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4. Description of the Proposed Development

4.1 Introduction

4.1.1 This Chapter provides an overview of the Proposed Development, including a description of the Site, infrastructure elements, and the key elements of the construction, operational and decommissioning phases. The extent of the Site and its wider geographical context is set out in **Figure 1.1** and **Figure 1.2.**

4.1.2 The description of the Proposed Development presented in this Chapter has been used by the EIA technical specialists as the basis for assessing its effects upon the environment.

4.2 Development description

4.2.1 The Proposed Development is a wind farm consisting of a maximum of eight wind turbines, each with a three-bladed rotor with a diameter of up to 150m, a hub height of up to 122m and maximum height to blade tip of 180m. **Table 4.1** provides the grid references for each turbine.

4.2.2 The application also comprises associated infrastructure including:

- Access works - improvements to the existing access together with new and improved internal wind farm tracks off the main internal access road;
- Crane pads at each turbine location;
- Turbine foundations;
- Underground power cables linking the turbines and the on-site substation;
- Temporary construction compounds, laydown, and storage areas; and
- Grid connection infrastructure, including the on-site substation, control building and underground cables linking the Site to the distribution network, together with construction enabling works.

Site location

4.2.3 The Site lies mainly within the Torfaen County Borough Council (TCBC) administrative boundary, with the western part lying within the Blaenau Gwent County Borough Council (BCGBC) administrative boundary. The Site boundary is approximately 300m from the eastern edge of Llanhilleth. The village of Brynithel is located approximately 500m to the south west of the Site at its closest point at Blaencuffin Road.

4.2.4 The Site is accessed from an existing tarmac road called British Road which is accessed from the B4246 to the east of the Site in the settlement of Talywain.

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Existing site and surroundings

4.2.5 The Site encompasses an area approximately 267.59 hectares (ha) and is shown in **Figure 1.1** and **Figure 1.2** and comprises a former quarry and associated area of coniferous woodland across its southern extents and intensively managed species-poor grassland, located within the high ground between the Afon Valley to the east and the Ebbw Fach Valley to the west. A number of public rights of way cross the Site, and an area of Open Access Land is located immediately to the west. The northern slopes of the site are characterised by coniferous and non-coniferous woodland.

4.2.6 Areas of the Site are designated as Mynydd Llanhilleth Common; it is intended that the DNS Application will be accompanied by a secondary application for consent to deregister and exchange common land and for consent to carry out works on common land.

Wind Farm development proposals

4.2.7 The application also comprises associated infrastructure including access improvements, new and improved internal wind farm tracks, crane pads, temporary construction compound, laydown and storage areas and grid connection infrastructure, including an on-site substation.

4.2.8 The wind farm will be designed with an operational life of 30 years. At the end of this period the Applicant has three options; to decommission the wind farm and dismantle and remove the turbines; to apply for an extension to the operating period using existing equipment; or apply to install new equipment on the site. For the purposes of this assessment, it is assumed that the wind farm would be decommissioned.

4.2.9 The layout of the Proposed Development, incorporating maximum tip heights of up to 180m, has been chosen because it balances high productivity with the environmental sensitivities present at the Site. The grid references for each turbine are provided within **Table 4.1**.

4.2.10 The current wind farm layout, including access tracks, temporary construction compound and substation are shown on **Figure 4.1a** and **4.1b.**

Table 4.1 Proposed turbine locations

Turbine ID	Easting	Northing
1	324630	202630
2	323855	202860
3	323485	202270
4	323770	201740
5	324821	201806
6	324695	201115
7	324830	200715
8	323300	201000

Site Access

4.2.11 The principal point of access into the Site is from an existing road called British Road which is accessed from the B4246 to the east of the Site in the settlement of Talywain. Upgrade works will be required to the junction to ensure it is suitable to accommodate all general construction traffic (site staff) and concrete, stone and turbine deliveries which will enter the Site. **Figure 4.2** provides details of this access.

4.2.12 The existing access track up to the Site will additionally require upgrade works at certain points to allow sufficient space for larger construction and transport vehicles to reach the Site.

Grid connection

4.2.13 The connection between the on-site substation and the electricity grid at Pontnewynydd will be consented as part of the application for the wind farm development and will be constructed separately by Western Power Distribution (WPD). Through pre-application discussions undertaken with PEDW, it was agreed that the potential environmental effects resulting from the grid connection will be assessed in the Draft ES.

4.2.14 **Figure 4.3** illustrates the corridor within which the proposed grid connection would be routed, between the Site and a point which intersects with the existing WPD overhead line network to the east of the Site near Tal-Ochor Farm to the west of Pontnewynydd. The connection is likely to be between approximately 1.5km to 2km in length.

4.2.15 The exact construction / installation methodology to be implemented is dependent on the outcomes of further surveys to be undertaken by WPD. The following information is based on general design parameters provided by WPD; worst case scenario is assessed within the ES.

4.2.16 The underground cables can be laid directly into a trench or placed within ducts. The underground cable will be laid into a trench, using an open cut method, with a depth of up to 1.5m. The exact width of the trench is dependent on the final specification of the cable; however, it will be in the region of 600mm to 1.5m. The installation of the cables will further require a clearance distance of 5m either side of the trench, creating a corridor of approximately 11.5m. Upon completion of the installation of cables the ducts will be backfilled with sand before the remaining area is backfilled with the excavated material.

4.2.17 Trenching is likely to be the dominant form of construction, in certain circumstances an alternative method may be to drill a conduit into which the cabling can be installed. Known as Horizonal Directional Drilling (HDD) this approach is commonly used to place cables under natural features such as rivers or man-made infrastructure such as highways. In the context of this project, this technique is an option for installation in certain areas, therefore it, has been assessed within the ES as an alternative. HDD requires the creation of launch and reception sites with a laydown area for the placement of ducts and cables, and as a result temporary construction compounds may be required.

4.2.18 A tee-off structure will also be required at the point of connection, this will likely comprise a wooden H-Pole based on standard design parameters this H Pole will be 11m tall, upon which the line will be connected to the existing overhead line network.

4.2.19 The evaluation of potential effects from the grid connection presented in this Draft ES is based on baseline surveys, desk-based assessments and a worst-case scenario of a 66kV underground cable.

4.3 Delivery Route

4.3.1 It is anticipated that the Abnormal Indivisible Loads (AILs) (transporting turbine equipment) would travel by road from the Port of Swansea, which is the closest port in the region capable of handling wind turbine equipment. The Port of Swansea has been frequently used for the delivery of wind turbine components in this region, for example being the selected port of entry for Pant y Wal Wind Farm, located to the west of Tonyrefail and for Carn y Cefn Wind Farm.

4.3.2 An AIL access study has been undertaken and is provided as **Appendix 12B.**

4.4 Pre-Construction

4.4.1 This section describes those aspects that have become standard practice for developing a consented wind farm proposal into a buildable project. In the technical chapters of this Draft ES which follow, additional environmental management and mitigation proposals are set out and, for the avoidance of doubt, they are additional to the inherent environmental measures that are embedded into the development proposals as described in this Chapter.

Environmental Management Plans

4.4.2 A Draft Construction Environmental Management Plan (CEMP) would be produced prior to construction. Further detail on the CEMP is set out below in **Section 4.8** and a Draft CEMP is provided alongside this Draft ES. The CEMP will be secured as a condition of the consent.

4.4.3 The construction works would require a Construction Method Statement (CMS) to set out overriding construction principles, programme and health and safety requirements etc. The CMS would also be secured as a condition of the consent and would be agreed with the relevant local planning authority(s) in advance of commencement of development. Further detail on the CMS is set out below in **Section 4.8**. Additional CMSs corresponding to individual construction activities may also be provided. They would identify reference documentation for that activity; principally the CEMP and also any relevant individual management plans (e.g., waste, habitat, water management plans), legislation and construction drawings and documents. For each construction activity, the CMS would detail all environmental sensitivities pertaining to the activity alongside the controls/mitigation measures to be put in place. Approvals or consents required to complete the activity would also be described.

