to the hydrological regime or an increase in fluvial risk;
- use of a documented spill procedure and use of spill kits kept in the vicinity of chemical/oil storage;
- storage of stockpiled materials on an impermeable surface to prevent leaching of contaminants and use of covers when not in use to prevent materials being dispersed and to protect from rain; and
- stockpiles to be kept to minimum possible size with gaps to allow surface water runoff to pass through.

Dewatering

3.10.48 The construction of the transition joint bays, onshore HVDC Cables, HVAC Cables and associated joint bays or link boxes will require dry excavations. Therefore, the dewatering of open trenches and excavations may be required where shallow groundwater is encountered. Dewatering refers to the process of removing or draining groundwater or surface water from a trench, watercourse, etc.

3.10.49 The groundwater removed by dewatering would be pumped to an appropriate location to allow any sediments present to be settled, prior to discharge to local surface watercourses or across ground away from the excavations. This will be undertaken in accordance with measures agreed through the On-CEMP and Pollution Prevention Plan.

Construction Waste

3.10.50 Waste will be generated as a result of the Proposed Development, with most waste expected to be generated during the construction and decommissioning phases. In accordance with Government policy contained in NPS EN-1 (DESNZ, 2024a), consideration will be given to the types and quantities of waste that will be generated.

3.10.51 Procedures for handling waste materials will be set out in the Site Waste Management Plan (SWMP) and On-CEMP. The SWMP would be developed in accordance with the Outline SWMP, which would be produced and submitted as part of the ES. The SWMP will describe quantities of likely waste type arising from the Proposed Development and how they will be managed (i.e., reuse, recycling, recovery or disposal). All waste generated would be disposed of by a suitably licensed waste contractor to an appropriately licensed waste disposal facility. The SWMP will also describe the duty of care requirements and identify potential management facilities in the vicinity of the Proposed Development.

3.10.52 The SWMP will be updated as further detailed design information becomes available prior to construction. A Materials Management Plan in line with the Contaminated Land: Applications in Real Environments Definition of Waste: Code of Practice will form part of the SWMP.

3.10.53 Given the history of the majority of the route as agricultural use, potential contamination from former use of agrochemicals or other agricultural activities cannot be discounted. In addition, there are some potentially contaminative historical sources, including a quarry, lime kilns and a former rifle range, along the cable route. These are explored further within Volume 2, Chapter 4: Hydrogeology, Geology & Ground Conditions, of the PEIR. Measures to manage contaminated land are outlined in the Outline On-CEMP.

3.10.54 Construction of the cable corridors would require the excavation of spoil. During construction, excavated material would be stored temporarily alongside the trenches in the cable corridor working width prior to replacement within the trench. In the event that any material from the site is identified as not being suitable for use on site, some material may need to be transported away from the site to a suitably licensed site.

3.10.55 Furthermore, preparation of the Converter Site would involve significant cut and fill operations. The intention will be to reuse excavated material across the Proposed Development. However, where there is excess material, the remainder would be appropriately transported (with appropriate approvals/ permits) to locations in which it can be either re-used or disposed of at a licensed disposal site.

Use of Natural Resources – Construction

3.10.56 The Outline On-CEMP requires the contractor to identify the main types and quantities of materials required for the Proposed Development in order to assess potential for sourcing materials in an environmentally responsible way. The construction specification would place preference, when options are available, on the use of materials with a high recycled content.

3.10.57 The Considerate Contractors Scheme includes measures relating to the use of resources, including categories in relation to minimising the use of water. All timbers used as primary structural elements would be required to be Forest Stewardship Council (FSC) certified.

3.10.58 The construction process would take into account the principles of good practice in soil handling and restoration set out in the following documents, wherever possible, to reduce the possibility of damage to soil materials during the construction process:

- Ministry of Agriculture, Fisheries and Food (MAFF) (2000) Soil Handling Guide; and
- Department for Food and Rural Affairs (Defra) (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (including the Toolbox Talks).

