Chapter 5

Project Description

Contents

Glossary

Term	Definition
Environmental Impact Assessment	Environmental Impact Assessment (EIA) is a means of carrying out, in a systematic way, an assessment of the likely significant environmental effects from a development.
Environmental Statement	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations.
North section	Section of development located north of Bryn settlement, within Penhydd forestry block.
South section	Section of development located south of Bryn settlement, within Bryn forestry block.
The proposed development	Y Bryn Wind Farm development.

List of Abbreviations

Abbreviation	Description
AIL	Abnormal Indivisible Loads
BS	British Standard
CAA	Civil Aviation Authority
CDM	Construction Design Management
CEMP	Construction Environmental Management Plan
CMS	Construction Method Statement
CMRA	Coal Mining Risk Assessment
COSHH	Control of Substances Hazardous to Health
ECoW	Environmental Clerk of Works
EIA	Environmental Impact Assessment
ES	Environmental Statement
FCS	Forestry Commission Scotland
FLS	Forestry and Land Scotland
GPP	Guidance for Pollution Prevention
HGV	Heavy Goods Vehicle
Hectares	ha
HMP	Habitat Management Plan
HSE	Health and Safety Executive
HVAC	Heating, Ventilation and Air-Conditioning
IEC	International Electrotechnical Commission
ISO	International Organisation for Standardisation
kV	Kilovolts
LGV	Light Goods Vehicle
NFM	Natural Flood Management
NRW	Natural Resources Wales
OWC	Ordinary Watercourse Consent
PC	Principal Contractor
PCS	Power Conversion Systems
PD	Principal Designer
PEDW	Planning and Environment Decisions Wales
PPG	Pollution Prevention Guidelines
SCADA	Supervisory Control and Data Acquisition
SNH	Scottish National Heritage
SuDS	Sustainable Drainage Systems

5.1 INTRODUCTION

5.1.1 This chapter sets out the detailed project description of the proposed development as summarised in Chapter 1: Introduction, including specifications of the proposed turbines, access tracks and other associated infrastructure. It also describes the general construction methodology, timescales, and typical construction equipment likely to be used, including description of the operational and decommissioning phases.

5.1.2 The construction methods detailed build on best practice methodologies developed at other wind farms to comply with health and safety requirements for construction and operations, in addition to relevant environmental guidance including:

- Natural Resources Wales (NRW) Pollution Prevention Guidelines (PPG's)*;
- Scottish Natural Heritage's (SNH) (now referred to as NatureScot) (2015) Good Practice During Wind Farm Construction;
- SNH/Forestry Commission Scotland's (FCS) (now known as Forestry and Land Scotland (FLS)) (2012) Floating Roads on Peat; and
- Scottish Renewables, Joint Publication, (2012) Development of Peatland: Guidance on the Assessment of Peat Volumes, Ruse of Excavated Peat and the Minimisation of Waste.

*A review plan for the PPG is currently underway. The review will result in a replacement guidance series, Guidance for Pollution Prevention (GPP). It is intended that the new series will provide environmental good practice guidance for the whole UK, and environmental regulatory guidance directly to Northern Ireland, Scotland, and Wales.[1]

5.1.3 Further construction details and mitigation will be provided in the Construction Method Statement (CMS) which will include the Construction Environmental Management Plan (CEMP), (outline is included in Chapter 10: Hydrology, Hydrogeology & Geology). These along with other forms of embedded mitigation have been designed in as part of the proposed development to avoid and reduce the potential environmental impacts of the proposal as far as it is practical to do so. The effect of this on the Environmental Impact Assessment (EIA) process is discussed throughout the remainder of this Environmental Statement (ES).

5.2 SITE LOCATION

5.2.1 Figure 1.1 (found within Volume 2 of this ES) shows the location and extent of the proposed development in a regional context. The application is for a wind farm comprising of up to 18 wind turbines with a range of blade tip heights from 206 m up to 250 m (see Table 5.1). Chapter 4: Site Selection and Design Evolution provides details of the design process that resulted in the final layout.

