



Preliminary Environmental Information Report

Chapter 2: Description of the Proposed Development

PEIR Chapters: [PINS Ref: EN 010171]

Document Reference: EN 010171/PEIR CHP/2

Revision Number: 1

December 2025

Future Energy Llanwern Limited

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2.0 Description of the Proposed Development

2.1 Introduction

2.1.1 This Chapter provides an overview of the Future Energy Llanwern Solar Farm, hereafter referred to as the 'Proposed Development', and outlines the main components of the solar farm and associated Grid Connection Infrastructure. The Chapter describes the key activities that will be undertaken during the construction, operation and maintenance and decommissioning phases of the Proposed Development, whilst including key assessment assumptions along with indicative timescales.

2.2 Proposed Development Overview

2.2.1 At this stage, the description of the Proposed Development is indicative and a 'design envelope' approach has been adopted which takes into account the Planning Inspectorate Advice Note Nine: Rochdale Envelope, (Ref 2-1). The provision of a design envelope is intended to identify key design assumptions to enable the environmental assessment to be carried out whilst retaining enough flexibility to accommodate further refinement during detailed design. Further details on the use of the Rochdale Envelope as recommended by the National Policy Statement for Renewable Energy (NPS EN-3) (Ref 2-2) are provided in **Chapter 4: Legislation and Policy**.

2.2.2 Assessing the Proposed Development using this assumption-based design envelope approach means that the assessment will consider a maximum design scenario which allows flexibility to make design decisions in the future that cannot be finalised at the time of submission of the Development Consent Order (DCO) Application. Such design decisions may include the precise models and dimensions of Solar Panels which will be available upon the construction of the Proposed Development or the final optimised layout taking into account detailed engineering factors and solar energy optimisation. This approach has been adopted for this Preliminary Environmental Information Report (PEIR) and will also enable the Environmental Impact Assessment (EIA) to be based on a description of the location, design and size of the Proposed Development that is suitable to allow a preliminary

assessment of its likely significant environmental effects, and includes the information reasonably required to enable a properly informed response to the consultation.

- 2.2.3 The Proposed Development will have a generating capacity of more than 350 megawatts (MW), the relevant infrastructure which comprises the Proposed Development is set out in **Table 2-1** below.
- 2.2.4 The description of the Proposed Development will be refined as the design continues to evolve through the key subsequent stages of the design, consultation and EIA process culminating in the Environmental Statement (ES) that will accompany the DCO Application.
- 2.2.5 The description of the Proposed Development also includes embedded environmental measures, to avoid or reduce environmental effects, which have been directly incorporated into the design. **Chapter 5: Environmental Impact Assessment Methodology** explains the approach to environmental measures that has been applied in the PEIR. The preliminary environmental assessments presented in **Chapters 6 to 19** provide details of how the embedded environmental measures are proposed to avoid or reduce environmental effects.
- 2.2.6 The layout of the Proposed Development is shown in **Figure 2-1a** and **Figure 2-1b**.

2.3 PEIR Assessment Boundary

- 2.3.1 The PEIR Assessment Boundary (illustrated in **Figure 1-1**.) used to inform this PEIR combines the search areas for the infrastructure associated with the Proposed Development. It is defined as the area within which the Proposed Development and associated infrastructure will be located, including the temporary and permanent construction and operational work areas.
- 2.3.2 The total area of the PEIR Assessment Boundary is 547.69 hectares (ha). The layout of the Proposed Development is depicted in **Figure 2-1a** and **Figure 2-1b**, the relevant infrastructure comprises the following:

- a solar farm area of 149.05ha which includes:
 - Photovoltaic (PV) Arrays (**Figure 2-2**);

- PV Module Details (**Figure 2-3**);
- Inverter units (**Figure 2-4**);
- Transformers and Coupler Stations, also known as Solar Stations (**Figure 2-5**);
- Proposed Grid Connection Corridor (**Figure 2-6**);
- onsite cabling (including high and low voltage **Figure 2-7a-b**);
- proposed crossing locations (**Figure 2-7a-b**);
- Horizontal Directional Drilling Locations (**Figure 2-8a-b**);
- Grid Connection Infrastructure (Options 1 to 4 defined in **paragraph 2.4.36 to 2.4.40**) (**Figures 2-9 – 2-19**);
- Cable Bridge crossings (**Figure 2-20**);
- Proposed access points (**Figure 2-21**);
- proposed internal access roads (**Figure 2-22**);
- Fencing and Gate Elevations (**Figure 2-25**);
- fencing locations (**Figure 2-26**);
- CCTV and satellites (**Figure 2-27**);
- CCTV layout (**Figure 2-28**);
- drainage proposals;
- environmental mitigation and enhancement areas (**Figure 2-29**); and
- temporary construction compounds (**Figure 2-1a-b**).

2.3.3 'Options' as stated above are intentionally included within the PEIR Assessment Boundary to allow for further design refinement which will take into account engineering information, environmental effects and stakeholder feedback. The intention is, where possible, to refine the options to a single design for the ES and DCO Application.

2.4 Design Parameters

2.4.1 The design evolution process adopted for the Proposed Development is a

fundamental element of the EIA. The process is iterative and has led to opportunities for the development of environmental measures which have been embedded directly into the design of Future Energy Llanwern. These are referred to as 'embedded environmental measures' (discussed in further detail in **Chapter 5: Environmental Impact Assessment Methodology**). The process has involved engagement, providing opportunities for stakeholders to provide feedback and to understand and influence the design as it progresses. This will continue to develop for the ES that will accompany the DCO Application.

- 2.4.2 The design and optioneering of the Proposed Development is an iterative process, refined by the preliminary environmental assessments and relevant consultation with statutory and non-statutory consultees. **Chapter 3: Alternatives and Design Evolution** describes the other site locations and technologies that have been considered to date, and the reasons why the proposed design has been chosen instead of the alternative options. Overall, alternative site areas were assessed and the Proposed Development has been designed to avoid environmental impacts as far as is possible.
- 2.4.3 Owing to the nature of the Proposed Development, there is a proportion of the design elements and features which cannot be confirmed until further optioneering and tendering relating to the design and construction of the Proposed Development have been undertaken. As such, the Rochdale Envelope approach is being adopted, meaning that each of the technical assessments will therefore describe where there is uncertainty in the potential effects and provide a precautionary reasonable worst-case assessment. The description of the Proposed Development will be refined as the design continues to evolve through the key subsequent stages of the design, consultation and EIA process culminating in the ES that will accompany the DCO Application.
- 2.4.4 **Table 2-1** describes the parameters and assumptions relevant to the PV Arrays which have formed the basis of the PEIR assessment. The following Sections further describe the design parameters and assumptions relevant to the remaining Site infrastructure.