Local Community Liaison

3.10.59 The Applicant will establish an approach for liaising with the local community and stakeholders during the construction process, which will build on the engagement undertaken prior to and throughout the EIA process. A Project website, email address and phone number will remain in place.

3.10.60 A Communications Plan will be developed in accordance with an Outline Communications Plan, which will be submitted with the DCO application. The Communications Plan will set out a management framework to be followed by the Applicant and contractors during construction, ensuring proactive communication with all relevant stakeholders and relevant parties (e.g. local residents). It would ensure communication with the local community is appropriate, timely and easily understood.

3.10.61 The plan will include provision for a Community Liaison Officer, who will actively work with the local community to ensure the local community is kept up to date with progress and that any queries arising are dealt with appropriately. The plan will also include a procedure for dealing with enquiries or complaints from the public, local authorities or statutory consultees.

3.10.62 A Community Liaison Officer will be provided as the main point of contact for landowners, to provide project updates and to resolve any queries arising during the construction phase.

Site Clearance Following Construction

3.10.63 Following construction, all temporary working areas and associated temporary accesses will be removed and the land re-instated to its previous use using stored subsoil and topsoil, in line with the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (PB13298).

3.10.64 All temporary construction compounds and temporary fencing will be removed, field drainage and/or irrigation reinstated and the land restored to its original condition. Where practicable, consideration will be given to early restoration of sections of the Onshore HVDC Cable Corridor.

3.10.65 Where vegetation, hedgerows and trees are removed from working areas, construction compounds or haul roads, they will be replaced/reinstated following the completion of construction, where possible. Further details will be included within a LEMP.

3.11 Biodiversity Net Gain

3.11.1 The Applicant aims to mitigate for effects on habitats arising as a result of the Proposed Development and to deliver at least a 10% BNG. BNG proposals will consider relevant green infrastructure strategies and plans, including but not limited to the North Devon Biosphere Nature Recovery Plan (2021).

3.11.2 Areas will be identified and included within the Proposed Development Order Limits where current habitat condition affords an opportunity to improve habitat quality or where enhancements can be made to habitats identified as functionally linked to designated sites.

3.11.3 The identification of suitable mitigation and net gain opportunities and refinement of the approach to mitigation and net gain will be refined as the design evolves and as surveys are completed. These surveys will continue to build a more detailed understanding of the current condition, linkages and opportunities present within the Proposed Development Order Limits.

3.12 Offshore Construction Environmental Management

3.12.1 The Applicant would adopt best practice environmental management measures for the offshore elements of the Proposed Development, in line with the requirements of all relevant legislation, codes of practice and standards as identified in the topic chapters of this PEIR to actively limit adverse effects on the marine environment. A key aspect of this approach is the development of an Offshore CEMP(s) prepared prior to commencement of construction to outline how construction of the Proposed Development would avoid, minimise or mitigate any adverse effects. The Offshore CEMP(s) will detail the best practice approach to offshore activities and would implement those measures and environmental commitments identified in the EIA. The Offshore CEMP(s) will be developed in accordance with an Outline Offshore CEMP(s) submitted with the DCO application and it will be a live document that is reviewed and updated throughout the construction of the Proposed Development.

3.12.2 Key environmental principles and measures during construction of the offshore works are set out in this section. Details of all mitigation measures proposed at this stage of the EIA process are provided within Volume 1, Appendix 3.2: Mitigation Schedule, of the PEIR.

Marine Pollution Prevention

3.12.3 Detailed plans for the prevention of pollution at sea, and the management of any such incidents will be developed for the Proposed Development.

3.12.4 The Offshore CEMP(s) will include the following plans to limit the potential for pollution incidents:

- Emergency Spill Response Plan;
- Waste Management Plan;
- Marine Pollution Contingency Plan (MPCP); and
- Shipboard Oil Pollution Emergency Plan (SOPEP).

3.12.5 All project vessels would have control measures and shipboard plans in place. In addition, project vessels would be compliant with the requirements of the following international agreements:

- International Convention for the Prevention of Pollution from Ships (MARPOL Convention);
- International Regulations for the Prevention of Collisions at Sea (COLREGS);
- International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention).