5.2.2 The application is for:

- Up to 18 turbines;
- Turbine foundations;
- External transformer housing;
- Crane pads and hardstand areas;
- Micrositing allowance of turbines and associated infrastructure of up to 50 m;
- Substation, control building and compound;
- Battery/energy storage infrastructure;
- Construction of approximately 8,934 m of new access tracks;
- Upgrading of approximately of 12,580 m of existing tracks;
- Secondary construction routes 8,039 m (no widening required with minor upgrades only used for Heavy Goods Vehicle (HGV)/Light Goods Vehicle (LGV) only);
- Alterations to the public road network;
- New slip road exiting the M4 for Abnormal Indivisible Loads (AIL);
- Underground electricity cables;
- Two permanent wind monitoring equipment locations, expected to comprise of anemometry masts or lidar;
- On site signage;
- 6 temporary borrow pits (local temporary sources of construction aggregate which are solely for the purpose of the wind farm construction);
- Temporary concrete batching plant(s);
- Appropriate drainage measures across the Y Bryn site boundary;
- Temporary construction and storage compounds, laydown areas and ancillary infrastructure;
- Habitat Management Plan (HMP) and enhancement measures; and
- A lifetime of up to 50 years.

5.2.3 It is intended that the proposed development will make use of the available capacity on the local transmission network. For further information relating to the indicative grid connection see Appendix 5.1 in Volume 3 of the ES.

5.3 SITE LAYOUT

5.3.1 The turbine layout and associated infrastructure is presented in Figure 1.2 (Volume 2). This figure illustrates the relevant elements, including locations for the proposed 18 turbines, site tracks, crane pads, substation, construction and storage compound areas, wind monitoring equipment and borrow pits.

5.3.2 Micrositing allows the exact turbine location and infrastructure to be modified post consent, following detailed ground investigation and ground clearance (within 50 m). Table 5.1 gives the centre point coordinates and proposed maximum tip height for each of the proposed turbine.

Table 5.1: Turbine coordinates (British National Grid)

Turbine Number	Easting	Northing	Maximum Tip Height (m)
1	282978	193397	206
2	283552	193600	206
3	282921	192990	206
4	283805	193313	206
5	283594	192814	206
6	282453	190558	230
7	281978	190586	230
8	282300	189991	250
9	282490	189646	250
10	282783	189343	250

[1] Net Regs (2020). *Guidance for Pollution Prevention (GPPs) - Full List*. [Online]. Available from - http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ [Accessed 28/03/2023]

Turbine Number	Easting	Northing	Maximum Tip Height (m)
11	283107	188997	206
12	280945	189877	206
13	281299	189545	250
14	281770	189376	206
15	282166	189165	206
16	282459	188852	206
17	280888	189123	206
18	281227	188966	206

Source: Natural Power

5.3.3 This layout was developed taking into account the ecological, geological, hydrological, archaeological, topographical, landscape, visual, forestry, peat, existing public right of way, and noise constraints amongst others, whilst ensuring optimal wind resource (see Chapter 4: Site Selection and Design Evolution for further details on site constraints which were taken into consideration (Figure 4.1: Site Constraints)).

5.3.4 Each turbine location, although limited to some extent by on-site constraints, was considered according to its landscape and visual impact and the location and dimensions modified until meeting the design strategy principles set out in Chapter 4: Site Selection and Design Evolution and Chapter 8: Seascape, Landscape and Visual Impact Assessment as judged from a selection of key viewpoints.

5.3.5 Once the layout was confirmed as being acceptable with respect to other on-site interests (including but not limited to ecology, hydrology, archaeology, and forestry), the layout was fixed, and the detailed assessment was continued and completed.

5.3.6 The total permanent land take of the proposed development, after completion of reinstatement measures including foundations; crane pads; site tracks; has been assessed to be approximately 21.3 hectares (ha) excluding batter slopes. Indicative drawings for current available technologies that suit site conditions are presented in Figures 5.1 - 5.10 within Volume 2 of the ES. Drawings include indicative turbines, turbine foundations, site track cross sections, crane pads, turbine transformer housing, cable ducts, temporary construction compounds, signage, batching plant, substation and battery compound, and wind monitoring equipment (comprising anemometry masts or lidar).

5.4 PUBLIC AND PRIVATE ROAD ACCESS

5.4.1 Chapter 11: Traffic and Transport, details the public road network proposed for the transportation of turbine components via HGVs and LGVs and AIL.

Abnormal Indivisible Loads (AIL)

5.4.2 The preferred turbine delivery route would start at the port of Swansea, and loads would depart the port and access the A483 Fabian Way (Eastbound) using a contraflow manoeuvre. Loads would proceed eastbound and would join the M4 at Junction 42. Loads would proceed on the M4 until the purpose built diverge slip road where they would depart the M4 and would continue to site using private, purpose-built access track.

5.4.3 AIL vehicles proceeding to the northern section of Y Bryn site boundary (five turbines) would exit Margam forest, proceeding via the existing forestry haulage Heol y Moch road to then cross the B4282 directly into Penhydd forest.