4.4.4 Detailed management plans are frequently requested as pre-commencement documents for agreement with the relevant local planning authority and relevant environmental regulators. Once these are agreed, the provisions and requirements set out therein would be incorporated into the CEMP. It is envisaged that the following may be required, but this yet to be confirmed:

- A detailed Transport Management Plan (TMP);
- A Water Management Strategy; and
- A Habitat Management Plan (HMP).

Geotechnical Investigations

4.4.5 Geotechnical Investigation (GI) work would be carried out at the pre-construction stage to determine detailed ground conditions to allow for the design of foundations and micro-siting of turbines, along tracks, and at construction compound and wind farm substation locations. This would provide support to the project team to develop further phases of detailed design work. The geotechnical fieldwork undertaken may include (but not be limited to): visual inspections; machine and hand excavated trial pits; windowless sample boreholes; rotary core boreholes; and sampling and laboratory based geotechnical and geochemical testing. This information would inform the detailed track design, the turbine foundation design and identify any micro-siting requirements.

4.5 Construction Activities

Enabling works

4.5.1 Prior to the main construction phase commencing, a number of enabling works may be necessary, including:

- Geotechnical investigations: excavation of trial pits or boreholes (see above);
- Upgrading of existing access point and tracks and construction of new access tracks and passing places inter-linking the turbine locations and sub-station; this will require import of suitable roadstone;
- Any required upgrades to public roads, including road widening to allow the abnormal loads to negotiate corners, protection of any below ground services and the temporary removal or resiting of infrastructure (ie signage); and
- Establishment of site compounds.

Local sources of stone

4.5.2 It is anticipated that stone would need to be imported from existing quarries and would be sourced from one or more of the local established sources identified below:

- Gryphonn Quarry, Trefil, Tredegar; and
- Hafod Quarry, Abercarn, Newbridge.

Site infrastructure

4.5.3 The following components would be required for the Proposed Development and typical design details are shown on the accompanying figures listed:

- Proposed Access Design (**Figure 4.2**);
- Proposed Grid connection corridor (**Figure 4.3**);
- Wind turbine foundation (**Figure 4.4**);
- Wind turbine crane hard standing (**Figure 4.5**);
- Internal site track cross sections (**Figure 4.6**);
- Typical cable trench details (**Figure 4.7**);
- Switchroom and substation compound (**Figures 4.8**);

- Substation Elevations (**Figure 4.9**); and
- Construction Programme (**Figure 4.10**).

Micrositing

4.5.4 In carrying out the various surveys that are necessary in advance of construction activities, environmental, geotechnical and health and safety sensitivities, as well as wind-related sensitivities such as turbulence, might be identified that could be avoided if the locations of turbines or tracks are re-sited to a relatively small degree (i.e., 'microsited'). It is therefore proposed that some flexibility for infrastructure micrositing be retained and that appropriate limits of deviation would be up to 50m for turbines and 100m for internal wind farm tracks and other infrastructure such as the substation and site compound. This mitigation may be restricted further in terms of specific locational hard constraints, for example not micrositing closer to a watercourse if within 50m of a watercourse.

Wind turbines

4.5.5 The turbines of the Proposed Development would be three bladed variable speed pitch regulated, with the rotor and nacelle mounted on a cylindrical tower. This is a typical modern, horizontal axis design comprising four main components: a rotor (consisting of a hub and three blades); a nacelle (containing the generator and often a gearbox) to which the rotor is mounted; a tower; and a foundation. The specific choice of wind turbine to be installed (hereafter called the 'reference turbine') is dependent on the final commercial and technical choice by the Applicant but would not exceed the physical parameters specified in the consent. A typical turbine is shown on **Figure 3.1.**

4.5.6 Wind turbines convert the kinetic energy of the wind into electrical energy, the air passing over the blades causing them to rotate. This low-speed rotational motion of the blades is converted into electrical energy by a generator located inside the nacelle at a nominal voltage of 690V.

4.5.7 A transformer located immediately adjacent to the turbine tower in a small kiosk (typically 5.0m x 2.5m x 2.5m (L x W x H)) steps up the voltage which is then fed to the control building via underground electrical cabling linking all of the turbine unit transformers. Some turbine options may allow transformers to be incorporated into the nacelle, or into the base of the tower itself. An external kiosk is more likely and therefore has been considered by this assessment as a worst-case assessment. The electricity generated by the Proposed Development would be metered and fed into the electricity transmission network to which it is connected.

4.5.8 The hub height and rotor diameter may vary depending on the final turbine type selected following competitive tender. For the reference turbine used to inform this assessment, an indicative 4.2MW machine has been considered with a hub height of 122m and rotor diameter of 150m.

4.5.9 The design process has considered an appropriate colour for the wind turbines. They would be painted in a neutral colour (colour specification, light grey RAL 7035) with a semi-matt finish so as to minimise the visual intrusion. Note however that the montages supporting **Chapter 6: Landscape and Visual Impact** are shown in white to ensure adequate contrast in the imagery. The components for each turbine would be brought to the Site separately, with the towers being delivered in three or four sections. The overall assembly process for each turbine takes approximately two to four days, depending on weather conditions.

4.5.10 Wind turbine towers, nacelles and blades will be transported to the Site via low bed trailers, some incorporating rear steering. The towers will be delivered in three or four sections, which will be stored at each turbine lay-down area until lifted into position. Some storage of components may also be required at the site compound dependent on weather conditions and access track construction progress at the time of delivery.

4.5.11 Two teams will carry out erection, each using either two road-going cranes (of approximately 100 tonne capacity and 500 or 800 tonne capacity) or crawler cranes. The construction contractors would determine the actual cranes used, together with the exact programme and number of teams on site.

Wind turbine foundations

4.5.12 Where rockhead, or suitable bearing, is relatively shallow (<2m), the wind turbine foundations will bear directly onto rock. Where rockhead or suitable bearing is between 2-5m depth, the existing overburden will be excavated and replaced with suitable load-bearing material, most likely to be imported stone.

4.5.13 The foundation design will depend on the results from detailed ground investigation, it is currently expected that turbines will not require piled foundations. Should piling be necessary, it is proposed to agree the methodologies for this and any conditions which may be appropriate with the determining authority prior to construction. It is expected that the conditions would vary depending on the relative location of the turbine to potential receptors for any adverse environmental impacts.

4.5.14 Foundations will usually comprise a reinforced concrete base slab with dimensions of approximately 20m diameter x 4m depth. This will include a circular steel support plinth to suit the base profile of the wind turbine steel tower and will then be overlaid by stone and previously excavated overburden and dressed back with topsoil to allow re-vegetation. The design of these foundations in terms of size and depth minimises excavation requirements, minimises visible projection above the ground and allows the re-establishment of surface vegetation following construction. The final choice of foundation design will be based on the most efficient use of materials and local ground conditions. A typical wind turbine foundation is shown on **Figure 4.4.**

Crane pads

4.5.15 Each wind turbine requires an area of hardstanding to be built adjacent to the turbine foundation. This provides a stable base on which to lay down turbine components ready for assembly and erection, and to site the two cranes necessary to lift the three-tower section, nacelle, and rotor into place. Areas for crane pads were identified to avoid sensitive ecology habitats, archaeological constraints, and areas of steeper gradients where possible. The crane hardstanding will be left in place following construction in order to allow for the use of similar plant should major components need replacing during the operation of the wind farm. These could also be utilised during de-commissioning at the end of the wind farms life. The total area of hardstanding at each turbine location including the turbine foundations and the crane pad will be sized to suit the turbine manufacturer's requirements but will be approximately 2,500m^2. A typical crane hardstanding is illustrated in **Figure 4.5**.

Internal wind farm tracks

4.5.16 Approximately 10.1km of site access tracks will be required which includes 5.8km of existing track, 2.2km of this existing track will require upgrades. The track construction will

be approximately (~)5m wide, ~0.6m deep (dependent of ground conditions), with a ~2m grass verge either side. Typical track cross sections are shown in **Figure 4.6.**

4.5.17 Further details relating to the movement of traffic on and off the site are reported in **Chapter 12: Traffic and Transport** and the Draft Construction Traffic Management Plan (**Appendix 12A**).