3.12.6 Drilling fluids required for HDD operations would be carefully managed to minimise the risk of unplanned breakouts into the marine environment. The use of best practice drilling fluids such as bentonite (OSPAR PLONOR list substance) would be prioritised.

Dredging Management

3.12.7 Localised dredging (or other seabed clearance) may be required for seabed preparation at the HDD exit points. This is the only location where dredging is a part of the offshore project design. A Dredging Management Plan will be developed to limit seabed disturbance and suspended sediment concentrations and control the generation of sediment plumes.

3.12.8 Appropriate dredging / clearance plant will be identified for the extent and volume of material to be dredged but it is considered that a Trailing Suction Hopper Dredger (TSHD), back-hoe dredger, or MFE are the most likely to be used.

3.12.9 Disposal options for the dredged material (where arisings occur) will be considered as the design evolves with beneficial re-use of dredged material the preferred option. Where this is not possible, alternative disposal options in line with regulatory and consenting requirements for disposal of dredged material will be adhered to. This PEIR considers the dredging activity only.

Marine Vessels

3.12.10 The installation of the cables would require various vessels including:

- Pre-installation survey vessels;
- Workboats / tugs;
- CLVs;
- Guard vessels;
- Trenching support vessel;
- Rock placement vessels; and
- Jack up vessels.

3.12.11 To ensure the safe navigation and operation of project vessels and the safety of other marine users, the following plans will be developed as part of the Offshore CEMP(s):

- Vessel Management Plan;
- Navigation Safety Plan; and a
- Lighting and Marking Plan.

3.12.12 The above plans will identify measures to be implemented through the final Offshore CEMP(s) including, but not limited to:

- The implementation of safety exclusion zones;
- Appropriate notification of activities to other marine users;
- A clear process of marine coordination of all project vessels and vessel activity including vessel transit planning; and
- Appropriate marking and lighting of vessels.

3.12.13 Where vessel anchoring is required, designated anchoring areas and protocols would be employed during offshore construction activities to minimise physical disturbance of the seabed.

Waste Management

3.12.14 Prior to cable installation, a pre-lay grapnel run may be required along portions of the Offshore Cable Corridor to clear the seabed of debris. Debris would be retrieved onboard the vessel for later onshore disposal.

3.12.15 In the case of marked abandoned, lost or discarded fishing gear (ALDFG), these would be returned to the MMO / relevant Inshore Fisheries and Conservation Authority (IFCA) for return to the owner of the marked gear. Unmarked gear and other debris retrieved on deck would be disposed of onshore at appropriate disposal facilities.

3.12.16 At OOS cable crossings, a section of the OOS cable would be cut and removed. The cut section would be recovered onboard the vessel and transported ashore for disposal at an appropriate onshore facility.

3.12.17 The above measures would be implemented through the Offshore CEMP(s) and an associated Offshore Waste Management Plan.

3.12.18 In addition, all project vessels would be required to comply with the Convention on the Prevention of Pollution from Ships (MARPOL Convention), which requires vessels to comply with regulations regarding the prevention of pollution and the discharge of sewage and garbage at sea.

Cable Protection

3.12.19 Where the cable cannot be buried at cable crossings or on account of the bed characteristics, cable protection in the form of a rock berm or concrete mattresses would be required.

3.12.20 The placement of such cable protection can result in the loss of seabed habitat and the permanent change to a new seabed type. The requirement for such protection measures will be carefully planned and mapped out to minimise the area of seabed affected at each location and protection measures would only be deployed where considered necessary for the safe operation of the Proposed Development and other marine users.

3.12.21 Design of crossings will adhere to International best practice guidance.

Marine Invasive Species

3.12.22 Measures to prevent the introduction and spread of marine invasive non-native species (INNS) would be implemented through the Offshore CEMP(s) and associated Biosecurity Plan.

3.12.23 A Biosecurity Risk Assessment will be undertaken to identify potential pathways of introduction, and critical control points for preventing the spread of INNS.