General Construction Traffic

5.4.4 General construction traffic and material deliveries will travel to site via the A4107, B4282 and A4063 depending on their origin. There are three different site access points one for AILs to enter only (one way) and two are proposed for HGV and LGVs accessing and exiting the proposed development, these are outlined.

Access Point 1 – Purpose Built Diverge Slip Road from M4 for AIL Deliveries

5.4.5 Located to the south of the proposed development, this access point is for AIL deliveries only. AILs will exit the M4 via a purpose built diverge. Once unloaded the delivery vehicles will be reduced in size (AIL > HGV) and will exit the proposed development from one of the alternative access points. No vehicles will exit the proposed development from the proposed M4 diverge.

Access Point 2 – B4282

5.4.6 Located on the B4282 between Bryn and Maesteg settlements, at this location it will be possible for construction traffic to access or egress either the north section and / or south section of Y Bryn site boundary. Traffic to this access point will either travel from the M4 Junction 40 along the A4107 prior to turning onto the B4282 at the west end of the route; or alternatively traffic will arrive from the east on the A4063 at Maesteg then onto the B4282.

Access Point 3 – Goytre Road

5.4.7 Located to the west of the proposed development, this access point is for traffic entering or exiting the south section of the proposed development and is the nearest access from the M4. Traffic exiting M4 Junction 40 will then travel along Dyffryn Road and Goytre Road before entering the proposed development.

5.4.8 The condition of the public road utilised by construction traffic would be surveyed and recorded prior to wind farm construction commencing and it is expected that a planning condition will commit the applicant to undertake this. Where required, repair and maintenance work will be carried out on these roads during and following the construction period to rectify any identifiable damage which is directly attributable to the proposed development.

5.4.9 The effect of the proposed development construction and operation traffic on the public road system is assessed in Chapter 11: Traffic and Transport.

5.5 FELLING

5.5.1 The land where the wind turbines, associated infrastructure and new tracks will be developed is currently Welsh Government owned productive forestry plantation managed by NRW. As a result of the proposed development some existing tracks will be utilised however will need upgrading and some new tracks will be required to facilitate construction traffic and component deliveries, therefore some felling of productive forestry will be required prior to construction. Assessment of the felling and proposed arrangements are provided in Chapter 13: Forestry. The felling of existing forestry will be managed by the applicant prior to main construction activities on Y Bryn site boundary. The methods and full description of this process are described in Chapter 13 of this ES.

5.6 CONSTRUCTION PHASE

Construction Method Statement (CMS) and Construction Environmental Management Plan (CEMP)

5.6.1 Prior to the commencement of construction, a CMS incorporating a CEMP would be produced setting out in detail the individual items of works associated with the construction of the proposed development and is considered as embedded mitigation (see Chapter 10: Hydrology, Geology & Hydrogeology for detail on the outline CEMP).

5.6.2 The CEMP shall include the following:

- Practical measures (both physical measures and sensitive working practices) to avoid or reduce impacts during construction (may be provided as a set of method statements), including a Pollution Prevention Plan outlining measures to control pollution and a Drainage Management Plan outlining measures for management of surface and groundwater;
- The location of sensitive works to avoid harm to ecological features;
- The times and locations during construction when specialist ecologists need to be present on site to oversee works;
- Species Protection Plans outlining specific measures to avoid and reduce impacts on protected species;
- Responsible persons and lines of communication; and
- The role and responsibilities on site of an Ecological Clerk of Works (ECoW) or similarly competent person.

5.6.3 The CMS would consider relevant planning conditions and ensure that each activity is carried out safely, in accordance with best practice and the relevant guidelines, and to minimise environmental impact, in accordance with NRW's pollution prevention guidelines. Typically, the document would cover the following topics:

- Site Health & Safety Plan;
- Method Statements and Risk Assessments to include for environmental considerations e.g., sympathetic construction methodology with regard to weather and ground conditions;
- Location and Description of Project;
- Consent and Regulation Approvals e.g., discharge of planning conditions, Ordinary Watercourse Consent (OWC) and Sustainable drainage systems (SuDS);
- Pre-construction Survey Work Undertaken;
- Turbine Description/Specification;
- Construction Schedule;
- Public Highway Works;
- Forestry Felling;
- Site Tracks;
- Temporary Construction Compound;
- Crane Pads;
- Cable Trenches;
- Foundation Works;
- On-site Substation, Battery/Energy Storage and Control Building;
- Borrow Pits;
- Monitoring – Ecological, Hydrological and Geotechnical, and Archaeology;
- Public Access Safety;
- Emergency Procedures; and
- Pollution Control and Waste Management – potential waste material, materials that can be reused onsite or elsewhere and mitigation measures.

