

5 CONSTRUCTION METHODOLOGY & PHASING

Introduction

- 5.1 This chapter describes the anticipated construction and decommissioning methodology and phasing of the Development. Consideration of likely significant effects on the environment that may arise during the construction and decommissioning phases, and any necessary mitigation measures are provided within the respective technical chapters of this ES.
- 5.2 Planning for construction and decommissioning is necessarily broad at this stage and may be subject to modification. This chapter is based on reasonable assumptions and experience that allows assessment of the realistic “worst case” construction phase effects.

Anticipated Programme

- 5.3 The construction phase is anticipated to commence in 2027, based on anticipated timescales for determination. The construction phase is anticipated to take approximately 9 months. The modelled operation period is anticipated to be 40 years.

Construction Methodology

Machinery

- 5.4 Consideration has been given to the types of plant that are likely to be used during the construction works. The plant and equipment likely to be associated with each key element of the construction process is set out in Table 5.1.

Table 5.1 Plant used during the Construction Process

Type of Equipment	Required for Construction Phase
Tracked/wheeled 360-degree excavators	✓
Dumpers	✓
Mobile cranes	✓
Manitou	✓
Bobcat	✓
Handheld tools including breakers (pneumatic and hydraulic)	✓
Power tools including percussion drills, cutting disks, pipe-threaders	✓
Piling equipment (rotary piling)	✓
Wheel washing plant	✓
Scaffold	✓
Mobile access platforms	✓
Delivery trucks	✓
Skips / Skip trucks	✓
Forklift trucks	✓
Ready mix concrete wagons	✓
Road sweepers	✓

Construction Overview

- 5.5 The construction works will comprise five key stages: site preparation, solar array installation, associated infrastructure installation; and completion works. Further details of each stage are described below:

Site Preparation

Site Establishment

- 5.6 The initial stage of works will include the access works and visibility splay improvements, marking out the Site, creation of the construction compound and temporary welfare facilities, rerouting of the PRow and installation of signage and temporary fencing, where necessary. During this stage initial deliveries of stone or temporary matting to form the base of the construction compound and roads would be undertaken. The initial stage of works will also include the delivery of excavation equipment on the Site. Site Groundworks
- 5.7 Site preparation will include the installation of maintenance tracks whilst an area of hardstanding will be made for substations, transformers and associated equipment, which will involve excavation. Temporary drainage measures will be implemented on the Site during the Site preparation stage. Trenches for the cable connections within the Site will be excavated and timed to minimise impact on other activities.

Site Fencing

- 5.8 As part of the Site preparation, installation of perimeter fencing (deer fencing) will be installed around the perimeter of the Site, as well as other temporary ecological buffer zones and tree protection fencing.

Ecological Clerk of Works

- 5.9 An Ecological Clerk of Works (ECoW) will be nominated at the site preparation stage, see the oCEMP (Appendix 5.1) for further details. The oCEMP also sets out a general precautionary approach to hedgerow removal works, works impacting (or with the potential to impact) watercourses, biodiversity protection to avoid impacts on protected species, and construction phase ecological monitoring..

Construction of the Substation

- 5.10 The substation is the connection between the Solar Array and the National Grid Electricity Distribution Network, construction works will be completed by both parties. Access tracks will be constructed and ground cleared to enable platform construction to support electrical transformer and switchgear installation as well as the export cable to connect to the nearby 132kv OHL circuit. The substation will be fenced for security.

Solar Array Installation

- 5.11 The components will be delivered to localised distribution points within the Site from where they will be distributed by bobcat or other associated distribution vehicle. The equipment used is similar to agricultural machinery used on arable farms and is specifically designed to ensure minimal soil compaction.
- 5.12 The installation of the solar panels and their supporting framework will be undertaken in sequence across the Site. First, the vertical support 'legs' of the framework will be piled driven into the ground to a depth suitable to ground conditions but typically to a depth of 0.5 m to 4.5 m. The horizontal framework will then be attached to the vertical support and associated metal rails and fixings attached using nuts and bolts. Connecting cables will be installed in the support rails and then the solar photovoltaic panels will be fixed to the framework. Finally, the electrical connections between the individual panels, and panel rows will be made. The sequencing of the parcels will be determined by the appointed contractor. No chemicals or below ground lubricants will be required with the vertical support 'leg' of the supporting framework driven into the ground.
- 5.13 The piling method will be determined prior to works commencing depending on the final PV array supporting framework design forming the Development and further ground studies.

Associated Infrastructure Installation

- 5.14 Associated infrastructure comprising the substation, edge of park switchgear station and a monitoring cabin. This will be located within the central region of the Site.