3.12.24 All project vessels (where relevant) would be compliant with the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention).

Dropped Objects Procedures

3.12.25 Objects dropped overboard during the construction activities can pose a significant hazard to the marine environment and other marine users. The potential for objects to be dropped or otherwise accidentally deposited should be minimised as far as reasonably practicable.

3.12.26 A dropped objects procedure would be developed by the Contractor within the final Offshore CEMP(s), detailing the requirements and procedures for vessel operators to identify, record, notify the MMO and, where possible, recover dropped objects.

3.13 Operation and Maintenance

3.13.1 The Proposed Development would be designed to operate on a continuous basis throughout the year. Details of the operation and maintenance activities associated with the Proposed Development, including converter stations, onshore cable route (HVDC and HVAC), and offshore cable route, are presented below.

Converter Site

3.13.2 The proposed converter stations are likely to be operated 24/7 by staff on-site through shifts, which would include personnel for operation, maintenance, asset management, and security. The converter site is anticipated to provide approximately 30 FTE jobs, with up to 15 staff on-site at any one time in the day, reducing to approximately five overnight.

3.13.3 Operation and maintenance staff would be required to undertake routine on-site checks, as well as preventative and corrective works on a regular basis. As part of the general maintenance, there would likely be requirements for replacement or upgrade of components, however, this would be infrequent. In these instances, additional deliveries and vehicles would be required, which may include HGV movements.

3.13.4 During periods of annual (once a year) or biannual (twice a year) maintenance, there may be additional maintenance staff required on-site (approximately 30 to 40 visitors) for 1-2 weeks per converter station. These maintenance periods would comprise sequentially switching off each converter station, whilst carrying out necessary checks, testing and replacement of electrical equipment and components.

Onshore Cable Route

3.13.5 Following completion of construction, access to the cable route would be from access points along the existing highway.

3.13.6 The operation and maintenance requirements for the onshore HVDC and HVAC cables would involve infrequent on-site inspections of the cables and corrective maintenance activities (e.g. repairs due to cable failure). The cables would be continuously monitored remotely.

3.13.7 It is not expected that the transition joint bays at the landfall would need to be accessed during the operation and maintenance phase. However, link boxes would be provided with inspection covers to allow for access. Link boxes will require access in the event of a cable failure requiring replacement or repair, and for testing purposes.

3.13.8 In the event of a cable failure, access to link boxes would be required to identify where along the cable section the fault has occurred. Once this is detected, a maintenance team would be required to excavate, remove and replace the section of damaged cable along the route.

Offshore Cable Route

Inspection Surveys

3.13.9 The preferred installation methods are designed to minimise the number of cable inspection surveys that will be required. However, some cable inspection surveys are expected during the operational lifetime of the Proposed Development.

3.13.10 These surveys will involve the use of a single survey vessel equipped with an inspection ROV and geophysical survey equipment including Multibeam Echo Sounder (MBES), Side Scan Sonar (SSS) and a magnetometer.

3.13.11 The inspection survey schedule is anticipated to include surveys up to once a year for the first 5 years, and then approximately every 5 years for the remainder of the operational life of the cables (anticipated 50 years).

Maintenance and Repair

3.13.12 There may be a requirement to undertake unplanned maintenance works in the event of failure of components of the system or if a cable becomes exposed due to changes in seabed morphology or the activities of third parties.

3.13.13 Repair works for cable failure would require the exposure of the cable at the point of failure, which would require de-burial of the cable from the trench. The cable would then be cut, recovered to the surface, repaired using a section of spare cable and redeployed for reburial using similar methods to those used for installation.

3.13.14 Given additional cable length would need to be added to join the cut ends at the surface, the relayed cable would take up a greater footprint than the original cable through incorporation of a ‘repair loop’. Any additional footprint associated with repaired sections would be anticipated to fall within the Offshore Cable Corridor.

3.14 Decommissioning

3.14.1 The Applicant is seeking consent for the installation, operation and maintenance of two converter stations and associated development including transmission infrastructure and highways improvements.