Table 2-1 Maximum PEIR assessment assumptions

Project Component	Parameter	Applicable Design Principle
Solar Panels	Maximum height of Solar Panels above ground level (agl)	The maximum height of the Solar Panels will be 3.5 metres (m) agl at its highest point.
	Minimum height of the flood sensitive equipment agl	The minimum height of the Solar Panels will be up to 1.0m agl.
	Indicative footprint (ground coverage)	Up to 2.4m length x up to 1.1m wide.
	Indicative slope and orientation of the Solar Panels	The Solar Panels will slope in a southerly direction, at a fixed slope of between 15 to 25 degrees from horizontal.
	Indicative Solar Panel colour	The Solar Panels are likely to be either black or dark blue. This will be fixed during detailed design and will be selected to ensure that they fit within the landscape.
	Frame type	Anodised Aluminium
	Solar Panel system	Monofacial and bifacial Solar Panels
PV Array works area (linked assembly of Solar Panels)	Location	See Figure 1-1 . The maximum area to be covered by Solar Panels is 149.05ha and given the pile area is 0.07m ² total area to be impacted by Solar Panel foundations is 1.14ha and 0.0087ha for inverter foundations. .
PV Mounting Structures	Rack	Each PV String of Solar Panels will be mounted on a PV Mounting Structure made of galvanised steel.
	Foundation type	Screw Pile

Project Component	Parameter	Applicable Design Principle
	Typical number of foundations	8 for Solar Panel 3P9 and 20 for Solar Panel 3P24
	Maximum depth of piles	3m
	Indicative separation distance between rows	Approximately 3m. This will depend on the local ground topography.
Inverters	Type of inverter	Smart string inverters
	Indicative dimensions of inverters	Smart string inverters, the maximum parameters will be 1.0m by 0.4m and 0.8m in height. Inverters will be mounted on the back of the PV Mounting Structures.
	Number of inverters	1,232
	Foundation	The inverter will share one pile with the Solar Panels and require a second screw pile
	Maximum depth of piles	3m
	Colour	Light grey
Solar Station	Type	The candidate Smart Solar Station is the Jupiter-9000k-H1 a pre-fabricated Solar Station which houses the independent equipment (Figure 2-5).
	Indicative number of Transformers and Switchgear Stations	54 Solar Stations located throughout the Site. Coupler stations will also be situated around the Site to combine and transform the electricity from the Transformers. The location of Solar Stations are illustrated on Figure 2-1a-b .
	Indicative dimensions	The maximum parameter of the Inverters, Solar Stations will be up to 6.1m by 2.5m footprint, and 2.9m in height. This will

Project Component	Parameter	Applicable Design Principle
		be entirely enclosed by a container.
	Colour	Externally finished in keeping with the surrounding environment.
	Indicative foundations	3.0m structural footings on 75mm concrete binding on 1.1m compacted type 1, raising the transformers 1.2m above Natural Ground Level (NGL) to ensure they are sited suitably above flood levels.
Onsite Cabling - Low Voltage Distribution Cables (between PV Solar Panels and inverters)	Type	Low voltage onsite electrical cabling is required to connect the Solar Panels to inverters and the inverters to the transformers onsite (typically less than 1kV cables). Cabling will be above ground level between the Solar Panels. These will be fixed to the PV Mounting Structure. Cabling between the Solar Panels and Solar Stations will be buried within underground trenches.
	Indicative cable trench dimensions	Maximum dimensions: 1m deep and 1.8m wide.
Onsite Cabling - High Voltage Distribution Cables (between transformer stations, coupler stations and substation)	Type	High voltage onsite electrical cabling is required to connect the Solar Stations to one another as well as the onsite electrical infrastructure (typically 33 kV cables).
	Indicative cable trench dimensions	Maximum dimensions: 1m deep and 1.8m wide.
Grid Connection Infrastructure (including relevant	Indicative dimensions of proposed substations	There are four proposed connection options to the National Grid substation, which are dependent on determination of National Grid on the voltage of the connection.

Project Component	Parameter	Applicable Design Principle
transforming, switch gear and connection equipment)	Location	Options are split between National Grid Substation, North Compound 1, North Compound 2, North Compound 3 and the Southern Compound depicted in Figures 2-9 to Figure 2-19 .
	Foundations	Dependent on the option taken forward, this is explained in full below.
Grid Connection Corridor	Maximum cabling width	1.6m
	Maximum depth	1m

Solar PV Infrastructure

Solar Panels

- 2.4.5 The Solar Panels have not been selected at the time of writing PEIR. Due to the rapid development of solar technologies, an element of flexibility is required prior to final design selection with respect to the dimensions, appearance and arrangement of the Solar Panels.
- 2.4.6 Therefore, to inform this PEIR a reasonable [envelope] assumption has been applied which includes a dimensional Solar Panel parameter of up to 3.5m at its highest point. It should be noted this has taken into account the PV Mounting Structures together with the panels and therefore represents an anticipated maximum height of 3.5m. **Figure 2-2** provides an indicative plan of the proposed Solar Panels.
- 2.4.7 The following Solar Panels are currently under consideration:
- three by 24 Solar Panels (3P24 Frame) which will typically be up to 27.7m long and 7.2m wide; and
 - three by eight Solar Panels (3P8 Frame) which will typically be up to 9.2m long and 7.2m wide.
- 2.4.8 Each Solar Panel will form one Solar Module, and each individual panel will be made up of approximately 72 and 24 cells respectively (**Figure 2-3**). The Solar Panels are fixed to a PV Mounting Structure in groups known as 'PV Strings'. The PV Mounting Structure frame is typically built from galvanised steel.
- 2.4.9 The total number and arrangement of Solar Panels will depend on the iterative layout design process and available technology at the time of construction. There are a number of factors which influence the arrangement of Solar Panels in each PV String, and therefore a degree of flexibility will be required to accommodate the development of future technologies. As such, the PEIR assessment will be based on the parameters detailed in **Table 2-1**.
- 2.4.10 The Solar Panels will be fixed on a PV Mounting Structure, with the Solar Panels oriented towards the south at a slope of between 15 to 25 degrees from horizontal as shown on **Figure 2-2**.

PV Mounting Structures

- 2.4.11 Each row of Solar Panels will be mounted on a galvanised steel frame as depicted on **Figure 2-2**. These will screw piled up to a maximum depth of 3m into the ground depending on the ground conditions present.
- 2.4.12 There will be a separation distance of approximately 3m between the rows of Solar Panels to prevent the accumulation of surface water runoff and to ensure maintenance can be carried out and to minimise the effect of inter-row shading. Additionally, there will be a gap of 1-2 centimetres between the panels to allow permeability of water and prevent accumulation of surface water runoff.
- 2.4.13 For the purposes of this PEIR, it is assumed the Solar Panels will be mounted on structures with a clearance level of up to 1m agl, and a maximum upper height of up to 3.5m agl. It should be noted the parameters defined above are currently indicative as the final structures' elevation will be influenced by the topography, flood risk and other constraints across the Site.

Inverters

- 2.4.14 Inverters are required to convert the Direct Current (DC) electricity collected by the Solar Panels into Alternating Current (AC) which allows the electricity generated to be exported to the National Grid. Inverters are sized to deal with the level of voltage and intensity, which is output generated by the Solar Panels.
- 2.4.15 The Proposed Development will utilise string inverters which are mounted to the PV Mounting Structures underneath the Solar Panels and are required for every PV String. String Inverters are typically 700 millimetres (mm) in length by 365mm in depth by 1,035mm in width (**Figure 2-4**).

Transformers

- 2.4.16 Transformers are required to step up the voltage of the electricity generated by the Solar Panels before it reaches the onsite substations. As string inverters are being utilised across the Site, the transformers will be located within containers and distributed throughout the Proposed Development (**Figure 2-1a** and **2-1b**).
- 2.4.17 The candidate Solar Station is depicted in **Figure 2-5** is the Jupiter-9000k-H1 a pre-fabricated Solar Station which houses the independent equipment.

- 2.4.18 The containers will typically be 2.9m high, 2.5m wide and 6.1m in length, as depicted on **Figure 2-5**. Additionally, the Solar Stations will have 300mm structural footings on 75mm concrete binding on 1125mm compacted type 1, raising the transformers 1.2m above Natural Ground Level (NGL) to ensure they are sited suitably above flood levels. Overall, there will be 54 transformer units located across the Site.
- 2.4.19 As set out in **Table 2-1** it is proposed to utilise Coupler Stations to connect the three phases of the Proposed Development, before connecting to the Grid Connection Infrastructure. The design of these Coupler Stations is still being finalised, however, their current locations can be seen in **Figure 2-1a** and **Figure 2-1b**.