- 5.15 String inverters and transformer stations are distributed around the Site. The inverters are fixed to a previously installed metal structure (piled legs with cross beams) and positioned in the shade of the solar array whereas the transformer stations will be mounted on concrete foundations and include an oil bund sized to collect at least 110% of the volume of oil within the transformer in event of a spill.
- 5.16 The majority of cabling is above-ground and will be mounted in strings beneath the panels. Cables that are required to be buried under the ground will be installed using trench equipment. The maximum depth of the cable trench will be anticipated to be 1.2m deep.
- 5.17 In addition, CCTV cameras will be installed on the Site. The CCTV poles will be secured in a concrete base. Additionally, up to 3m high fences surrounding the Site will enclose the Site.

Completion Works

- 5.18 The final stage of works includes the commissioning and testing of all systems on Site, including electrical testing. The relevant installation, safety and compliance tests will be passed prior to the first export of electricity from the Development.

Details of Proposed Storage of Materials

- 5.19 Where practical, most of the materials necessary to construct the Development will be distributed directly into the area where they will be installed following delivery onto the Site. When the materials will be stored in temporary construction area, materials will be stored only for a short time period prior to be utilised on the Site after being delivered at regular intervals.
- 5.20 All materials will be stored appropriately and in a safe manner. For example, fuel for construction plant and equipment and other flammable materials, will be stored within bunded containers, located away from sources of accidental ignition and in accordance with all applicable legislation and guidance. The Site and temporary Site construction compound areas will be kept to a good standard of tidiness.

Temporary Site Lighting

- 5.21 The only lighting that will be installed on Site will be around the substation compound. This lighting will only be used when maintenance is being carried out during the operation period or at the end of the day during construction. During construction, there will also be lighting at the construction compound and there may be a need for temporary lighting towers to ensure the construction team can carry out their works safely during short winter days. These would be localised to the area where work is carried out.

Dust Management and Cleaning of Wheels

- 5.22 Construction traffic will be managed to ensure that the construction route into the Site along Lower Lamphey Road and accesses to the Site will be kept clean of dust, debris and mud during the works. Wheel cleaning of HGVs exiting the Site will be undertaken when necessary. As an additional measure, as required, a road sweeper will be deployed by the Site manager if necessary.
- 5.23 Measures will be put in place to ensure that dry wheel washing (or other run off from rainfall) does not drain onto the public highway or carry sediment.
- 5.24 Dust suppression measures will include the storage of sand and other aggregates in bunded areas and, where possible, they will not allowed to dry out. The dry sweeping of large areas will be avoided and it will be ensured that surfacing equipment is only operated with any manufacturer's dust measurements in place.
- 5.25 All construction traffic including delivery vehicles will be limited to 20mph to minimise the generation of air borne dust. The roads will be dampened at times of extended dry weather.

Details of Emergency Procedures and Pollution Response Plans

- 5.26 Emergency contact details for the Site / H&S manager will be placed on a notice board near the Site entrance. A pollution response plan will be prepared by the contractor following appointment. The

pollution response plan will follow appropriate guidance and cover matters including fuel delivery and fuel storage, provision and control of silt, working near water bodies and sources of soil and groundwater contamination.

- 5.27 The pollution response plan will fully outline the measures to be adopted in the event of a spill and pollution incident.

Agricultural Land and Soils

- 5.28 Good working practices will be implemented to ensure soil structure is not damaged as a result of trafficking or trench works, and a Soil Management Plan will be produced. An outline Soil Resources Management Plan is included as Appendix 8.2 of this ES. Good working practices will mean that disturbance to the soil profile is limited only to those areas where substation and inverter bases are located and where trenching for cabling is needed. For the cabling, these soils will be replaced in the order they were removed, such that even localised works do not affect agricultural land quality. In areas where infrastructure is required for the duration of the operational period, such as tracks or inverter bases, soils will be stored and seeded in bunds so that these areas will be capable of restoration on decommissioning. Access to all farmed areas not within the Site will be retained throughout the construction period.
- 5.29 Construction work at the Site will not suspend agricultural management of the land and forms the start of a period of altered agricultural use or practices for the occupying farm businesses. The equestrian activities will continue as currently.

Construction Noise Mitigation

- 5.30 Construction activities can give rise to noise associated with the works required to construct the Development. The piling of the supporting structures to the solar array framework is typically the activity which generates most noise during the construction phase. Where possible, plant and equipment utilised in construction works, will be deployed with suitable noise mitigation or specification (i.e., the quietest plant or construction method feasible) in any sensitive areas.