3.14.2 The converter stations would be designed, manufactured and installed for a minimum operational lifetime, which is currently anticipated to be 50 years. Taking account of ongoing repairs and maintenance, the operational lifetime of the onshore and offshore electricity cables (including both HVDC and HVAC) is anticipated to exceed that of the converter stations. The highways improvements will not have a forecast end of life and will not be decommissioned.

3.14.3 For the electricity infrastructure only, the end of the operational lifetime is anticipated to be 50 years from date of full commissioning. Subject to relevant additional consents and legislative requirements, it is anticipated that potential refurbishment and operational life extension of the Proposed Development may occur. This potential refurbishment and extension of operational life would be considered closer to the end of the initial operational lifetime.

3.14.4 In the event that the operational lifetime of the Proposed Development is not extended, decommissioning would take place. The decommissioning sequence will generally be the reverse of the construction sequence and involve similar types and numbers of vehicles, vessels and equipment. Therefore, it is likely that the effects of decommissioning on the environment would be no worse than those effects identified during the construction phase. Notwithstanding, decommissioning will be considered in the relevant sections of the PEIR and ES.

3.14.5 The following sections provide details on the approach to decommissioning for the main components of the Proposed Development.

Onshore Electrical Infrastructure Decommissioning

3.14.6 An Outline Onshore Decommissioning Strategy would be developed in a timely manner in consultation with the relevant stakeholders and prior to commencement of construction. The Onshore Decommissioning Plan would be developed in accordance with the Outline Onshore Decommissioning Strategy prior to decommissioning. The Onshore Decommissioning Plan would consider the latest best practice and new technologies, in preparation of decommissioning occurring.

3.14.7 The Onshore Decommissioning Plan would include provisions for the removal of all above ground infrastructure and the decommissioning of below ground infrastructure. The plan would focus on details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The approach and methodologies to be implemented would be in accordance with the latest available guidance, legislation and any new technologies at the time of the Proposed Development's decommissioning.

Converter Stations and HVAC Cables

3.14.8 The operation of the proposed converter stations are intended to form permanent elements of electrical infrastructure serving the national grid, however as stated above, the minimum operational lifetime is currently anticipated to be 50 years. It is likely that this operational lifetime could be extended through refurbishment and the replacement of equipment, rather than decommissioning.

3.14.9 If the operation of the Proposed Development does not continue beyond 50 years, the proposed converter stations would be decommissioned. If complete decommissioning is required, then all the electrical infrastructure and buildings would be removed and any waste arising recycled or disposed of in accordance with the waste hierarchy and relevant regulations at the time of decommissioning. The proposed converter site may be re-purposed for an alternate use (separately agreed and consented) or would be reinstated to a suitable use, in accordance with the Onshore Decommissioning Plan.

3.14.10 For the purposes of EIA, decommissioning of the proposed converter stations is assumed to be similar to the construction and in reverse sequence.

Onshore HVDC Cables

3.14.11 If the Proposed Development is required to be decommissioned, the proposed underground electricity (HVDC and HVAC) cables would be decommissioned. HVDC and HVAC cables may be recovered and removed by pulling the cables through the ducts (e.g., for recycling). Otherwise, they will be left in place in the ground with the cable ends cut, sealed and securely buried as a precautionary measure. Cable ducts, joint bays and link boxes would be left in-situ, to minimise environmental disturbance.

Offshore Decommissioning

3.14.12 The current anticipated lifetime of the Proposed Development offshore cables (operational phase) is 50 years, following which the Proposed Development will be decommissioned.

3.14.13 The options for decommissioning the cable would be evaluated at the time of decommissioning, with e.g. engineering technologies ever evolving. Current best practice, and the least environmentally damaging decommissioning option, is (in general) to de-energise the cable, disconnect it from any wider system, and secure it in place to be left *in-situ*, thereby avoiding unnecessary seabed disturbance.