Switchgears

- 2.4.20 Switchgears are the combination of electrical disconnect switches, fuses or circuit breakers used to control, protect and isolate electrical equipment. Switchgears are used both to de-energise equipment which allows work to be undertaken and to clear faults located downstream. Switchgears will be housed within the same container as the Transformer within a typical footprint of 2.9m high, 2.5m wide and 6.1m in length as depicted on **Figure 2-5**.
- 2.4.21 The overall configuration and layout of the equipment will depend on the iterative design process which is influenced by technical and environmental factors.
- 2.4.22 It is expected that the Solar Stations will be mounted up to 1.2m above ngl. They will be located at regular intervals across the Site, however as the design of the Proposed Development evolves, the layout of the Site will be determined to take into account the relevant environmental conditions and technical requirements.

Onsite Cabling

- 2.4.23 The Onsite Cabling will comprise low voltage electrical cabling which will be used to connect the Solar Panels to the inverters (typically low voltage cables). Additionally, low voltage cables will be used to connect inverters to the Solar Stations. These cables will all be underground and installed via trenching. The dimensions of the trenches will vary but they will typically be up to 1.8m in width and up to 1m in depth dependent on the number of cables within the trench.
- 2.4.24 Where low voltage cables converge upon a crossing point (either a drain or a ree)

they will cross these sections via a cable tray / pipe, as shown by **Figure 2-20**. The utilisation of cable trays at crossing points has been identified to minimise the use of Horizontal Directional Drilling and the associated impacts in addition to avoiding ecological impacts caused by a 'cut and fill' installation.

- 2.4.25 Higher voltage cables will be required between the transformers and the onsite electrical infrastructure and substations. These cables are likely to run centrally through the Site between transformer units and the substations. The dimensions of the trenches will vary but they will typically be up to 1.8m in width and up to 1m in depth. The indicative trenching locations are shown in **Figure 2-7a-b**.
- 2.4.26 Where these high voltage cables are required to cross reens and other obstacles this will be completed via Horizontal Directional Drilling (HDD). The indicative mud yard locations for launch and receival pits are shown in **Figure 2-8a-b**.
- 2.4.27 A crossing schedule has been developed, this lists all crossing locations required for the Proposed Development, from cable trays to HDD and access track crossings (**Appendix 2C**).
- 2.4.28 As the design of the Proposed Development evolves, the alignment and location of such cables will be determined taking into account the relevant environmental conditions and technical requirements present on Site. A reasonable worst-case scenario will be assessed for EIA purposes, including a 5m micro siting allowance for cabling and crossing locations to allow for constraints which may be identified during the enabling phase.
- 2.4.29 The cabling between the Solar Panels and inverters will typically run above ground fixed to the PV Mounting Structure. The cables then run underground between the PV String and Transformers. All other onsite cabling will be underground where possible. In addition to these, data cables will be installed which will allow for monitoring during operation and enable the collection of relevant data. The data cables would typically be installed within the same trench as the electrical cables.
- 2.4.30 The existing above ground powerlines across the Site are not proposed to be altered by the Proposed Development. The offsets to these easements are to be discussed with the Statutory Undertakers as part of the ongoing design process. As such, precautionary buffers have been applied to the Proposed Development.

2.4.31 Electricity generated will be conveyed to the appropriate transformer before transferring to the National Grid Substation. The connection routes are not yet [fully] defined but lie within the western extent of the PEIR Assessment Boundary, running north to the National Grid Substation, as shown in **Figure 2-6**.

Grid Connection Infrastructure

2.4.32 Grid Connection Infrastructure plays a key role for the delivery of electricity transmission throughout the National Grid transmission network. One of the key pieces of equipment are substations with functions which includes the conversion of electricity into different voltages, depending on the required output. Substations use transformers to transform or 'switch' the voltage, meaning that it has been either increased or decreased.

2.4.33 The proposed design of the grid connection is being developed and refined through the iterative design process. As part of the Rochdale Envelope approach, which is applicable to this PEIR, a reasonable worst-case scenario for the Grid Connection Infrastructure within the Site will be assumed to ensure that a robust assessment of the Proposed Development is undertaken. The Proposed Development's connection will likely consist of electrical infrastructure such as transformers, switchgear and safety equipment. The dimensions of the proposed infrastructure are highly dependent on the findings of further work and will be refined through the iterative design process. Maximum parameters for the arrangements will be defined throughout the DCO Application, and a reasonable worst-case scenario will be assessed and presented in the ES.

2.4.34 Due to the unknown voltage requirement of the connection which is to be agreed with National Grid, four different options for the connection and its associated infrastructure have been identified. As a result of this optionality to ensure that the relevant technical topics assess a worst case scenario within the Rochdale Envelope, each topic has reviewed the available information and is assessing the option which would constitute worst case for their technical discipline.

2.4.35 The location and extent of the substations will be confirmed through the detailed design process but are located within the PEIR Assessment Boundary. The different options for the connection are explained fully below.

Option 1 (Works No 2(a))

2.4.36 This option would include the construction and operation of two compound yards within the north-western section of the Site as depicted in **Figure 2-9**. There is an existing 132kV Grid Yard located within the proposed field serving a separate solar farm. Separate 33kV and 132kV Grid Yards would be located directly east and south of the existing substation respectively (North Compound 1 and North Compound 2 depicted on **Figure 2-10a-b** and **Figure 2-11a-b**). A separate Point of Connection (PoC) would be installed within the National Grid Substation (Point of Connection 1 and 2 depicted on **Figure 2-12a-b**) acting as the POC for the 33kV and 132kV connections. The transformer would subsequently connect to tee offs at the base of the existing pylons and therefore the transmission network located to the north of National Grid Substation (Tee Connections 1 and 2 depicted in **Figure 2-13a-b** and **Figure 2-14a-b**). The compounds and the infrastructure included within them are explained fully below. Option 1 would consist of the following compounds:

- North Compound 1 (**Figure 2-10a-b**);
- North Compound 2 (**Figure 2-11a-b**);
- Point of Connection 1-2 (**Figure 2-12a-b**); and
- Tee Connections 1-2 (**Figure 2-13a-b** and **Figure 2-14a-b**).

Option 2 (Works No 2(b))

2.4.37 Option two (**Figure 2-15**) would include three 132kV compounds and one 33kV control room, two of the 132kV compounds and the 33kV compound would be located within the north-western section of the Site (North Compound 1, North Compound 2 and North Compound 3 in **Figure 2-10a-b**, **Figure 2-11a-b** and **Figure 2-16a-b respectively**). The final 132kV compound is located to the south (South Compound in **Figure 2-17a-b**). These compounds would be connected via underground cabling and a separate PoC would be within the National Grid Substation (Point of Connection 1-2 depicted on **Figure 2-12a-b**) acting as the PoC for the 33kV and 132kV connections. Option 2 would consist of the following compounds:

- Point of Connection 1-2;
- North Compound 1;

- North Compound 2;
- North Compound 3; and
- South Compound.

Option 3 (Works No 2(c))

2.4.38 Option three (**Figure 2-18**) would include a single 132kV grid yard located in South Compound (depicted in **Figure 2-17a-b**) along with a 33kV control room to be located in the north-western section of the Site (North Compound 1 in **Figure 2-11**). A 33kV and 132kV transformer would be located within the National Grid Substation and act as the PoC (Point of Connection 1-2 in **Figure 2-12a-b**). Grid connection Option 3 would consist of the following compounds:

- Point of Connection 1-2;
- North Compound 1; and
- South Compound.

Option 4 (Works No 2(d))

2.4.39 Option four (**Figure 2-19**) would include a single 33kV grid yard located in the Grid Yard to the north (North Compound 1 in **Figure 2-13**). A 33kV and 132kV transformer would be located within the National Grid Substation and act as the PoC (Point of Connection 1 in **Figure 2-12a-b**), the transformer would subsequently connect to tee offs at the base of the existing pylons and therefore the transmission grid located to the north of National Grid Substation (Tee Connections 1-2 in **Figure 2-13a-b** and **Figure 2-14a-b** respectively.). Grid connection Option 3 would consist of the following compounds:

- North Compound 1;
- Point of Connection 1; and
- Tee Connections 1-2.