Drainage Works

- 5.31 Temporary drainage infrastructure will be installed to manage and regulate surface water run-off during the construction period.
- 5.32 To ensure that the Development does not have any adverse off-Site impacts or increase flood risk elsewhere, surface water will be managed using sustainable drainage system (SuDS) techniques. SuDS Approval Body (SAB) approval would be obtained prior to works. It is anticipated that these will be constructed during the infrastructure works when installing the temporary surface water management measures. Engineering works will be required to allow suitable depth and extent of drainage basins.
- 5.33 All Site works will be undertaken in accordance with CIRIA (2001) Control of Water Pollution from Construction Sitesⁱ which promotes environmental good practice for control of water pollution arising from construction activities.
- 5.34 Construction vehicles will be properly maintained to reduce the risk of hydrocarbon contamination and will only be active when required. Construction materials will be stored, handled and managed with due regard to the sensitivity of the local water environment and thus the risk of accidental spillage or release will be minimised.
- 5.35 Any above ground storage tanks will be located on a designated area of hardstanding. No underground storage tanks will be used during the construction period. Storage of liquids such as degreasers, solvents, lubricants and paints will be in segregated, bunded enclosures. The construction drainage system will be designed and managed to comply with BS6031 "The British Standard Code of Practice for Earthworks"ⁱⁱ, which details methods that should be considered for the general control of drainage on construction sites. Further advice is contained within the Geotechnical Design, General Rules (BS EN 1997)ⁱⁱⁱ which should be read in conjunction with Basis of Structural Design (BE EN 1990)^{iv}.

Material and Resource Use

- 5.36 The primary construction materials to be used will include silicon, aggregate, steel, aluminium timber. Associated electrical equipment, such as the inverters/ transformers will be delivered to the Site in containerised form. Where possible, materials and resources used during the construction of the Development will be sourced from the local area. Materials likely to be sourced locally include stone and fencing.

Construction Phase Vehicle Movements

- 5.37 Construction vehicle movements will be managed to minimise the impact on the local road network. The construction of the Development will generate approximately 98 vehicle movements per day at the peak of construction, 48 of which are two-way HGV movements. The vehicle movements during the decommissioning phase are expected to be similar to the construction phase.
- 5.38 Construction activities and deliveries will be carried out within the standards hours of work (see below). Where possible, construction deliveries will be coordinated to avoid construction vehicle movements during the traditional AM peak hour (08:00-09:00) and PM peak hour (17:00-18:00).

Controls to Protect the Environment

- 5.39 The environmental controls (or mitigation measures) to eliminate, reduce or offset likely significant adverse effects on the environment during the construction phase (as identified above) are identified below. It is anticipated that these controls will be secured by appropriately worded planning conditions or obligations:
- 5.40 An outline Construction Environmental Management Plan (oCEMP) (Appendix 5.1) has been prepared for the Development. A detailed CEMP will be secured via planning condition prior to the commencement of the Development which would consolidate the various mitigation measures identified in this ES and would be agreed with PCC and relevant statutory bodies.
- Requirement to comply with the CEMP included as part of the contract conditions for each element of the work. All contractors tendering for work will be required to demonstrate that their proposals can comply with the content of the CEMP and any conditions or obligations secured through the planning permission;
 - A Construction Traffic Management Plan (CTMP) has been prepared as part of the Transport Statement (submitted in support of the planning application) to outline traffic management procedures during the construction phases. Details of the CTMP will be secured via a planning condition.
 - In respect of necessary departures from the above, procedures for prior notification to PCC, as appropriate, and affected parties will be established;
 - Establishing a dedicated point of contact and assigning responsibility to deal with construction related issues if they arise. This will be a named representative from the construction team; and
 - Regular dialogue with PCC and the local community.
- 5.41 The preparation of the oCEMP is an established method of managing environmental effects resulting from construction works. Following a secured planning condition, the CEMP will be submitted to PCC (and other statutory authorities) for approval prior to the commencement of the works. The structure of the CEMP will include the following:
- A table showing the objectives, activities (mitigation/ optimisation measures), and responsibilities for the implementation of those activities;
 - The broad plan of the work programme including working hours and delivery times;
 - Details of prohibited or restricted operations (location, hours etc.);