3.14.14 However, other options may include the requirement for full or partial removal of the cables. The methods for removal would be broadly similar to those used during the construction phase with the potential for the cables to be removed by direct pulling, rather than de-burial. The requirement for any removal could also apply to other infrastructure installed as part of the project i.e. cable protection. The footprint of decommissioning activities (disturbance footprint at the sea bed) will be less than that of the construction phase.

3.14.15 The framework of environmental permitting and all applicable UK and International legislation at the time of decommissioning will be adhered to.

3.14.16 Once the final decommissioning measures are known, an environmental assessment (EIA or similar) will be performed prior to the decommissioning phase (i.e. in approximately 50 years' time) to assess the potential impacts that may arise. This will inform any licence applications for decommissioning.

Initial Offshore Decommissioning Plan

3.14.17 An Initial (offshore) Decommissioning Plan (IDP) containing the anticipated approach to, and methods associated with decommissioning has been prepared at PEIR stage. It is recognised that the Final (offshore) Decommissioning Plan (FDP) will a) be developed in the years that precede decommissioning, and b) be subject to Environmental Impact Assessment (EIA) or similar environmental appraisal and permitting at that time.

3.14.18 The IDP represents an initial statement of:

- the measures, methods and timescales for decommissioning the offshore cables including the parts to be removed and the methods of removal, the parts to remain *in-situ* and the measures to make them safe, and the measures for the clearance of debris and the restoration of the sea bed;
- the methods of providing post-decommissioning verification that the decommissioning has been completed satisfactorily; and
- the measures for post-decommissioning monitoring, maintenance and management of the seabed.

3.14.19 The IDP will form the basis for the FDP for the offshore elements of the Proposed Development, which will be developed in consultation with The Crown Estate and other international stakeholders in line with the following decommissioning principles:

- the measures and methods for any decommissioning will comply with any legal obligations referred to in the development consent;
- all sections of the offshore cables will be removed except for any sections which it is preferable to leave *in-situ* having regard to minimising risk to the safety of surface or subsurface navigation, other uses and users of the sea, the marine environment including living resources, and health and safety;
- the Applicant will comply with any national or international requirements in relation to leaving the offshore cables *in-situ*; and
- the seabed will be restored, as reasonably as possible and to the extent reasonably practicable, to the condition that it was in before the offshore cables were installed.

3.14.20 Due to the unknown element of what policies and processes will be in place when the Proposed Development reaches the end of its feasible life, the IDP and FDP will be reviewed and updated periodically in line with applicable guidance and regulations to ensure that all legislation at the time of decommissioning the system will be adhered to.

3.14.21 The Applicant will commence further consultation with stakeholders at least two years prior to decommissioning. This may be informed by the required permit applications at the time.

3.14.22 Prior to decommissioning, a contingency plan will be developed for resolving the potential issue of cables becoming exposed post-decommissioning.

3.14.23 The decision as to whether to recover a cable or leave *in-situ* will be taken at the appropriate time. The methods available for removal of out-of-service cables are summarised below.

Cable Recovery

3.14.24 All offshore cables, sections of offshore cables, or cable ends which are exposed at the time of decommissioning, or likely to become exposed, will be recovered, unless studies show that they will not pose an enduring threat to other seabed users. This will be determined by survey(s) prior to decommissioning of the Proposed Development.

3.14.25 Any sub-sea trenches left after cable removal will be filled by natural tidal action. Exposed cable ends will be weighted down and then allowed to naturally rebury.

3.14.26 To recover a cable first it is necessary to obtain one end which is used to pull the cable out of the seabed by applying traction to it from a cable engine on the recovering ship or barge. To obtain an end, the cable would likely be cut at the seabed as, considering the weight of the cables, it is unlikely that a bight of cable can be brought to the surface. Methods that can be used to obtain a single end include using an ROV and or crane with grab tooling (preferred), using divers, or using special cable hooks called “grapnels”.