Track layout design

4.5.18 There are various constraints which have influenced the track layout design, some generic and some site-specific:

- Track length is kept to a minimum and utilises existing access tracks where possible to reduce environmental impact, construction time and material quantities (imported stone);
- Track length minimised on common land;
- New track gradients are to be kept to less than 8 percent (1 in 12.5) and radius curves to 50m where practicable to accommodate the requirements of delivery vehicles and also to allow construction plant to move safely around the Site;
- Track layout is designed to reflect contours and avoid cross slopes and deep cut and fill into existing terrain where possible; and
- Tracks are routed to avoid sensitive ecological, archaeological, and hydrological features, where possible.

4.5.19 The track design resulted from optimisation of these criteria.

Site Access

4.5.20 The Site Access point for the development is proposed from the B4246 through an unnamed road onto Farm Road. This will involve the upgrading of the junction which connects the B4246 and Farm Road, whilst Farm Road itself will require improvements to ensure it is suitable for construction vehicles. These works will include widening, earthworks, and vegetation clearance.

Electrical connection

4.5.21 Following turbine foundation construction, some of the required electrical infrastructure would be installed such as the small transformers to be located either internally within the turbine towers or adjacent to each turbine in a small kiosk (5.0m x 2.5m x 2.5m (L x W x H)) according to the selected turbine specification.

4.5.22 Underground cables will link the turbines to each other and to the on-site substation. Detailed construction and trenching specifications will depend on the ground conditions encountered at the time, but typically cables will be laid in a trench ~750mm deep and ~450mm wide. To minimise ground disturbance, cables will be routed along the side of the access tracks wherever practicable. **Figure 4.7** shows a typical cable trench detail.

4.5.23 The Site substation will connect the wind farm into the national distribution system off site (to be via a 66kv connection in the substation compound).

4.5.24 The arrangement of the substation, to be located in the northeast corner of the Site, would depend on WPD's requirements, and shall be determined by the rating of the grid connection and requirement for a step-up transformer. If required, a transformer would be

provided within the substation compound which would comprise a stoned area of approximately 37.5m x 35m containing the transformer and associated equipment (isolators, circuit breakers). If a transformer is not required, then all electrical equipment would be housed within the substation building. The substation building (approximately 14m x 10m) would be a single storey building which will house metering, protection and control equipment, storage, and welfare facilities. The substation building would be traditional blockwork construction and faced in stone with a slate roof. Associated fencing would be either moorland green/brown or dark grey in order to blend with either the existing landscape colours or traditional building colours for the area. **Figure 4.9** provides an illustration of the switchroom and substation compound.

4.5.25 Further details on the proposed grid connection to the wider electricity distribution network are provided in **Section 4.2.**

Site accommodation and construction compounds

4.5.26 A temporary site office comprising a portacabin, a single parking space and a vehicle layby would be located at the Site compound, near to Turbine 1. This office would be manned during construction hours and provide a sign-in / out function for the Site. This would prevent unauthorised vehicular access to the Site and allow supervision of anyone remaining on-site beyond agreed working hours.

4.5.27 The location of the main construction compound is illustrated on **Figure 4.1**. A maximum area of 50m x 50m in area has been assumed as a worse case for the assessment but this may be reduced depending on site requirements at the start of the construction phase.

4.5.28 Other temporary fenced compound areas will be established on turbine craneage areas as appropriate for security of plant in remote parts of the site. These will not require any additional hardstanding to that proposed for the craneage areas.

4.5.29 Once the erection and commissioning of the wind turbines is complete, the main construction compound would be removed and the land reinstated.

Site security and lighting

4.5.30 The construction compound would be lit with security lighting, which would face inwards to minimise light pollution. The construction compound may be enclosed within a security fence around the perimeter of the substation and the access to electrical compounds would be via a locked access gate.

Proposed working hours

Development timescales and programme

4.5.31 It is anticipated that the construction period for the Proposed Development would be approximately 22 months in duration. An indicative programme for construction activities is shown in **Figure 4.10.** The start date for construction activities is largely dependent upon the date that consent might be granted and grid transmission availability; subsequently the programme would be influenced by constraints on the timing and duration of any mitigation measures confirmed in the individual technical chapters or by the application decision.

4.5.32 Where possible, operations would be carried out concurrently (thus minimising the overall length of the construction programme). In addition, development would be phased such

that, at different parts of the Site, the civil engineering works would be continuing whilst wind turbines are being erected. Site restoration would be programmed and carried out to allow restoration of disturbed areas as early as possible and in a progressive manner.

4.5.33 The final length of the programme would be dependent on seasonal working and weather conditions. Summer months are favoured for construction due to longer periods of daylight allowing longer (and safer) working days. Summer months are generally also drier which aids construction progress and reduces the impact of site debris (mud etc) reaching the public highway, although wheel wash facilities would be installed at the main site entrance / exit points.

4.5.34 For the purposes of this Draft ES, subject to the caveats noted below, construction activities have been assumed to take place between 07:00 to 19:00 hours on weekdays and 07:00 to 13:00 on Saturdays. Quiet on-site working activities such as electrical commissioning have been assumed to extend outside the core working times, noted above, where required. No working will be undertaken on Sundays. Working hours may be reduced at times due to seasonal or weather restrictions or in certain locations where required as mitigation (for example during the breeding bird season should a stand-off from an active nest be required).

4.5.35 Weather, in particular wind, has a strong influence on the timing of construction activities. Crane activities are generally limited during strong winds (>9 m/s) and erection during these weather conditions may be avoided for safety reasons, with the actual limiting conditions being reviewed as part of the crane lifting plan. As a result of this, it may be necessary to carry out turbine erection activities out with the standard working times and during periods of calm weather. During periods of cold weather, concrete pouring of the turbine bases may be prohibited (temperatures <4°C) or subject to specific cold weather working practices.

Development phasing

4.5.36 Construction of the Proposed Development would consist of two main elements. Firstly, civil, and electrical construction of the infrastructure and secondly, erection and commissioning of turbines. Construction of the control building, and the grid connection are lengthy processes which would commence early in the construction programme to allow a live grid connection to coincide with the commissioning of the turbines. As noted, many individual construction processes would run partly or fully concurrently whilst others would progress in a sequence with or without some overlap in time.

4.5.37 There are constraints which will require cessation of construction of specific parts of the site during certain times of the year. These are discussed in later technical chapters as appropriate. Construction phasing to avoid those constraints will be agreed with the determining authorities and relevant consultees should development consent be agreed.

Site material quantities

4.5.38 A number of materials will be required to construct the different elements of the Proposed Development. **Chapter 12: Traffic & Transport** provides a detailed breakdown of the estimated material requirements for each element (e.g. site track, crane pads, hardstanding areas, turbine foundations etc), and a summary of total tonnages for each material to be used is provided in **Table 4.2**.

Table 4.2 Estimated tonnages of materials required for construction of the Proposed Development

Material	Estimated total tonnage
Stone	50,000
Tarmac	700 (max)
Sand	1,500
Concrete	10.500

4.5.39 All materials required for construction of the Proposed Development would be delivered from quarries and batching plants in the local area.

Waste management

4.5.40 At this stage it is not possible to estimate quantities of waste and surplus materials which would be produced on site. Any such waste materials produced, which are expected to be minimal, and surplus material excavated from constructing turbine bases, access roads and other infrastructure would be removed from site in HGVs and taken to an appropriate waste recycling or disposal facility. No other discharges are anticipated from the development. Site waste management procedures are discussed further in the Draft CEMP provided alongside this Draft ES.

Vulnerability to major accidents and disasters

4.5.41 The Draft CEMP details measures to manage the environmental impacts of the Proposed Development during the post consent phase. Such measures will minimise the likelihood of major accidents or disasters arising from construction of the Proposed Development, for example through pollution prevention, management of waste, and water management measures (see **Section 4.8** for further details).

4.5.42 The construction works for the Proposed Development would also be undertaken in accordance with primary health and safety legislation, including:

- The Health and Safety at Work Act 1974;
- The Management of Health and Safety and Work Regulations 1999 (as amended); and
- The Construction (Design and Management) (CDM) Regulations 2015.

4.5.43 As required by the CDM Regulations a Construction Phase (Health & Safety) Plan will be prepared for the works by the site contractors, setting out emergency procedures to be followed in the event of such an incident.