- Institutional arrangements for its implementation and for environmental monitoring: responsibilities, role of the environmental authorities, participation of stakeholders;
 - Contact during normal working hours and emergency details outside working hours;
 - Provision for reporting, public liaison, and prior notification of particular construction and decommissioning-related activities;
 - The mechanism for the public to register complaints and the procedures for responding to such complaints; and
 - The details of proposed routes for HGVs travelling to and from the Site.
- 5.42 Low levels of waste materials are expected during the construction phase due to the nature of the Development. The photovoltaic panels will be recycled, in accordance with the legislative requirements in place at the time¹, or re-used for other uses or projects in the local area once the Development is decommissioned.
- 5.43 To ensure that materials are handled in line with sustainable management principles, the CEMP will include appropriate waste management measures with the aims of achieving efficient use of material resources; minimising the amount of waste produced; and achieving, as far as possible, zero waste to landfill. The exact waste management measures will be set out in the CEMP but could include:
- Guidance for the provision for the segregation of waste streams on Site that are clearly labelled;
 - A mechanism to record the proposed carriers and licences for disposal sites;
 - An audit trail encompassing waste disposal activities and waste consignment notes;
 - Measures to provide adequate training and awareness through toolbox talks; and
 - Outline of opportunities for reuse and recycling.

Management of Construction Works

- 5.44 All contractors will be required to complete a task specific risk assessment and method statement (RAMS) prior to commencement of any works on Site.

Response to Complaints

- 5.45 Any complaints will be logged on-Site and, where necessary, reported to the relevant individual within PCC, as appropriate, as soon as practicable. Further details are provided in the oCEMP (Appendix 5.1).

Prior Notice

- 5.46 In the event of unusual activities or events, these will be notified to PCC, as appropriate, and relevant property owners or occupiers in advance. The relevant activities will be agreed with PCC, as appropriate, once the detailed programme of construction is defined. This will include:
- Necessary night-time, weekend or evening working (outside core areas) of a type which may affect properties; and
 - Road or footpath closures/diversions and movements of wide loads (the latter are unlikely).
- 5.47 The community will be kept informed during the construction phase through press adverts, PCC and through direct notification to PCC as appropriate.

¹ **Workplace recycling | GOV.WALES**

Decommissioning Methodology

- 5.48 Following the operational period of 40 years, the Development will be decommissioned, and the Site could be returned to its current agricultural use.
- 5.49 All solar array infrastructure including modules, mounting structures, cabling, inverters and transformers would be removed and, materials reused, recycled or disposed of in accordance with good practice and the legislative requirements in place at that time. The future of the electrical compound including the substation would be discussed with the distribution network operator and agreed with the landowner and PCC prior to commencement of decommissioning.
- 5.50 These works would be undertaken according to legislation, regulations and best practice that are current at the time of decommissioning.
- 5.51 An outline Decommissioning Environmental Management Plan (oDEMP) (Appendix 5.2) will be prepared to ensure that decommissioning is undertaken in line with prevailing good practice at the time. A detailed DEMP will be secured via planning condition prior to the commencement of the Development. The DEMP will include similar measures to those included in the CEMP submitted with the Application, covering issues such as:
- Transportation methods;
 - Pollution prevention; and
 - Noise management.
- 5.52 In addition, the DEMP will include details of ecological survey(s) to be undertaken prior to the commencement of decommissioning works to inform potential sources of impacts and necessary mitigation/compensation required to ensure legal compliance.
- 5.53 The decommissioning programme will likely involve the following steps:
- Installation of loading, packing and welfare compounds
 - Panel dismantling;
 - Panel support removal;
 - CCTV infrastructure removal;
 - Substation and inverters pile removal
 - Fencing removal;
 - Roads and foundations removal; and
 - Cable removal.

Hours of Work

- 5.54 Working hours on the Site will be agreed with PCC through the detailed CEMP. However, the standard hours of work will be adhered to. These are:
- Monday to Friday, 7am to 7pm with noisy activities limited to 8am to 6pm;
 - Saturday, 8am to 1pm; and
 - Sunday and Bank Holidays, no noisy activities on-Site.

- 5.55 All work outside these hours will be subject to prior agreement of, and/or reasonable notice to PCC, as appropriate.
- 5.56 Night-time working will be restricted to exceptional circumstances and work internally with buildings. By arrangement, there may be some out of hours construction deliveries made to the Site.

REFERENCES

-
- ⁱ CIRIA C532 (2001) Control of Water Pollution from Construction Sites Guidance for consultants and contractors
 - ⁱⁱ British Standards Institution (December 2009) BS6031:2009 Code of Practice for Earthworks
 - ⁱⁱⁱ British Standards Institution (December 2004) BS EN 1997-1:2004 Eurocode 7. Geotechnical Design. General Rules.
 - ^{iv} British Standards Institution (2002) BS EN 1990: 2002 Basis of Structural Design