2.4.40 Each of the above Compounds are being refined through the iterative design process, which compounds are taken forward for the Proposed Development will be dependent on which option is instructed by National Grid. Further details of each compound are set out below:

- Tee Connection 1 and 2 – constitutes a Tee Connection to enable connection of Point of Connections 1-2 to the transmission network. This would include the following infrastructure:
 - Cable Sealing End Towers, Disconnectors, 36kV circuit breaker and a 2.4m palisade fence. Further plans showing the location, size and elevation of this compound are shown in **Figure 2-13a-b** and **Figure 2-14a-b**.
- Point of Connection 1 and 2 - a compound containing electrical equipment within National Grid Substation. This would include the following infrastructure
 - 33kV switchroom, 132kV transformer and cable sealing end. Further plans showing the location, size and elevation of this compound are shown in **Figure 2-12a-b**.
- North Compound 1 - a compound containing electrical equipment to enable connection to the national grid. This would include the following infrastructure:
- Two 33kV control rooms (switchrooms) and associated infrastructure. Further plans showing the location, size and elevation of this compound are shown in **Figure 2-10a-b**.
- North Compound 2 - a compound containing electrical equipment to enable connection to the national grid. This would include the following infrastructure:
 - 132kV transformer, switchroom and associated infrastructure. Further plans showing the location, size and elevation of this compound are shown in **Figure 2-11a-b**.
- North Compound 3- a compound containing electrical equipment to enable connection to the national grid. This would include the following infrastructure:
 - 132kV transformer, switchroom and associated infrastructure. Further plans showing the location, size and elevation of this compound are shown in **Figure 2-16a-b**.

- South Compound - a compound containing electrical equipment to enable connection to the national grid. This option includes a 132kV and a 33kV connection to a Private Connection.
- Up to three 132kV transformers, switchroom and associated infrastructure
Further plans showing the location, size and elevation of this compound are shown in **Figure 2-17a-b**.

Crossings

- 2.4.41 There are road, water, footpaths, third party services, and other crossings along the cable routes which criss-cross the Site. Each crossing will be individually reviewed/surveyed during detailed design to confirm the crossing methodology employed. The crossing schedule is provided in **Appendix 2C**. The crossings include access track bridges, cable tray crossings / pipe bridges and HDD crossings, each of which are described and locations provided in **Appendix 2C** and further are shown on **Figure 2-7a-b**.
- 2.4.42 The use of trenchless methodology, such as HDD is less intrusive from a crossing interaction, traffic management and environmental perspective, however the equipment used is louder and as it requires 24 hour working, proximity to noise receptors must be considered. Therefore, a mix of trenchless and cable tray crossings have been identified for consideration.
- 2.4.43 HDD involves drilling a bore from one location to another under the crossing. Following completion of the bore the ducts lengths are strung out and connected in a line of equal length to the crossing and pulled through. Each circuit will have separate HDDs. The configuration and design assumptions of the trenchless crossings will be determined during the detailed design phase and informed by the EIA process.
- 2.4.44 With regards to watercourse cable crossings and reen crossings, these crossings will be informed by the sensitivity of the watercourse, with trenchless construction techniques applied where appropriate. New reen crossings will be designed to minimise impacts to habitats and riparian species, sited away from sensitive locations (such as water vole burrows) and will avoid fragmentation of habitats.
- 2.4.45 **Figure 2-7a-b** demonstrates the proposed locations of crossings associated with the

Proposed Development. **Figure 2-20** demonstrates a typical cable bridge crossing.

Site Access

2.4.46 The Proposed Development would be primarily accessed via the M4 and the A4810 down Broad Street Common (ST 38552 85031) through to North Row (ST 41236 84602), which lies 403m north-east of the PEIR Boundary. The following access points depicted on **Figure 2-21** are proposed as main site entrances:

- Site Entrance 1: Access off North Row along unnamed access track (ST 38552 85031);
- Site Entrance 2: Access off the junction at North Row and Broad Street Common (ST 39852 85634);
- Site Entrance 3: Access off Sea Street Lane (ST 41300 84044):

2.4.47 A number of secondary points of access to the Site will be required across the Proposed Development owing to the extent of individual land parcels that comprise the PEIR Assessment Boundary. Further details relating to the secondary points of access will be confirmed once the general arrangement and layout of the Proposed Development is further developed, however it is anticipated that the main point of entrances identified will be predominantly used and the secondary access points used when required. The following secondary access points are depicted on **Figure 2-21** and are currently under consideration:

- Site Entrance 4: at Half Acre Corner (ST 37759 83557);
- Site Entrance 5: South Row (ST 41985 84457);
- Site Entrance 6: Access off Pill Street (ST 42611 85064);
- Site Entrance 7: Access off the unnamed road at the junction at Pill Street and Whitewall (ST 43337 85358); and
- Site Entrance 8 Access off the Causeway (ST 41318 83847).

2.4.48 It should be noted that a proportion or all of the proposed access points depicted on **Figure 2-21** will be required to support the Proposed Development. Further details relating to the secondary points of access will be confirmed once the general arrangement and layout of the Proposed Development is further developed, however it is anticipated that the main point of entrances identified will be

predominantly used and the secondary access points used when required. The access strategy to the secondary points of access is currently still evolving and could potentially change as the design develops, this will be reported within the ES.

Internal Access Tracks

- 2.4.49 Within the Site, existing internal tracks depicted in **Figure 2-22**, points of access and field gates would be utilised where practical, however, in some cases these tracks need to be upgraded or new tracks would be constructed to provide access as shown on **Figure 2-21**. The internal tracks would be up to 5m wide and comprised of compacted stone with excavation kept to a minimum.
- 2.4.50 As detailed in **Figure 2-23**, 0.6m of sub-base and type 1 granular material will be underlain by a permeable geotextile layer (or similar material) providing a layer of separation between the road and the existing soil across the Site. Based on the current design there will be circa 22.8km of new access tracks required to support the Proposed Development and upgrades required to 5.5km of existing access tracks.
- 2.4.51 All internal tracks would be routed outside of the designated buffer zones for watercourses and reens, except for instances where they are crossing from one field to another. Where there will be a requirement to cross a watercourse or reen, different temporary methods may be required dependent on the ground conditions and environmental constraints present on the Site. It is proposed that a set of standard crossing types will be considered where practical, however, their precise locations and details of construction type and methodology will be assessed in the ES as this level detail is currently not known.
- 2.4.52 The indicative locations of proposed crossing points relating to internal access tracks are depicted in **Figure 2-21**. The design of the bridge crossing details is undergoing an iterative design review and will be set out at ES.
- 2.4.53 All scenarios would include a filter drain running along the length of the road where required. No ground levelling would be required across the Site.

Grid Connection Infrastructure access

2.4.54 Tracks would be developed to serve the infrastructure supporting the different Options 1 to 4 defined in **paragraph 2.4.36 to 2.4.40**. If they are to remain, it is intended that they will be [constructed to be permanent] and adopted by the Distribution Network Operator (DNO). The only permanent access tracks would be to serve the compound areas as indicated on the arrangement plans namely, **Figure 2-9 to Figure 2-19**.

Public Right of Ways

2.4.55 A number of footpaths that are Public Right of Ways (PRoW) are located within the PEIR Assessment Boundary (**Figure 2-24**). Noting that the Site lies on the boundary between Monmouthshire and Newport, the PRoWs located within the Site are as follows:

- Newport: 392/15A/1, 392/15/1, 392/14/1, 392/26/1, 392/27/1, 404/5/1, 404/6/1, 404/7/1, 404/3/1 Footpaths and 392/GL3/1 and 392/GL2/1 Green Lanes; and
- Monmouthshire: 372/58/2, 372/58/1, 372/59/1, 372/58/5, 372/58/3 and 372/56/1.