Employment proposals

4.5.44 Potential job creation levels are discussed in detail in **Chapter 16: Socio-economics.**

4.6 Operation

Wind turbine characteristics

4.6.1 The power output from a wind farm largely depends on the strength of the wind blowing across the site. Wind turbines start to generate electricity at a wind speed of about 4m/s, their output increasing up to their maximum rated power at a wind speed of about 12m/s. As the wind speed increases further, the output is limited to the maximum until the wind speed reaches 25m/s when the wind turbine shuts down automatically.

4.6.2 The proportion of time which the turbines will be generating electricity is therefore dependent on the time that the wind speed is between 4 and 25m/s. Generation output from a wind farm is also seasonally dependent, such that approximately two thirds of the total annual energy yield from the wind farm is expected to be delivered in the six months between October and March, with the remaining six months delivering the other third.

4.6.3 Wind data to inform final turbine design and selection is being gathered using a temporary anemometry mast.

Meteorological effects

4.6.4 Although the wind farms require wind for electricity generation, at high wind speeds (>25m/s or 56mph) they shut themselves down to avoid excessive wear on the components; the rotor is both aerodynamically and mechanically braked. However, modern wind turbines are designed to withstand much higher wind speeds and are normally certified against structural failure for wind speeds up to 150mph. Lightning generally has no effect on turbines, though as with all structures there is risk of damage if hit directly by lightning. Turbines are fitted with a lightning protection system as part of their design.

4.6.5 Snow does not generally pose problems other than with access to the site. Occasionally very heavy snow and ice may affect the anemometer or aerodynamics of the turbine blades resulting in temporary automatic shutdown. The wind turbine would restart automatically after accumulations have naturally thawed.

Servicing and emergency repairs

4.6.6 Turbines would be maintained by a local team of technicians. Turbines would be typically maintained at 6 monthly internals, with each service requiring on average two technicians over two days per turbine. Technicians operate in transit vans or 4x4 vehicles.

4.6.7 Technicians would also visit turbines to repair faults, again typically working in pairs in a transit van or 4x4. Most components would be replaced by hoisting to the nacelle using onboard cranes / hoists within the turbine. In instances of a major fault requiring major component replacement (e.g., blade failure), cranes would be required to remove components.

4.6.8 High Voltage equipment (substation) would be inspected and maintained at 6 monthly intervals, typically by two technicians over two days.

4.6.9 Servicing and emergency works would be covered by the *Construction (Design and Management) Regulations 2015*[1].

[1] UK Government (2015). Construction (Design and Management) Regulations 2015. [online] Available at: https://www.legislation.gov.uk/uksi/2015/51/contents [Accessed April 2022].

Extended services

4.6.10 At regular periods through the project life, oils and components will require changing which will increase the service time on site per machine.

4.6.11 Gearbox oil changes are required approximately every 18 months. Changing the oil and worn components will extend each turbine service by one day.

4.6.12 Blades would be inspected annually, either by drone or rope access. Repairs may be carried out every few years using a cherry picker or rope access.

4.6.13 Blade inspection and repair work is especially weather-dependent. Light winds and warm, dry conditions are required for blade repairs. Hence mid-summer (June, July, and August) is the most appropriate period for this work.

Emergency operations

4.6.14 The following factors could have significant effects on the duration of emergency operations:

- Working with cranes is highly weather dependant; wind speed and cloud cover being the key factors (due to crane and manhandling safety limits);
- The availability of spares will determine delivery times to site for a replacement; and
- The duration of repair on a component where there is no spare available is event specific.

4.6.15 It has been found that operation in the first three or four years will highlight any manufacturing and/or installation issues which may require multiple replacements. In general, unscheduled maintenance is more likely to be required at the project start up and towards the end of the 30-year period at the end of the design life.

Track maintenance

4.6.16 Site tracks are likely to be maintained annually with a JCB, dumper and a roller taking around 5 to 10 days and will generally be undertaken in the summer months when the tracks have dried out.

4.7 Decommissioning

Wind farm decommissioning requirements

4.7.1 There are two options available at the end of the operational lifetime of the Proposed Development. As wind energy is a renewable resource and thus a sustainable method of generation, the first is to re-power the site with new machines, which would require a new application and a further ES. The second option is to remove the wind turbines and re-instate the Site.

4.7.2 Wind turbines can easily be removed and the hardstanding areas re-instated. Prior to wind turbine removal, due consideration would be given to any potential impacts arising from these operations. Some of the potential issues could include:

- Potential disturbance by the presence of a crane, HGVs, and engineers on-site;
- On-site temporary compound would need to be located appropriately;

- Time of year and timescale (to be outside sensitive periods); and
- Access tracks may remain in use for the benefit of the landowner and other stakeholders.

Wind turbine decommissioning

4.7.3 Wind turbines (towers, nacelle, hub, blades, and electrical kiosk) can be dismantled using a crane and removed from site. When dismantling and removing the turbines the bases would be broken out to below ground levels and all cables cut at depth below ground level and left in the ground. Roads would either be left for use by the landowner or covered with topsoil. No stone would be removed from the Site. The decommissioning works are estimated to take six months. This approach is considered to be less environmentally damaging than seeking to remove foundations and cables entirely.

4.7.4 The turbine components themselves will be taken to an appropriate recycling facility where applicable. Due to the timescales, it is not possible to identify a specific facility at this time.

4.7.5 It should be noted that the developer will set up a decommissioning fund during the life of the project.

Substation and distribution system decommissioning

4.7.6 The control building, substation and associated equipment would be removed, and the components reused or recycled. It is likely that the plant would be re-used as it has a life well in excess of the Proposed Development itself. The buried distribution cables within the Site would be de-energised and would be cut off below ground level at the ends. Any disturbed areas would be reinstated and re-vegetated.

Access track decommissioning

4.7.7 Following decommissioning of the Proposed Development, some wind farm tracks may remain in perpetuity for future use by landowners, other stakeholders and for recreational purposes. It is also considered that the disturbance associated with their removal and disposal of the material would have a much greater environmental effect than leaving them in situ.

Transmission system decommissioning

4.7.8 There may well be other users of the wider transmission system at the end of the project. In this case, the relevant circuits would not be removed when the Proposed Development is decommissioned.

4.8 Embedded environmental measures

Introduction

4.8.1 A key benefit of the EIA process is the opportunity it gives to integrate environmental considerations into the iterative design of a project. Embedded environmental (mitigation) measures are those measures which are inherent to the Proposed Development and are integral to and should be included in consideration of the application. Embedded measures include those assumed to be in place during construction, operation, and

decommissioning. Embedded measures include those considered as industry standard or best practice.

4.8.2 Embedding environmental measures has been a feature of the process that has led to the final design of the Proposed Development (see **Chapter 3** for further details); these embedded measures therefore form part of the Proposed Development which is assessed.

4.8.3 In addition to the plans and management plans described in **Section 4.4**, the following provides an overview of some of the general environmental management considerations for the construction of the Proposed Development. These provisions do not replace or affect the implementation of specific environmental measures detailed in the specialist assessment chapters which follow.

Construction Enviromental Management Plan (CEMP)

4.8.4 The CEMP will be the master document for consolidating all environmental requirements and undertakings that relate to the Site. As such it aims to ensure that construction activities for the Proposed Development are carried out in accordance with legislation and best practice for minimising the effects of construction on the environment and local communities.

4.8.5 The CEMP will be produced prior to the commencement of works and made available to the appointed civil engineers and construction company, and its objectives will be to:

- Provide a mechanism for delivering many of the embedded environmental measures described in the ES;
- Ensure compliance with legislation through setting out the need for consultation with ‘consultation bodies’ (see Regulation 2 in the EIA Regulations), and by obtaining necessary consents and licences from relevant bodies;
- Provide a framework for monitoring and compliance auditing and inspection to ensure the environmental measures included in the Proposed Development are being implemented;
- Ensure environmental best practices are adopted throughout the construction stage;
- Provide a framework for dealing with adverse effects as they occur; and
- Ensure a prompt response should unacceptable adverse effects be identified during the works.