ROV grab method

3.14.27 Initial exposure of the cables is needed prior to grabbing. This can be done by excavating a pit using water jets mounted on the ROV or an MFE. The pit size need only be sufficient to allow the ROV access to cut the cables and attach a clamp (a “cable gripper”) and lifting rope to the cables. Once the cable is exposed, cut and gripped, the ROV does not take any further part in the operation, although it may be used to monitor the recovery if deemed necessary. If the seabed is particularly consolidated above the cables, the ROV water jets or MFE can be used to weaken the soil along the route line and reduce the resistance on the cables.

Diver method

3.14.28 This is essentially the same as the ROV method except that the operations are diver controlled. The operation is again precise but the downsides of diver operations, e.g. human safety, depth limitations and weather dependency, are significant. This operation can only be carried out in shallow water and, for safety reasons, the use of divers should be avoided as far as possible.

Grapnel method

3.14.29 Grapnels come in various configurations that can cut, hook and hold a cable, whether it is exposed on the seabed or buried into it. Various types and sizes of grapnels are used for different cable sizes, burial depths and soil conditions. The grappling process is essentially the same in all cases, with the grapnel towed across the seabed at right angles to the cable line, with the point of the device penetrating into the seabed at the expected depth of the cable. Initially a grapnel fitted with cutting blades is used to cut the cable and then another is used to hook and hold it a safe distance away from the cut end. In this way a small bight of cable is recovered to the ship and recovery can be started. At the time of drafting, no grapnel exists that can both cut and hold (one end of) a cable in a single operation for a large power cable.

3.14.30 The main advantage of grapnel recovery is that it is a relatively simple operation that has been used over many years. The main downside is that the grapnels may be dragged across the seabed for some distance before the cable is hooked, creating wider physical disturbance. Grapnel operations may also be restricted by the proximity of other cables or other infrastructure.

3.14.31 Deployment of a grapnel is unlikely for the Proposed Development, however, is presented here as a fallback option in the event that e.g. a cable is dropped or lost. An ROV or crane grab is more likely to be deployed.

3.14.32 Any perpendicular grapnel runs would only take place in locations approved following benthic ecology and marine archaeology expert review, provisionally identified if necessary as part of the FDP i.e. areas of low environmental sensitivity would be identified for potential cable recovery by grapnel (if necessary) to avoid ‘new’ disturbance of receptors.

Cable recovery

3.14.33 Once a viable cable end has been recovered, the cable or cables are then recovered to the vessel in what is, in effect, a reversal of the cable lay operation; however only one vessel is usually necessary (unless burial conditions dictate the use of a de-burial system ahead of the recovery vessel). Once the ship’s capacity has been reached, the cable end is abandoned to the seabed, probably with a marker buoy attached, and the ship returns to port to discharge the recovered cable.

Crossings

3.14.34 Due to the protection methods employed at crossings, typically rock placement or concrete mattresses, the recovery of cable at these locations can be more complex. The presence of other, potentially still operational, assets can be a complicating factor. Where the other assets are operational at the time of decommissioning, and most likely in the case of other crossings, the likelihood is that leaving the cables in place would be the safest and most environmentally sensitive option.

Landfall sections

3.14.35 Recovery of the section of cable associated with the HDD is anticipated to be relatively straightforward. Cutting the cables at the seaward end and attaching a winch to the landward end should enable the cables to be pulled out of the HDD ducts and recovered intact onshore. These cables would then be transported in sections to appropriate recycling facilities.

3.14.36 Removal of the ducts below the Mean High Water mark would be considerably riskier and would, with current techniques, entail both environmental and safety risks. It is therefore expected that, in line with the decommissioning principles, the ducts would be left *in-situ*.

De-burial

3.14.37 As the cables are planned to be buried along the entire route, they may require de-burial in order to speed up the recovery process. A smaller ship preceding the main recovery ship using a tool such as a MFE is one possibility. Alternatively, a bespoke tool that allows for simultaneous de-burial and recovery from the same ship may be available in the future. The Applicant will benefit from knowledge gained on previous decommissioning operations on similar but older assets (which are much anticipated in the intervening decades).