2.4.56 The Wales Coast Path is situated just outside the southern edge of the PEIR Assessment Boundary.

2.4.57 The existing Public Rights of Way (PRoW) that cross the Proposed Development and Ecological Mitigation an Enhancement Areas will be retained and incorporated within multifunctional green corridors where possible.

2.4.58 Two PRoWs, within the PEIR Assessment Boundary, are to be permanently re-routed (**Figure 2-24**):

- A section of Footpath 404/3/1, approximately 1.2 km in length, will be diverted at X:339500, Y:183654 to adjoin Green Lane 392/GL5/1 (Mead Lane).; and
- a section of Footpath 404/5/1, approximately 400m in length, will be diverted between X:341060, Y:183591 and X:341152 and Y:183916.

2.4.59 Subject to the construction phasing and methodology there may be a requirement to temporarily divert or close other PRow for a period during the construction phase.

Surface Water Drainage

2.4.60 **Chapter 10: Water Environment** provides further information relating to flood risk and drainage design. A Surface Water Drainage Strategy (SWDS) will be developed for ES, however, the principles of the proposed SWDS can be found in the flood risk section of **Chapter 10: Water Environment**.

Fencing and Security Measures

2.4.61 A security fence with gated access will enclose the operational areas of the Proposed Development (Work 1). The proposed fencing will consist of stock proof fencing which would be comprised of timber and steel wire, or similar, as shown in **Figure 2-25**. The proposed access gate(s) will be located at each access location and will be up to 3.0m in height and 6.0m wide with fence posts measuring up to 3.0m high and 0.5m wide, spaced equidistantly up to 4.5m with concrete foundations driven up to 1.0m into the ground. The access gate(s) will also have concrete foundations which will be up to 0.6m wide and installed up to 1.2m below existing ground level. **Figure 2-26** demonstrates the layout of the proposed fencing.

2.4.62 There will be a total of 37.9km fencing surrounding the operational areas of the Site and it is anticipated that foundations will be placed every 4m which means a total area of 0.34ha will be impacted by the foundations.

2.4.63 CCTV infrastructure will consist of pole mounted cameras, positioned appropriately around the perimeter of the operational areas of the Proposed Development. The cameras will sit atop of a 3m CCTV post which will be set 0.8m within concrete foundations which extend to a depth of 0.9m and a width of 0.5m. **Figure 2-27** illustrates the typical CCTV posts and associated foundations. **Figure 2-28** demonstrates the location of the CCTV across the Site.

2.4.64 CCTV cameras would use night-vision technology with a 50m range, allowing for remote monitoring which avoids the need for night-time lighting. As such, no areas of the Solar Panels are proposed to be continuously lit.

2.4.65 Satellite dish posts would be located around the perimeter of the Site, positioned

atop of a 4m post which will be set 0.9m within concrete foundations and with a width of 0.6m.

2.4.66 It is anticipated that lighting will not be required around the Site, with the exception of the substation compounds. However it should be noted that this lighting would only be used for emergency purposes.

Green Infrastructure

2.4.67 The existing hedgerows, woodland, ditches, ponds and field margins will be retained within the layout of the Solar Panels, with the exception of breaks and/or crossings required for new access tracks, security fencing and cable routes or where to be removed in accordance with enhancement proposals.

2.4.68 The minimum offsets/buffers from the Solar Panels or security fencing, as set out in **Table 2-2**, will be incorporated within the design of the Proposed Development, with the exception of where access tracks, security fencing and/or cable routes are required to cross an existing feature. These offsets/buffers have been established based on best practice and guidance and will be used to deliver additional planting of diverse habitats to either increase habitat connectivity and structural diversity through combinations of, scrub, grass / wildflower planting. The buffers/offsets are a minimum and for example may be increased to deliver further mitigation or enhancements and/or respond to root protection areas where required.

Table 2-2 Minimum offsets and buffers applied within the PEIR Assessment Boundary

Landscape / Ecological Feature & Designations	Minimum Offset to Solar Infrastructure*
Ancient Woodland & Woodland	Not required as there are none located within the Site.
Veteran Trees	7m
Site boundary hedgerows*	7m
Internal hedgerows*	7m
Main river*	12.5m

Reens / ditches*

7m

*With the exception of where access tracks, security fencing and/or cable routes are required to cross an existing feature; however, these will be kept to a minimum.

2.4.69 The Proposed Development offers opportunities to enhance the quality of the Gwent Levels SSSI's (covering parts of Magor and Undy SSSI, Redwick and Llandevenny SSSI, Nash and Goldcliff SSSI and Whitson SSSI), in particular notified features: 'reen and ditch habitat', 'insects and other invertebrates' and 'shrill carder bee'. The current intensive agricultural management of the largely pastoral landscape could be enhanced to reduce livestock density and reliance on pesticides or fertilisers. Buffers to reens of semi-natural habitat will reduce run-off of nutrient enriched water entering the reens, and allow sensitive management for terrestrial invertebrates. In addition, the proposal for the removal of the southern hedgerow where double hedgerows exist on east-west running hedgerows will allow light to reach the reen, which would result in increased plant and fauna diversity within the reen. As such, the Proposed Development will restore historic ditch boundaries which would enhance the baseline conditions.

2.4.70 The sensitive management of the entire Site would be carried out in accordance with an Outline Landscape and Ecology Management Plan (oLEMP) which will enhance the Site for species including plant flora, reptiles, amphibians, brown hare and other species.

2.4.71 The bird mitigation and enhancement areas are shown on **Figure 2-29**. Further areas and described within **Chapter 8: Ecology** and **Chapter 9: Ornithology** will be shown in the ES. An outline LEMP has been produced to support this PEIR (**Appendix 8J**) and will be updated for ES.

2.5 Electricity Export Connection to National Grid

2.5.1 There is a requirement for the Proposed Development to connect to the grid transmission network. The proposed options for the grid connection described above would connect the Proposed Development into the national transmission system.

2.5.2 The electricity generated by the Proposed Development would be exported to the National Grid as the Distribution Network Operator (DNO). The Applicant has received offers of grid connection from National Grid. The Proposed Development

will connect to the existing electricity distribution site, National Grid Substation (275kV).

2.5.3 The offers from National Grid allow for the export of 380 MW from the Proposed Development.

2.5.4 The cable route will need to cross a range of existing infrastructure such as minor roads and tracks, existing buried/underground utilities (specifically the TATA pipeline that transects the Site, reens, field drains and main drains.

2.5.5 The Grid Connection Corridor route is shown in **Figure 2-6** and is subject to an iterative design process.

2.6 Construction

2.6.1 The construction of the Proposed Development is anticipated to take up to four years spread across three phases; however, the final programme will be dependent on the detailed layout design and consideration of potential environmental constraints on the timing of construction activities. As such, the ES will present further details relating to the construction activities, as well as their anticipated duration. These issues will be addressed in the ES.

2.6.2 A construction period of four years has formed the basis of the PEIR assessment. The construction programme will be split up into three phases (**Figure 2-30**).

Construction Activities

2.6.3 The construction activities associated with the Proposed Development are summarised below.

Site Preparation and Civil Engineering Works

2.6.4 The following enabling works would involve the preparation of the Site and carrying out the following activities:

- Site inductions & toolbox talks;
- Coppicing / removal of hedgerows (where required);
- Delivery of construction materials, plant and equipment to the Site;
- Establishing of the perimeter fencing;

- Establishment of primary and secondary temporary construction compounds;
- Upgrade of existing track and the construction of new and/or temporary site accesses, as required; and
- Upgrade of construction of crossing points over drainage ditches and below ground utility infrastructure.

2.6.5 It is anticipated that as part of the Site preparation phase hedgerow removal will be required to allow for crossings of access roads and low voltage cables across reens and field parcels. It is anticipated that 2m of each side of a reen edge would provide sufficient area for works on a bridge / cable tray. There would be a requirement to remove an estimated 2040m of hedgerow to enable the 355 cable crossings and a further 2040m of hedgerow for 160 bridge crossings. The total proposed hedgerow removal would therefore be an estimated worst case of 4650m. Further removal is being suggested as part of ecological enhancement, whilst mitigatory and compensatory measures are set out fully within **Chapter 8: Ecology** and **Chapter 9: Ornithology**.