4.8.6 The CEMP will remain a live document throughout the pre-construction and construction processes and some provisions may extend into the operational phase. The CEMP will consolidate all appropriate embedded measures, and additional mitigation and enhancement strategies where required, and would clearly outline what should be implemented, where, and by whom. A Draft CEMP is provided alongside this Draft ES.

Construction Method Statement (CMS)

4.8.7 The CMS would be prepared following the grant of consent and be subject to approval with individual elements and the supporting CEMP. The proposed content of the CMS is as follows:

- Ground Investigation (GI) methods including appropriate reference to the CEMP;

- Turbine and infrastructure locations following post GI micro-siting involving a number of technical specialists;
- Good practice guidance relevant to H&S, design details etc;
- Design detail for infrastructure (e.g., foundation specification, foundation and crane hardstanding configuration, confirmation of track sections to be excavated, external finish to buildings, security fencing form and location, etc) - see **Section 4.5**;
- Design detail for pollution control measures (location specific arrangements and design for management of dewatering activities) - see **Section 4.5**;
- Material import requirements and confirmation of stone and concrete source - see **Section 4.5**;
- Programme of works and working hours controls -see **Section 4.5**; and
- Site restoration plan to be implemented to restore areas affected by construction activity.

Construction Transport Management Plan

4.8.8 A detailed Construction Transport Management Plan (CTMP) would be produced and agreed with PEDW in advance of commencement of development. The CTMP would address traffic related planning conditions and would include, but not be limited to:

- Communication – The TMP would include a strategy for communication with local residents and businesses. The strategy would include procedures to keep affected parties aware of when works would be carried out, if / when roads would be closed (and diversionary routes to be used if there are closures) and how to contact the construction team with a query or complaint;
- Traffic Management – Detailed traffic management strategies would be provided for each stage of the construction works alongside finalised road traffic signage arrangements and a proposed programme of safety inspections on the public highway. This would include details of proposed timings of deliveries and transportation during the construction period;
- Road Condition Survey pre and post construction;
- Remedial Works – Details of procedure for conducting emergency road maintenance, on-going remedial work, and final remedial work along with an agreed maintenance period for any repairs carried out on the public road; and
- Contact and Liaison – Details would be outlined with respect to road safety and condition monitoring, including a named individual who would be responsible for liaising and coordinating with PEDW, Torfaen County Borough Council and Blaenau Gwent County Borough Council.

4.8.9 A draft CTMP is provided as Appendix 10B of this Draft ES.

Water Management Plan

4.8.10 A Water Management Plan would be produced and agreed prior to the commencement of development. The WMP would provide specific information in relation to the management of water on the construction site. Practices set out in the WMP would be incorporated into the project CEMP once agreed and where they relate to the construction phase. This

would draw on the specific measures set out in **Chapter 10: Water Environment**. A Draft Water Management Strategy is provided alongside the CEMP as **Appendix B.**

Landscape and Ecology Management Plan

4.8.11 An Outline Landscape and Ecology Management Plan (LEMP) would be produced and would include the location and approach to implementing ecological and other enhancements and mitigation where applicable. A LEMP will be submitted at Final Submission.

Dust and Air Quality

4.8.12 Particular care would be required to maintain dust emissions at a practicable minimum when working in the vicinity of residential properties and environmentally sensitive areas. Good practice mitigation would be required during dry conditions. The use of Best Practicable Means (as defined in Part III of the Environmental Protection Act 1990) would be employed.

4.8.13 The environmental measures to be implemented to control dust emissions during construction and decommissioning are:

- The use of dust suppression facilities on-site. This would include the provision of water bowsers with sufficient capacity and range to dampen down all areas which may lead to dust escape on-site;
- Any storage on-site of aggregate or fine material would be properly enclosed and screened so that dust escape is avoided. Adequate sheeting would also be provided for the finer materials which are prone to 'wind whipping';
- Wheel wash facilities would be installed for vehicles entering and exiting the Development Site where required. This facility would be able to automatically clean the lower parts of the HGVs by removing mud, clay etc from the wheels and chassis in one drive through operation;
- HGVs entering and exiting the Site would be fitted with adequate sheeting to totally cover any load carried which has the potential to be 'wind whipped' from the vehicle;
- Good housekeeping or 'clean up' arrangements would be employed so that the Site is kept as clean as reasonably practicable. There will be daily inspections of the working areas and immediate surrounding areas to ensure that any dust accumulation or spillages are removed / cleaned up as soon as reasonably practicable; and
- The appointment of a contact to whom complaints / queries about construction dust can be directed. Any complaints to be investigated and action taken where appropriate.

4.8.14 Dust and air quality are not considered any further within this Draft ES because no likely significant effects are anticipated in this regard and have been scoped out of the assessment. This approach was set out in the Scoping Report and no objections were raised in the Scoping Direction.

Site Waste Management

4.8.15 Site waste management practices to be implemented by the appointed contractor for the construction works for the Proposed Development are included in the Draft CEMP provided alongside this Draft ES.

Re-Use and Recycling of Decommissioned Materials

4.8.16 All decommissioned materials would be stored on site in segregated areas. The principal contractor would provide method statements for the collection, storage, and transportation of materials / waste. Where appropriate, materials / waste would be segregated on the Site in skips or bunded tanks and transported to appropriate sites or recycling facilities.

4.8.17 No materials would be burned on the Site. Hazardous waste would be held in a separate skip (or suitable bunded facility) and disposed of at a suitably licensed site.

4.8.18 No waste would leave the Site until the appropriate waste carriers' license and management certificates for the disposal site or transfer station have been inspected and authenticated by the relevant parties.

Control of Hazardous Materials

4.8.19 All hazardous materials and substances stored on the Site would be stored in a 'Haz-bin' or similar secure lockable container located within the temporary decommissioning compound.

4.8.20 Control of Substances Hazardous to Health (CoSHH) assessments would be completed by all contractors for activities using hazardous substances.

4.8.21 Any on site facilities for the storage, transportation or refuelling of chemicals, oils or fuels shall be sited on suitable impervious bunds. No discharge to any watercourse, land or underground strata would be permitted.

4.9 Implementation of embedded environmental measures

4.9.1 **Table 4.3** summarises the environmental measures that form part of the Proposed Development, as well as the mechanisms which would be used to ensure that these measures are implemented as part of the Proposed Development. Greater detail on these measures can be found in each of the technical assessment chapters.

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Table 4.3 Summary of environmental measures to be implemented

Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
Construction			
Loss of habitat would be temporary in some instances and therefore reinstated at construction. Where permanent loss occurs, loss would be offset by mitigation planting elsewhere on site as compensation and enhancement would be provided. Cable routes buried below ground and reseeded managed for appropriate grassland/scrub habitat. **Existing access points, roads and tracks have been used where possible to minimise vegetation loss, and to provide betterment to existing roads which would benefit from upgrading.** **Mitigation planting around access points and additional tree planting in lower parts of the site.**	Developer / Contractor	LEMP	Section 6.6
The construction design will ensure that settings changes during construction are kept to a minimum. The construction phase will be temporary. **Development design has aimed to avoid impacts on historic assets within the Site.**	Developer / Contractor	Development Design	Section 7.6
To ensure construction works do not damage the asset it will be temporarily fenced off throughout construction works.	Developer / Contractor	DNS planning condition	Section 7.6
Construction works to be carried out during daylight hours, and/or during the winter months when bats will be in hibernation. A sensitive lighting regime can also be incorporated if works need to be carried out at night.	Developer / Contractor	CEMP	Section 8.6
Habitats that are subject to temporary loss to be reinstated at the earliest opportunity and enhanced where possible.	Developer / Contractor	ECMS/LEMP	Section 8.6