3.14.38 It is assumed that the de-burial (and the entire decommissioning) footprint would be less than the construction phase footprint.

Offshore Decommissioning Schedule

3.14.39 A programme of periodic reviews of the IDP would take place, starting at a 10 yearly interval and decreasing to a three yearly interval, 10 years prior to the scheduled decommissioning in approximately 50 years' time.

3.14.40 The preparation of the FDP prior to the actual Proposed Development decommissioning would incorporate sufficient time to allow for the environmental assessments (e.g. EIA, decommissioning Non-Statutory Environmental Statement (NSES) or similar) to be assessed and any subsequent measures arising from the review to be implemented before the decommissioning programme is finalised. An FDP would therefore be prepared two years prior to the proposed shutdown and decommissioning of the offshore elements of the Proposed Development.

3.14.41 Should the Proposed Development be decommissioned early, or the life of the project be extended, the decommissioning programme will be adjusted accordingly. The FDP is expected to be informed by and include references to relevant surveys performed during the construction and operational phases of the Proposed Development.

Post-Decommissioning – Additional Surveys & Seabed Clearance

3.14.42 Following decommissioning, survey(s) will be carried out to show that the route has been cleared and left in a safe condition. It is likely that recovery operations will be monitored by ROV and this may prove adequate to show that the cables have been cleared and the seabed left in a safe condition. However, additional surveys, including side-scan, magnetometer and bathymetric surveys, may be required (with possible use of drop-down video or ROV to ground truth the data where necessary).

3.14.43 The FDP will contain details of any requirements on post-decommissioning monitoring, maintenance and remediation.

3.15 Accidents and Disasters

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

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

- Reduction in groundwater quality and quantity resulting from accidental spillage:
  - Volume 2, Chapter 4: Geology, hydrogeology and ground conditions;
- Impact of accidental pollution on quality of surface water and watercourses:
  - Volume 2, Chapter 3: Hydrology and flood risk;
- Increased flood risk:
  - Volume 2, Chapter 3: Hydrology and flood risk;
- The vulnerability of the Proposed Development to climate change:
  - Volume 4, Chapter 1: Climate Change;
- Accidental pollution:
  - Volume 2, Chapter 1: Ecology and Nature Conservation;
  - Volume 3, Chapter 6: Shipping and Navigation; and
  - Volume 3, Chapter 1: Benthic Ecology.
- Impact of construction traffic on accidents and safety:
  - Volume 2, Chapter 5: Traffic and transport; and
- Impact of Abnormal Indivisible Loads on safety:
  - Volume 2, Chapter 5: Traffic and transport.
- Risk of vessel anchor and gear snagging:
  - Volume 3, Chapter 6: Shipping and Navigation.
- Reduction of under keel clearance:

  – Volume 3, Chapter 6: Shipping and Navigation.
- Risk of accidental frack-out during HDD:
  – Volume 3, Chapter 1: Benthic Ecology.

3.15.3 During construction, normal construction good practice would be followed to ensure on-site safety of the workforce in accordance with the Construction (Design and Management) Regulations 2015. Independent health and safety advisors would be employed by the contractor(s) during construction to report on the site's safety. It would be required that these reports take place monthly with the reports being provided to the Applicant.

3.16 Next Steps

3.16.1 This chapter sets out the design parameters and the proposed installation and construction, operation and maintenance and decommissioning methods assessed within this PEIR.

3.16.2 The location and siting of the Proposed Development has been informed by a site selection and route refinement process, which is set out in Volume 1, Chapter 4: Need and Alternatives, of the PEIR. This process has considered a wide range of environmental constraints as well as technical and commercial factors.

3.16.3 The process of site selection and refinement remains ongoing. The design described within this chapter will continue to be refined, taking into account the findings of the ongoing EIA process, ongoing and further surveys, and engagement with stakeholders. Refined design parameters will be presented in the ES and draft DCO that will accompany the application for development consent. The final design for the Proposed Development will be developed after development consent has been granted, from within the parameters set out in the project description chapter of the ES and the DCO.

3.17 References

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