Access Roads

2.6.6 The Proposed Development requires temporary and permanent access roads to be installed to support the construction, operational and decommissioning phases. Site preparation will include the removal of topsoil typically the upper 150-300mm, which will be stockpiled separately, as well as the installation of silt fences, hay bales or membrane buffer strips where road alignment nears watercourses or protected habitats. The following works will be undertaken to install permanent and temporary access roads:

- Excavation and grading of the ground and installation of subgrade to the designed formation level;
- Installation of geotextile membrane;
- Addition of sub-base and capping layers which are anticipated to include 600mm minimum 150mm sub-base and 450mm capping layer, with 50mm of blinding stone on top;

- Manipulation of layers to provide nominal 1:100 cross fall, and installation of filter drains as required;
- Final surface aggregate or top layer added and compacted to provide durable running surface; and
- Replace stored topsoil, verges and margins. Reinstate, reseed or replant as required.

Security Fencing and CCTV

2.6.7 The Proposed Development requires the installation of security fencing around the perimeter of the operational Solar Farm. During the Site preparation phase the relevant environmental protection measures including silt fences or straw bales, spill kits and flora / fauna protection measures will be implemented. The following construction activities would be required to install the perimeter fencing and CCTV:

- Hand excavation within 1m of reens to avoid undermining banks, excavating to required depths and dimensions (1.2m by 0.6m);
- Stockpile subsoil and topsoil separately on sheeting;
- Position and drive CCTV posts into the ground, pour concrete in-situ and allow 24 hours set time prior to fixing panels;
- Fix fence brackets to posts and fit gates in pre-set positions. Over watercourses maintain minimum clearance height; and
- Backfill post holes in layers and replace topsoil and reinstate vegetation.

2.6.8 The installation of Satellite dishes will follow a similar process to the above.

PV Array Installation

2.6.9 The following construction activities would be required to support the installation of the Solar Panels:

- Delivery and transport of solar infrastructure to Site;
- Screw Piling and erection of PV Mounting Structures, which includes foundations to a maximum depth of 3m (see **Figure 2-2** and **Figure 2-3**);
- Piling and erection of inverters, which includes foundations to a maximum depth of 3m, on the back of the Solar Panels (see **Figure 2-4**);

- Mounting of Solar Panels on PV Modules; and
- Installation of ancillary electrical equipment such as control systems, monitoring and communication to be installed on the back of the Solar Panels.

2.6.10 The method for installation is anticipated to be completed by the following methods; the preparation of the area, including top soil stripping, with the separate storage of top soil and where required the installation of silt fences or straw bales to prevent run off, the presence of spill kits and bins as well as the protection of any flora and fauna identified by the Ecological Clerk of Works (ECoW) prior to construction. Following initial works, the piling rig will be brought in and placed on a piling mat, piles will be installed systematically, with brackets / frames fixed to pile posts and PV Table set in position.

Installation of Transformers

2.6.11 To install the transformers, the foundation will be constructed first, this will include stripping and storing of the topsoil, which will be stored separately. Following Stripping 75mm concrete binding on 1125mm compacted Type 1 Hardcore will be installed and 375mm thick single size stone will be installed on top of this. The 300mm deep footings (1500x1000x300mm RC Footings) will be installed within the thick single size stone, raising the transformer to circa 1.2m above ngl in accordance with maximum flooding levels.

2.6.12 The Smart Transformer Station will subsequently be lifted into position using a crane, after testing of the foundations.

Construction of Onsite Electrical Infrastructure

2.6.13 The following construction activities would be required to support the construction of onsite electrical infrastructure. The construction of the different grid connection options and compounds are anticipated to follow similar processes for construction and installation including:

- Hand Excavation:
- Machine Excavation utilising a mini digger;
- Installation of piles, utilising temporary working platform for piling rig;

- Pouring of concrete via a concrete wagon into the prepared excavation, subsequently the concrete will be compacted by a vibrating poker unit and finished off by hand methods;
- Installation of reinforcement bars within the concrete utilising a telehandler or dumper;
- Transportation of electrical infrastructure to Site;
- Trenching and installation of electrical cabling; and
- Installation and construction of relevant substation infrastructure.

Construction of Cable Routes and National Grid Substation Connection

2.6.14 The following construction activities would be required to support the construction of cable routes and the connection to National Grid Substation.

- Site preparation and relevant civils works for the National Grid Substation (anticipated to be similar to the above);
- Horizontal Directional Drilling of High Voltage cables between compounds and National Grid Substation;
- Trenching of low voltage cables may be required within compounds; and
- Installation of compounds within Whitson and associated tee-offs.

Cable Tray Crossings

2.6.15 Cable Tray Crossings are required where low voltage cabling intersects a ree or ditch. These will consist of individual cable pipe crossing, consisting of a galvanised pipe supported on either end of the ree/ditch by a galvanised pile. This will allow the cable pipe to span across the ree without any excavation. The installation of the cable tray crossings is defined in the following five steps:

1. Excavation and Ground Preparation will include:

- Undertake hand excavation within 1m of reens to avoid undermining banks.
- For tray supports (posts/concrete pads), excavate to specified depth and dimensions.

- For buried trays/ducts, excavate trench to required depth (min. 600mm below finished ground level or as specified).
- Stockpile subsoil and topsoil separately on sheeting.

2. Installation of Tray Supports will include the following:

- Posts: Position and drive posts into the ground as per manufacturer specifications.
- Concrete Footings: If ground conditions require, install pre-cast concrete blocks or cast in-situ pads as per engineers' specification.
- Brackets/Support Frames: Fix brackets to posts; ensure line and level using a level and laser.

3. Laying and Securing Trays will include:

- Where trays are buried, lay marker tape 150mm above.
- For at-grade crossings, use steel cover plates or concrete slabs to protect from vehicles.
- On re-en banks, use anti-corrosion paint/coverings as specified.
- Install warning signage at both sides of crossing.

4. Crossing Protection

- Where trays are buried, lay marker tape 150mm above.
- For at-grade crossings, use steel cover plates or concrete slabs to protect from vehicles.
- On re-en banks, use anti-corrosion paint/coverings as specified.
- Install warning signage at both sides of crossing.

5. Backfilling and Reinstatement will include

- Carefully backfill trench or post holes in layers.
- Reinstatement ground to original levels/contours. Replace topsoil and reinstatement vegetation (seed or turf).
- Remove all surplus materials and waste.

Horizontal Directional Drilling

2.6.16 HDD will be required where high voltage cables intersect obstacles including reens, roads and farm tracks and pedestrian pathways. The indicative mud yard locations for launch and receival pits are shown in **Figure 2-8a-b**. Site preparation would include the confirmation of entry and exit points, including horizontal and vertical alignment. The following activities would be required to install the cables via HDD:

- Stringing area setup, identification of flat area aligned with bore path and set up rollers to support pipe string;
- Locate Mud Yard near HDD Entry point, install containment bunds to prevent fluid migration, set up tanks, pumps, mixers and mud recycling system;
- Install drill and bore along defined alignment, enlarge bore in stages using reamers, maintain continuous drilling fluid circulation;
- Attach pipe string and pull the pipeline back through the borehole; and
- Cap pipe ends, remove temporary works, dispose of drilling fluids as per environmental guidance and reinstate site to pre-work conditions.

Testing and Commissioning

2.6.17 Commissioning of the Proposed Development will include testing of the electrical transmission from the Proposed Development. Commissioning of the solar infrastructure will involve mechanical and visual inspection, electrical and equipment testing, and commencement of electricity supply into the grid.