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
Habitats that are permanently lost to be offset through habitat creation and enhancements to retained habitats within the wider Site.			
Update Otter survey of stream adjacent to access route and any other affected watercourses prior to construction. In unlikely event that holts are recorded, exclusion of animals from the affected area and provision of alternative habitat (under NRW EPS licence) prior to works. Construction activities will be restricted to daylight hours as far as possible to mitigate effects of increased visual and noise disturbance, with the use of temporary, artificial lighting avoided during the hours between dusk and dawn, with directional and low-level lighting used away from sensitive habitat corridors to mitigate effects relating to increased use of artificial lighting.	Developer / Contractor	ECMS/CEMP	Section 8.6
Suitable reptile habitat to be subject to a habitat manipulation exercise prior to construction works commencing. Any reptiles found to be moved to retained habitats away from the working corridors, to prevent killing or injury. The construction areas to be retained as unsuitable habitat for the duration of the construction works.	Developer / Contractor	ECMS/CEMP	Section 8.6
Specialist removal and control measures to be employed during construction, including removal of controlled waste to prevent spread of invasive non-native species	Developer / Contractor	ECMS/LEMP	Section 8.6
Construction methods and programme will consider the location of identified nest sites with the timing and duration of works managed to avoid direct conflict. Where works cannot be scheduled to avoid the main breeding season, additional measures such as the employment of "no-disturbance buffers" around nest sites or the use of sound buffers would be considered. The use of lighting around the proposed construction compound and the close proximity of the compound to the previously identified Barn Owl nest may necessitate further measures to provide alternative nesting opportunities for this species.	Developer/Contractor	Construction Environmental Management Plan (CEMP)	Section 9.6

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
Measures to prevent impacts on breeding birds will be included in final construction methodologies. This will include steps such as: • **Clearance of construction and other working areas outside of the breeding bird season;** • **The use of dedicated working areas and construction access routes;** • **Where works cannot be completed outside of the breeding bird season the construction methodology will include employment of Ecological Clerk of Works to carry out pre-works checks and monitoring of construction areas to identify potential bird nests; and** • **Any active bird nests in or immediately adjacent to working areas would be identified and suitable "no working" buffers established around nest sites.**	Developer/Contractor	CEMP Construction Method Statement (CMS)	Section 9.6
Design iterations have previously included areas of woodland and plantation with potential to support these species. The current site boundary and proposed construction and access routes do not include loss of woodland habitat. **Identified working areas and access routes will ensure no loss of these habitats.** **The proposed grid connection corridor, which will be subject to a separate application may pass through areas of plantation or woodland and it is assumed would be subject to suitable embedded measures.**	Developer/Contractor	CEMP CMS	Section 9.6
<u>ID1 - Good working practices</u> **Good working practices will be implemented during construction, with adherence to the Construction Environmental Management Plan (CEMP), which will be secured through a planning consent requirement, and relevant guidance. A monitoring schedule will be implemented by the contractor to ensure that the measures taken to protect the water environment are effective.**	Developer / Contractor	CEMP	Section 10.8

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
ID2- Water Management Plan (WMP) **Implementation of an appropriate Water Management Plan (WMP) for the construction phase of the Proposed Development, utilising SuDS principles, including collection, conveyance and attenuation/infiltration storage where suitable. Suitable temporary silt fencing, bunding and water quality measures (i.e., silt capture to maintain storage volume) will be included in the design of these works. Sufficient capacity will be provided on-site to hold runoff prior to discharge runoff to ground and/or any water discharge into watercourses is limited to greenfield rates. A water quality monitoring programme will be agreed with NRW and implemented prior, during and following construction.** **ID3 – Water discharges** **Further investigation of the viability of infiltration as a means by which surface water runoff and any groundwater dewatered from excavations (e.g., excavations associated with turbine foundations and underground cables) could be discharged to ground will be undertaken through liaison with BGCBC and TCBC and by undertaking soakaway testing exercises. Information from the future Phase 2 Geo-environmental Ground Investigation (details provided in Chapter 11: Ground Conditions) will also be considered to assess the potential for introducing pollutants pathways to groundwater via leaching from contaminated soils. In the case that the soakaway testing concludes that infiltration is not solely sufficient in managing runoff, and discharge to the watercourses is required, this will be subject to a Consent from the NRW or CCBC. Dewatering would be suspended if a flood alert or flood warning is in place downstream (and the discharges from the Proposed Development site could feasibly contribute to the flood event).** **Any discharge to surface water would be restricted to the greenfield runoff rate and will be treated in a suitable basin/trench before discharging.** **ID4 - Materials Management Plan** **Excavated materials during construction works should be segregated and stored/ re-used on-Site in accordance with a Materials Management Plan (in compliance with the CL:AIRE Definition of Waste: Code of Practice). Any temporary on-site storage of excavated materials suspected or confirmed to be contaminated will be on impermeable sheeting, covered over and with adequate leachate / runoff**			

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
drainage to prevent migration of contaminants from the stockpile. Materials will be segregated where possible to prevent cross-contamination occurring. Such materials will only be reused if they are confirmed as suitable for use in line with the requirements of the Materials Management Plan. **ID5 – Soil stockpiles** **Stockpiles will be appropriately maintained and have the minimum lifespan possible, with materials being reinstated as construction works progress. Where these remain in situ for 3 months or longer, seeding management techniques will be used.**			
See measures ID1 (Good working practices), ID2 (WMP), ID3 (Water discharges), ID5 (Materials Management Plan) and ID5 (Soil stockpiles) **ID6 - Standoff distance** **No works will be undertaken within 3m of any watercourse (other than for watercourse crossings and drainage mitigation). Any works within 8m of non-tidal Main River will be subject to a Flood Risk Activity Permit (FRAP) from NRW. Any works within 8m of an Ordinary Watercourse will be subject to a Land Drainage Consent (LDC) from the relevant LLFAs.** **ID7 - Watercourse/surface water flow path crossings** **Access tracks crossing mapped surface water flow paths or watercourses will require appropriately sized culverts. The design of any culverts will be confirmed as part of the detailed drainage design.** **The capacity of any existing culverts should be maintained at a minimum in instances where updates may be required associated with access track improvements and widening. Any new culverts required will be sized at the detailed design stage and will be subject to consent from the relevant LLFAs.** **Where the proposed underground cable crosses mapped surface water flow paths, each crossing will be individually reviewed / surveyed during detailed design (which will occur subsequent to gaining planning consent) to confirm the crossing methodology employed. It is anticipated that open cut crossing methodology will predominantly be used.** **ID8 - Underground cables**	Developer / Contractor	CEMP	Section 10.8

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
The underground cables linking the turbines to the substation and the substation to the electrical connection point will be constructed in discrete sections with the reinstatement process commenced in as short a timeframe as practicable.			
ID9 – Fuel, oil and chemicals storage (construction phase) **Areas of construction compounds that are used for fuel storage, plant maintenance and refuelling will be surfaced with fully impermeable materials to prevent any infiltration of contaminated runoff and contain bunding. An effective accident response protocol will be developed to ensure any spillages or potential pollution incidents are dealt with appropriately including the provision of containment for spills of contaminated liquids. Plant and machinery will be maintained to minimise the risks of oil leaks or similar. Any tanks containing oils, fuels and chemicals will be double skinned. There will be a bunded capacity of 100% of the maximum tank volume for non-hazardous fluids. For fuels or oils the bund capacity will be the larger of 110% of the largest tank volume for single tank bunds, (or, in the case of multi tank bunds, 110% of the largest tank capacity or 25% of the combined tank capacity, whichever is the largest). Fuel storage will be in accordance with Pollution Prevention Guidelines (PPGs). All stores of fuel will be located at least 20m from any watercourses and away from areas at risk of flooding.**	Developer / Contractor	CEMP	Section 10.8
Storage and handling of soil will be informed by the Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites to avoid damage to soil structure and help to minimise soil compaction. This measure is integrated into the CEMP submitted alongside this ES. **If ground conditions require it, a temporary trackway of either metal, wood, or plastic, would be used for vehicles to access the working areas. This would be removed once construction is complete.** **During topsoil stripping, machinery with low ground pressure will be used to minimise soil compaction, including during construction of the access tracks, the tracks will then be available for heavier vehicles to use to avoid impacts on other areas.**	Developer/Contractor	CEMP and Materials Management Plan (MMP)	Section 11.6

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
Temporary storage of soils will be carried out in accordance with the MMP. This document will outline where excavated non-waste materials will be reused in line with the CL:AIRE Definition of Waste Code of Practice (DoWCoP). The MMP will include a declaration by a Qualified Person that the MMP has been completed in accordance with the DoWCoP and that best practice is being followed. The CEMP refers to the MMP.			
Storage and handling of soil will be informed by the Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites to avoid damage to soil structure and help to minimise soil erosion from surface water runoff. This measure is integrated into the CEMP. **Measures to avoid soil compaction (which can result in soil erosion by increasing surface run-off) are integrated into the CEMP to avoid damage to soil.** **The CEMP refers to the MMP which will detail how temporary storage of soils is to be managed.** **Soil stockpiles will be stored for the shortest amount of time possible.**	Developer/Contractor	CEMP and MMP	Section 11.6
Elements of the Proposed Development which require removal of topsoil during construction and where topsoil cannot be reinstated will be kept to the minimum footprint required for the Proposed Development. **Storage and handling of soil will be informed by the Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites to avoid damage to soil structure. This measure is integrated into the CEMP.** **Permanently displaced soil will be reused within the Proposed Development Site where practicable in accordance with the MMP, as referenced in the CEMP.**	Developer/Contractor	CEMP and MMP	Section 11.8
A Phase 1 geo-environmental desk study has been completed for all elements of the Proposed Development (Appendix 11A). This has identified potential contamination sources within agricultural areas.	Developer/Contractor	CEMP, MMP and DNS condition	Section 11.8

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
A Phase 2 geo-environmental ground investigation will be completed at the pre-construction stage to characterise soil chemistry at target areas. This will include environmental testing of soil for potential contaminants, including asbestos, metals and hydrocarbons as identified in the Phase 1 Geo-environmental desk study, in addition to geotechnical testing to inform the design and material selection. Deeper soil testing will be carried out as needed to inform the detailed (post consent) design of the Proposed Development in relation to former colliery tip areas or other areas of suspected made ground. The results of the soil testing will be used to carry out a contaminated land risk assessment to confirm that the soils are suitable for use in the Proposed Development. Monitoring for gas and groundwater is to be undertaken at the proposed turbine locations and associated with mine related features beneath access/internal roads to inform the design. The contaminated land risk assessment will be completed in accordance with the Environment Agency LCRM guidance. **Prior to construction, an MMP will be prepared outlining where excavated non-waste materials will be reused in line with the CL:AIRE Definition of Waste Code of Practice (DoWCoP).** **The CEMP includes a procedure for encountering unexpected contamination or suspected contamination, which will require additional testing and risk assessment to determine appropriate measures. Materials will be segregated where possible to prevent cross-contamination occurring and will only be reused if confirmed to be suitable for use and in accordance with other requirements of the MMP.** **Any temporary onsite storage of excavated materials suspected or confirmed to be contaminated will be placed on impermeable sheeting, covered over and with adequate leachate/ runoff drainage to prevent migration of contaminants from the stockpile.**			
A Phase 1 geo-environmental desk study has been completed for all elements of the Proposed Development (Appendix 11A).	Developer/Contractor	CEMP, MMP and DNS condition	Section 11.8

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
Phase 2 intrusive geoenvironmental ground investigation will be completed during the pre-construction phase, including soil sampling and chemical testing, to confirm the ground conditions. **Potential risks to human health from any known, suspected or unexpected ground contamination will be avoided by adopting appropriate working methods and all aspects of construction will be completed in compliance with the Construction (Design and Management) Regulations 2015, CAR 2012 and the Health and Safety at Work Act (1974) and regulations made under the Act. These legal obligations include the requirement for risk assessments and method statements for all construction related activities and the use of appropriate working methods, training and Personal Protective Equipment (PPE).** **Temporary storage of excavated materials will be in accordance with the MMP.** **Contamination if found will be subject to appropriate risk assessment and if necessary, either removed, treated and/or mitigated as part of the Proposed Development. The CEMP includes an unexpected contamination protocol.** **Best practice air quality management measures will be applied as described in Institute of Air Quality Management (IAQM) (2014) guidance on the Assessment of Dust from Demolition and Construction 2014, version 1.1.**			
A Phase 1 geo-environmental desk study has been completed for all elements of the Proposed Development and the report is appended (Appendix 11A). **If groundwater is present and needs to be pumped from excavations and is suspected to be contaminated, appropriate measures will be taken in accordance with NRW guidance and the Environmental Permitting Regulations to prevent uncontrolled or unauthorised releases of this water to ground or to the water environment.** **Phase 2 intrusive geoenvironmental ground investigation will be completed during the pre-construction phase, including soil sampling and chemical testing, to confirm the ground conditions.**	Developer/Contractor	CEMP and DNS condition	Section 11.6

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
During construction, vehicle maintenance and refuelling of machinery will be undertaken within designated areas where spillages can be easily contained, and machinery will be routinely checked to ensure it is in good working condition. These areas at risk of spillage or containing hazardous materials, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) will comply with industry good practice, be bunded, have appropriate containment and segregation. Additionally, the bunded areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage/spillage.	Developer/Contractor	CEMP	Section 11.6
A Phase 1 geo-environmental desk study has been completed for all elements of the Proposed Development and the report is appended to the ES (Appendix 11A). **The Phase 1 Geoenvironmental Desk Study and the Coal Mining Risk Assessment have identified coal mining hazards including known shallow abandoned mineworkings, possible unrecorded shallow mineworkings, backfilled opencast workings and associated highwalls, unstable ground and potential untreated mine entries (adits). The reports recommend a programme of Phase 2 intrusive investigation and testing to allow better quantification of the identified constraints.** **Consideration of the risks from ground gas will be given in the design of the preconstruction Phase 2 ground investigation, in areas of the Proposed Development where there could be potential for ground gas accumulation to take place in enclosed spaces (this depends on the detailed design of these buildings/structures in addition to the presence of ground gas).** **All aspects of the Proposed Development from construction to operation will comply with the Health and Safety at Work etc. Act and regulations made under the Act.** **The design for the Proposed Development will comply with good practice in structural design including compliance with the Eurocodes and relevant British Standards. The design will account for the expected ground conditions and**	Developer/Contractor	DNS condition	Section 11.6

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
design loads, accounting for the effects of climate change. The design of the Proposed Development will be completed in accordance with CDM 2015.			
A Phase 1 geo-environmental desk study has been completed for all elements of the Proposed Development and the report is appended to the ES (Appendix 11A). **Phase 2 intrusive geo-environmental ground investigation will be completed during the pre-construction phase, including soil sampling and chemical testing, and groundwater monitoring / testing, to confirm the ground conditions. The design for the Proposed Development will be based on the data obtained from the investigation and will comply with good practice in structural design to mitigate risks from aggressive ground conditions.**	Developer/Contractor	DNS condition	Section 11.6
Wheel washing facilities will be installed on site. **Sheeting installed prior to leaving site.**	Developer/Contractor	DNS Planning condition/Draft CTMP	Section 12.8
Specific travel routes to and from site are defined for delivery vehicles.	Developer/Contractor	DNS Planning condition/Draft CTMP	Section 12.8
No existing accident problem identified. HGVs to use identified route.	Developer/Contractor	DNS Planning condition	Section 12.8
All construction activities undertaken in accordance with good practice as set out in BS5228-1:2009+A1:2014	Developer / Contractor	CEMP	Section 13.6
All employees on the construction site will be advised of quieter methods of operating plant and tools. Noise control measures (silencers, mufflers, any noise barriers, etc.) are to be subject to regular inspection and maintenance.	Developer / Contractor	CEMP	Section 13.6
Where practicable, for any particular activity, suitable plant, machinery and working practices will be adopted.	Developer / Contractor	CEMP	Section 13.6