Construction Staff

2.6.18 It is assumed that an average of 265 staff per day will be required to work across the Proposed Development. This number will be lower during other periods of the construction phase.

Construction Hours

2.6.19 Indicative hours for the construction work and any construction-related traffic movements to or from the Proposed Development are as follows:

- 07:00 to 19:00 hours Monday to Friday;

- 08:00 to 13:00 hours on Saturday.

2.6.20 Specifically, piling activities will be restricted to 09:00 to 17:00 hours Monday to Friday.

2.6.21 No activity outside of these indicative hours, including Sundays, public holidays or bank holidays will take place unless otherwise otherwise agreed in writing with Newport City Council and Monmouthshire County Council.

Construction Traffic and Site Access

2.6.22 The locations described in **paragraphs: 2.4.46 to paragraphs 2.4.48** have been identified as appropriate accesses for the construction phase. **Figure 2.21** depicts both primary and secondary access points across the Site.

2.6.23 The vehicle movements anticipated for the entire 4 year construction period have been summarised in **Table 2-3** below.

Table 2-3 Construction vehicle movements

Purpose	Type of Vehicle	Two Way Movements
Delivery of Solar Panels & PV Mounting Structures	16.5m Articulated HGV	1810
Inverters	10m Rigid HGV	156
DNO Cabinet	12m Rigid HGV	22
Customer Switchgear	10m Rigid HGV	22
Access Tracks – Temporary Ground Re-Enforcement Works	10m Rigid HGV /Tipper Truck	1050
Storage Compound	10m Rigid HGV	22
Other (Cabling, Construction Material, Waste)	12m Rigid HGV	714
General Front End JCB by low loader	Low Loader HGV	22

Purpose	Type of Vehicle	Two Way Movements
Erection of the Substation	16.5m Articulated HGV	68
Construction Crane	Crane	1
16 Circuit Breaker Units	Low Loaders HGV	16

2.6.24 Relevant noise levels associated with the machinery described in **Table 2-3** are provided in **Chapter 13: Noise and Vibration**.

2.6.25 An outline Construction Traffic Management Plan (oCTMP) will be developed as part of the EIA which will guide the delivery of materials and staff onto the Proposed Development during the construction phase. **Chapter 15: Transport and Access** presents further details relating to construction traffic movement.

Construction Compounds

2.6.26 Temporary Compounds will be used in the construction of the development. The location of the temporary construction compounds are indicated on **Figure 2-1a-b**, further details (including location, scale and duration) are set out and described within **Table 2-4**.

2.6.27 During the construction phase, a primary construction compound is expected to be located onsite with temporary secondary construction compounds provided at different locations throughout the Proposed Development shown in **Figure 2-1a-b**.

Table 2-4 Temporary Construction Compounds required for the construction phase of the Proposed Development.

Name	Area	Overall Perimeter
Potential temporary compound	6795m ²	369.5m
Temporary construction compound 1	4683.5m ²	283.5m
Temporary construction compound 2	3392m ²	391.5m
Temporary construction compound 3	5360m ²	353m
Potential temporary car park area	2961m ²	419.5m
Temporary construction compound 4	4299m ²	300m
Temporary construction compound 5	3709m ²	256m
Temporary construction compound 6	3375.5m ²	274.5m
Temporary construction compound 7	4327.5m ²	346.5m
Temporary construction compound 8	4511.5m ²	330.5m
Temporary construction compound 9	5302.5m ²	310m
Temporary construction compound 10	4724m ²	341m

Name	Area	Overall Perimeter
Temporary construction compound 11	4490.5m ²	289m

- 2.6.28 The construction compound constitutes temporary works and will remain for the duration of the construction period. The compounds will include provisions for storage of materials, office and welfare spaces, etc.
- 2.6.29 The compound areas will be positioned and built in a way that ensures minimal disruption to its surroundings in terms of noise to surroundings and any impact to nearby watercourses, reens, ditches, etc. As indicated on **Figure 2-1a-b**, the construction compound will be offset at a distance of 12.5m from the top of bank of any main river or reen and 7m from the top of bank of any other ditch.
- 2.6.30 The temporary construction compounds will be utilised in a sequential process, following the phasing of the construction process. Construction compounds 1 and 2 will form part of Phase 1, following completion of Phase 1 of construction the compounds would be decommissioned, infrastructure relocated, and the area panelled. This same process will be followed for Phase 2 (Temporary Construction Compounds 3, 4, 5, and 6) and Phase 3 (Temporary Construction Compounds 7).

Storage of Construction Plant and Materials

- 2.6.31 No long-term onsite storage of materials is required during the construction phase. Materials will be delivered via Heavy Goods Vehicles (HGVs) at regular intervals to the construction compounds and transported directly to where it is required within the Site using smaller Large Goods Vehicle (LGVs).
- 2.6.32 Short term storage of materials and plant can be accommodated within the construction compound until it is required.
- 2.6.33 Topsoil, spoil and other construction materials will be stored outside of the 1 in 100 year floodplain extent and only moved to the temporary works area immediately prior to use.

Storage of materials and disposal of surplus material

- 2.6.34 Materials will be delivered to the temporary construction compounds. Delivery vehicles are to unload within the compound, and the load is to then be distributed around the Site as per the needs of the construction activities and programme.

- 2.6.35 All delivery vehicles will be able to enter the Site, unload within the compound areas, and exit the Site. In the case of road construction, stone materials will be directly deposited to areas of construction to minimise double handling, reduce traffic movements and avoid excess dust. The Site will operate with a JIT (just in time) delivery protocol, which signifies only accepting a delivery of material soon before said material is to be used in the construction. By definition, this means only a small storage area will be required within the temporary construction compounds.
- 2.6.36 In alignment with the position of the construction compounds, materials shall not be stored within the following proximity of the watercourses, reens or ditches:
- Minimum of 12.5m away from the top of the banks of main rivers; and
 - 7m from the top of reen or ditch banks
- 2.6.37 Fuels are to be stored in double-skinned, locked and bunded fuel bowsers, as far away from watercourses as possible, and away from the regular passage of construction traffic. Spill kits shall be located next to the fuel bowsers, and any other potentially hazardous material will also be stored within designated, impermeable, bunded area, in keeping with the respective Control of Substances Hazardous to Health Regulations and Safety Data Sheet requirements.
- 2.6.38 Materials, plants, spill kits and fuel storage areas will be protected from vandalism and inspected regularly for signs of damage. Keys will be removed from unattended vehicles/plant.
- 2.6.39 Usable Surplus materials shall be returned to compound to either be returned to supplier.
- 2.6.40 All materials would be stored outside of the site-wide buffer zones of 12.5m from the top of bank of any main river or Internal Drainage Board reen to the Construction Zone (fence line of the development) and 7m from the top of bank of any other reen or ditch.

Construction Lighting

- 2.6.41 Works are to be undertaken under normal daylight and night working will be avoided.
- 2.6.42 Where artificial illumination is required, such as task lighting or compound lighting,

such lighting would be positioned at low level on posts / tripods and directed at the most frequently used areas of work.

- 2.6.43 Efforts will be made to ensure that any onsite lighting will be directed away from any of the identified site habitats. Inward facing security lighting would be provided at temporary construction compounds on a 24 hour basis.
- 2.6.44 Cowled lighting would be used to minimise light spill beyond site compounds which would only be in place during the construction period.

Construction Environmental Management Plan

2.6.45 An Outline Construction Environmental Management Plan (oCEMP) has been prepared to accompany the PEIR (**Appendix 2A**). The oCEMP describes/ will describe mitigation measures to be followed, to be carried forward to a detailed CEMP prior to construction. The aim of the oCEMP is to reduce nuisance impacts from the following:

- Use of land for temporary laydown areas, accommodation, etc;
- Noise and vibration;
- Utilities diversion;
- Dust generation;
- Soil removal;
- Lighting; and
- Waste generation.