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
Construction plant capable of generating significant noise and vibration levels will be operated in a manner to minimise noise emissions.	Developer / Contractor	CEMP	Section 13.6
As a result of interference with a fixed microwave link, further mitigation options with Arqiva in relation to turbine 7 are being explored.	Developer/Contractor	DNS Planning condition	Section 14.8
MoD may request aviation lighting to ensure turbines visible at night to their aircraft	Developer/Contractor	DNS Planning condition	Section 14.8
Options to be discussed with Cardiff Airport – details to be finalised but agreed in principle. For example, a number of other wind farm developers are in discussion with Cardiff Airport about funding the provision of a radar upgrade, which would enable operation of wind farms without radar interference.	Developer/Contractor	DNS Planning condition	Section 14.8
Options to be discussed with NERL – details to be finalised but agreed in principle.	Developer/Contractor	DNS Planning condition	Section 14.8
Access along some PRoW will be required to be temporarily managed during construction. Safety signs will also be required during construction and operation. **Whilst PRoW users should in most circumstances be able to use the footpath and bridleway network during construction it is accepted that some may choose not to do so. The Applicant will therefore provide a temporary, permissive route away from the areas subject to construction for user by walkers and horse riders prior to the commencement of construction**	Developer/Contractor	CEMP With PRoW Management Plan, secured via DNS planning condition	Section 16.8
Areas of construction activity such as excavations fenced off to protect livestock. Plant and machinery removed to construction compound overnight. The temporary loss will be compensated for with a new area of land designated as common.	Developer/Contractor	CEMP With PRoW Management Plan, secured via DNS planning condition	Section 16.8

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
Operation			
Direct landscape effects on Site have been reduced be using existing roads and access points to minimise landscape effects. The siting and design layout of the array has been considered with respect to the landscape, and separation distances, and siting (similar elevations for each turbine) results in a relatively orderly and linear and simple formation from key views from the BBNP for instance, rather than cluttered. A simple appearance is also in keeping with the underlying landscape characteristics in this large scale landscape. **The turbine rotors and upper towers will be largely visible against the sky and therefore a non-reflective pale grey colour (e.g. RAL 7035) will be selected to minimise contrast.**	Developer / Contractor	DNS Planning Condition	Section 6.6
The Development design has positioned turbines so as to avoid settings changes of historic assets as best as possible	Developer / Contractor	Development Design	Section 7.6
Ongoing control and monitoring programme to ensure invasive species are eradicated from site.	Developer/Contractor	ECMS/LEMP	Section 8.6
Minimum 50m stand-off from turbine blade tip and any linear or woodland habitat. **Feathering of blades during idling. Curtailment during bat sensitive periods (e.g., at certain times of year and during good weather conditions when bats are active).**	Developer/Contractor	Collision Mitigation Monitoring Strategy (CMMS)	Section 8.6
Pre-commencement checks of trees and built structures with bat potential in vicinity of turbines to confirm continued absence of roosts. Implementation of mitigation measures prior to felling of trees with confirmed bat roost potential (or in accordance with an NRW EPS licence where bat roosts are confirmed).	Developer/Contractor	ECMS/LEMP/CMMS	Section 8.6
The positioning and number of turbines effects the potential risk for collision with specific species.	Developer/Contractor	A Collision Mitigation and Monitoring Strategy	Section 9.6

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
LEMP sets setting out the long-term management and enhancement of habitats for all wildlife, including birds		(CMMS) secured via DNS condition..	
Maintenance methodology to be adopted via CMMS that ensures major maintenance works avoid the breeding season, where possible, and/or are completed sensitively where nest sites of Schedule 1 species are known. **HMP will include ongoing long-term management measures to enhance wider opportunities for any disturbed or displaced birds.**	Developer/Contractor	CMMS and LEMP	Section 9.6
See measures ID3 (Water discharges), ID7 (Watercourse/surface water flow path crossings) ID10 (Detailed Drainage Design) and ID11 (Fuel/oil/chemicals storage (operational phase)) **ID10 – Detailed drainage design** **Detailed drainage design for the operational wind farm development, utilising SuDS principles, including attenuation storage where necessary, to ensure sufficient capacity is available on Site to discharge runoff to ground and/or any water discharge into watercourses is limited to greenfield rates. The detailed design will be prepared in accordance with the Drainage Strategy for the operational wind farm development, which will accompany the ES.** **ID11 – Fuel, oil and chemicals usage (operational phase)** **Following the construction phase there will be no requirement for fuel, oil or chemicals to be stored on Site, however, small quantities of fuel/oil/chemicals may need to be brought onto Site for maintenance activities. In these cases, only the minimum quantities possible should be brought on to Site and must be removed from Site following completion of works, The fuel/oil/chemicals must be kept in the appropriate containers and sealed when not used for refuelling. An effective accident response protocol will be developed to ensure any spillages or potential pollution incidents are dealt with appropriately including the provision of containment for spills of contaminated liquids. Plant and machinery will be maintained to minimise the risks of oil leaks or similar.**	Developer/Contractor	DNS Planning condition	Section 10.8

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
Maintenance activities requiring ground disturbance will be infrequent and limited in extent and are therefore likely to require minimal disturbance to soil.	Developer/Contractor	Standard operating procedures (SOPs)	Section 11.6
During operation, vehicle maintenance and refuelling of machinery will be undertaken within defined areas where spillages can be easily contained, and machinery will be routinely checked to ensure it is in good working condition. These areas at risk of spillage or containing hazardous materials, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils, and chemicals) will comply with industry good practice, be bunded, have appropriate containment and segregation. Additionally, the bunded areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage/spillage.	Developer/Contractor	Standard operating procedures (SOPs)	Section 11.6
A Phase 1 geo-environmental desk study has been completed for all elements of the Proposed Development and the report is appended to the ES (Appendix 11A). **A Phase 2 geo-environmental ground investigation will be completed at the pre-construction stage to assess the presence of contaminants in the shallow soil that could subsequently be mobilised e.g., as dust or loose fibres that can be inhaled, or tracked back into vehicles/enclosed spaces. this will include a human health risk assessment to confirm whether additional measures are needed. The contaminated land risk assessment will be completed in accordance with the Environment Agency LCRM guidance. The assessment will determine whether the soil is suitable for use and this information will inform the MMP. If material is not suitable for use, then it will be disposed of offsite in accordance with the Waste Management Regulations.** **All aspects of construction will be completed in compliance with the Construction (Design and Management) Regulations 2015, CAR 2012 and the Health and Safety at Work Act (1974) and regulations made under the Act.** **The CEMP includes an unexpected contamination protocol.**	Developer/Contractor	DNS planning condition	Section 11.6

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
A Phase 1 geo-environmental desk study has been completed for all elements of the Proposed Development and the report is appended to the ES (Appendix 11A). **A Phase 2 geo-environmental ground investigation will be completed at the pre-construction stage where the potential for gas accumulation in enclosed spaces is identified (e.g., substation buildings). This will include adequate gas monitoring so that a ground gas risk assessment can be completed in accordance with CIRIA C665[2], which is likely to entail a minimum of six monitoring rounds over a minimum period of three months.**	Developer/Contractor	DNS planning condition	Section 11.6
The Phase 1 Geoenvironmental Desk Study and the Coal Mining Risk Assessment have identified coal mining hazards including known shallow abandoned mineworkings, possible unrecorded shallow mineworkings, backfilled opencast workings and associated highwalls, unstable ground and potential untreated mine entries (adits). The reports recommend a programme of Phase 2 intrusive investigation and testing to allow better quantification of the identified constraints. **The basis of the structural design for the Proposed Development will be completed in general accordance with design standards to minimise the risk of future structural or geotechnical instability.**	Developer/Contractor	DNS planning condition	Section 11.6
Implementation of a shadow flicker control module will reduce effects to an acceptable level	Developer / Contractor	DNS planning condition	Section 15.5
Recreational users are likely to be walkers and horse riders using the local public rights of way network. All PRoW will remain open for use during the operational phase. However the Applicant will provide alternative permissive footpath and bridleway provision to provide routes that extend beyond a 200m buffer from the wind turbines.	Developer / Contractor	DNS planning condition	Section 16.6

[2] CIRIA (2007) Assessing risks posed by hazardous ground gases to buildings (C665). CIRIA; UK

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Environmental measure	Responsibility for implementation	Compliance mechanism	ES section reference
Permanent loss of common land. 4ha of compensatory land provided at construction as common land to replace the 2.7ha lost to development retained permanently.	Developer / Contractor	Commons Act 2006	Section 16.6
Presence of wind turbines within buffer zone affecting the viability of future mineral extraction. Wind turbines would have a limited lifespan of 30 years.	Developer / Contractor	DNS planning condition	Section 16.6

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Monitoring

4.9.2 Monitoring, where it is required, is explained further within the relevant technical chapters.