2.6.46 The detailed CEMP will be produced by the appointed construction contractor following the making of the DCO and prior to the start of construction (for example, as part of a Requirement of the DCO). The CEMP will identify the procedures to be adhered to and managed by the Principal Contractor throughout construction.

2.6.47 Contracts with companies involved in the construction works will incorporate environmental control, health and safety regulations, and current guidance and will ensure that construction activities are sustainable and that all contractors involved with the construction stages are committed to agreed best practice and meet all relevant environmental legislation including: Control of Pollution Act 1974 (COPA)

(Ref 2-3), Environment (Wales) Act 2016 (Ref 2-4), Hazardous Waste Regulations 2005 (Ref 2-5) and the Waste (England and Wales) Regulations 2011 (Ref 2-6) all as amended.

Site Reinstatement and Habitat Creation

- 2.6.48 Upon completion of the construction phase, the temporary construction compounds and all other temporary works shall be dismantled and the top soil reinstated to its original state, where not being panelled. Following construction, the areas between panel rows will be power harrowed, re-seeded with vegetation. All developed areas of the Site will include a vegetation cover, appropriately managed, to promote low erosive sheet flow during the operational lifetime of the Development.
- 2.6.49 In areas of the Site with minimal disturbance, the grassland may be allowed to re-colonise naturally. Where more significant disturbance has occurred, bare ground will be restored to permanent grassland using an appropriate meadow seed mix. It is proposed that an appropriate seed mix such as Emorsgate EM8 or similar will be used.
- 2.6.50 This mix would be used for the areas within the PEIR Assessment Boundary where the sward has been damaged and cultivation and seeding are required.
- 2.6.51 An outline LEMP (oLEMP) has been prepared to accompany this PEIR which sets out the principles for how the land will be managed throughout the operational phase, following the completion of construction. A detailed LEMP will be produced following the making of the DCO and prior to the start of construction.

Spoil Management

- 2.6.52 The Proposed Development is anticipated to generate spoil from cable trenches, temporary construction compounds, internal roads and substation compounds. Whilst it is not anticipated that the Proposed Development will generate excess spoil that will require removal from the Site, specific areas within construction compounds will be designated for stockpiling and the temporary storage and management of spoil material. Should more locations be required, other areas may be identified in accordance with the Ecological Clerk of Works (ECoW) and will take into account the following conditions:

- Avoid flood-prone areas and buffer at least 12.5m from watercourses, drainage ditches, and hedgerows.
- Stay clear of retained vegetation, protected habitats, and archaeological features.

2.6.53 Any spoil material generated will be used throughout the construction phase and utilised across the Site. Examples include the backfilling of cable trenches, reinstatement of temporary construction compounds.

Waste

2.6.54 All waste generated by the construction of the Proposed Development will be removed from the Site by a registered waste carrier to an appropriately licensed disposal location. All documentation will be available on site for inspection at any time. An oCEMP which covers waste removal has been prepared to accompany the PEIR, the detailed CEMP will be produced by the appointed construction contractor.

2.6.55 All waste removed from the Site will be managed in accordance with the detailed CEMP.

2.7 Operational Activities

2.7.1 The Operational Phase of the Proposed Development is proposed to be 40 years. From an operational perspective, activity within the Proposed Development will be minimal and would include vegetation management, equipment maintenance and servicing, replacement of any failing components and monitoring. It is anticipated that maintenance and servicing would include the inspection, removal, reconstruction, refurbishment or replacement of faulty or broken equipment and adjusting and altering the solar module orientation to ensure the continued effective operation of the Proposed Development and improve its efficiency.

2.7.2 Owing to the size of the Site, it is anticipated that 11 to 22 full or part-time operation and maintenance staff are required. These numbers will increase during seasonal vegetation or inspection cycles. Staff will work on Site, replacing and checking equipment, as well as remotely, to undertake remote monitoring of the Site's data and performance.

2.7.3 Any equipment that requires to be replaced during the operational phase will be

disposed of following the waste hierarchy, with materials being reused or recycled wherever possible. Any electrical waste will be disposed in accordance with the Waste Electrical and Electronic Equipment (WEEE) regulations, minimising the environmental impact of the replacement of any elements of the Proposed Development.

- 2.7.4 In the event of the need to replace any of the equipment used during the operational phase of the Proposed Development, there may be a level of HGV activity required onsite. However, this will be as required from time-to-time on a low frequency basis.
- 2.7.5 These numbers will be considerably lower than that of the construction phase and will not occur on a regular basis (i.e. only when maintenance is scheduled / required). Activities would include vegetation management, routine maintenance and the replacement of any equipment along with overall monitoring of the Proposed Development.
- 2.7.6 The land underneath and around the Solar Panels could be managed through sheep grazing in order to maintain the field vegetation during the Operational Stage of the Proposed Development. Alternatively it could be mechanically controlled through details set out in the LEMP.
- 2.7.7 The management of the landscape and ecological features will be undertaken in accordance with a detailed LEMP. An oLEMP has been prepared and included at **Appendix 8J** of this PEIR.
- 2.7.8 At this stage of the design, the number of visits and permanent staff provided in **paragraph 2.7.2** are indicative.

2.8 Decommissioning

- 2.8.1 The design life of the Proposed Development is expected to be 40 years starting from the date of energisation. Decommissioning is expected to take 24 months and will be undertaken in phases. An Outline Decommissioning Environmental Management Plan (oDEMP) has been prepared in support of this PEIR. A detailed DEMP will be prepared prior to decommissioning.
- 2.8.2 When the Operational phase ends, the Proposed Development will require decommissioning. All Solar Panels, PV Mounting Structures, structures,

foundations, cabling, Inverters and Transformers will be removed and recycled or disposed of in accordance with good practice following the waste hierarchy, with materials being reused or recycled wherever possible. All waste will be disposed of in accordance with relevant legislation at the time of decommissioning.

2.8.3 The future of the Grid Connection Infrastructure would be agreed with National Grid prior to commencement of decommissioning.

2.8.4 The effects of decommissioning are similar to, or often of a lesser magnitude than construction effects and will be considered in the relevant sections of the PEIR. However, there can be a high degree of uncertainty regarding decommissioning as engineering approaches and technologies are likely to change over the Operational Stage of the Proposed Development.

Land Reinstatement

2.8.5 The land within the PEIR Assessment Boundary will be returned to its original use after decommissioning; however, it is anticipated that all areas of habitat and biodiversity mitigation and enhancement will be left in-situ given they could contain protected species and so relevant licences at the time would be required for any changes.

2.9 References

- Ref 2-1 Planning Inspectorate (2018); Advice Note 9: Using the Rochdale Envelope. Available at:
<https://infrastructure.planninginspectorate.gov.uk/wpcontent/uploads/2013/05/Advice-note-9.-Rochdale-envelope-web.pdf> [Accessed: November 2025].
- Ref 2-2 Department for Energy Security and Net Zero (2023) National Policy Statement for renewable energy infrastructure (EN-3) Available at:
<https://www.gov.uk/government/publications/national-policy-statement-for-renewable-energy-infrastructure-en-3> [Accessed: November 2025].
- Ref 2-3 Control of Pollution Act 1974. Available at:
https://www.legislation.gov.uk/ukpga/1974/40/pdfs/ukpga_19740040_en.pdf [Accessed: November 2025].
- Ref 2-4 Environment Act 1995. Available at:
https://www.legislation.gov.uk/ukpga/1995/25/pdfs/ukpga_19950025_en.pdf [Accessed: November 2025].
- Ref 2-5 The Hazardous Waste (Amendment) Regulations 2016. Available at:
<http://www.legislation.gov.uk/uksi/2016/336/made> [Accessed: November 2025].
- Ref 2-6 Waste (England and Wales) (Amendment) Regulations 2014. Available at:
<https://www.legislation.gov.uk/uksi/2014/656/contents/made> [Accessed: November 2025].