5.6.4 A Site Waste Management Plan will be drawn up as part of the CMS prior to the commencement of construction.

5.6.5 Previous experience of agreeing the construction methodology during the post-consent/pre-construction stage has proved effective in securing accurate and realistic method statements. At this stage in a project, additional data will be available in the form of detailed site investigations. Furthermore, the civil engineering contractor and the turbine supply contractor would have been chosen, enabling more detailed preparation of individual method statements. During the preparation of the CMS, correspondence and meetings with NRW, the planning authorities and other relevant consultees would be undertaken to review the working methods proposed and, if necessary, incorporate changes. This iterative process of preparing the CMS ensures that when construction commences there is a robust process for ensuring that the construction effects associated with the proposed development are effectively managed and mitigated against where reasonably practicable. This makes monitoring of the construction activities, either by the appointed site representative or by the various bodies associated with the preparation of the document more effective.

5.6.6 Each section of the CMS will provide a detailed description of the tasks to be completed along with risk assessments, where necessary, covering items such as waste management, pollution prevention, control of waters, nuisance, and material use.

5.6.7 A section of the CMS regarding the handling and storage of peat would be prepared in accordance with recommendations from a suitably qualified geotechnical designer, ecologist, and hydrologist following a detailed site investigation. In respect of construction methodology and peat stability at the proposed development, the bullet points include general recommendations that would be adhered to and would form part of the overall CMS documentation.

5.6.8 Environmental awareness training will be provided to all staff entering on to Y Bryn site boundary; this will include a basic environmental site induction covering the following measures:

- Avoid placing excavated material and local concentrated loads on peat slopes;
- Avoid uncontrolled concentrated water discharge onto peat slopes identified as being unsuitable for such discharge;
- Avoid unstable excavations. All excavations would be suitably supported to prevent collapse and development of tension cracks;
- Avoid placing fill and excavations in the vicinity of steeper slopes;
- During construction install and regularly monitor geotechnical instrumentation as appropriate, in areas of possible poor ground such as deeper peat deposits;
- Implement site reporting procedures to ensure that working practises are suitable for the encountered ground conditions. Ground conditions are to be assessed by a suitably experienced geotechnical engineer;
- Form a contingency plan detail the level of response to observed poor ground conditions;
- Routinely inspect the wind farm site by maintenance personnel including an assessment of ground stability conditions;
- Carry out an annual inspection of the proposed development following completion of works by suitably experienced and qualified geotechnical personnel;
- Maintain stored peat in a suitable condition to minimise peat drying out; and
- Minimise the need to handle stored peat so as to reduce any drying or changes to the peat.

5.6.9 Information on the proposed development soils has been obtained from UKSO[2]. The map indicates that the dominant soil types are very acid/loamy soils with a wet peaty surface, freely draining acid loamy soils and slowly permeable wet very acid soils with a peaty surface. The quality of the soils has been affected by the existing land use, including productive forestry and artificial drainage ditches to dry the soils. The layout of the proposed development infrastructure has taken peat into account and avoided areas of priority peatland habitat where possible. Phase 1 and 2 peat surveys have been completed in the proposed development area which indicate an

[2] UKSO (2018). *UK Soil Observatory map viewer.* Available from - http://www.ukso.org/http://www.ukso.org/mapViewer.html [Accessed 28/03/2023]

average peat depth of 0.2 m. Further details are provided in Chapter 10: Hydrology, Geology and Hydrogeology. Construction procedures will follow best practise guidelines in order to ensure that areas of priority peatland habitat are protected.

5.6.10 Other sections relating to site-specific items including landslide hazard and the geotechnical risk register, identified during the pre-construction phase, will form part of the CMS. Geotechnical risks have been considered in the design evolution by identifying areas of deep peat through phase 1 and 2 peat probing and the coal mining risk assessment (CMRA). It is intended that the CMS will be an evolving document and staged completion of the document would be undertaken in line with the progression of construction. Updating of the document to reflect changes in the methods to be used would also be carried out, where necessary.

Construction Timetable

5.6.11 Construction of the proposed development would begin within a defined period following consent granted by the Planning and Environment Decisions Wales (PEDW). The applicant seeks a minimum 5-year period to allow time for the discharge of conditions, procurement of the turbine equipment and associated infrastructure delivery, and reaching an investment decision for the project.

5.6.12 The construction period for the whole of the proposed development is envisaged to last for 24 months, from commencement of construction through to installation and commissioning of the turbines. Site reinstatement (as shown on the construction programme) is ongoing to ensure reinstatement of any removed peat or habitat occurs as soon as possible and to minimise the duration of construction related cut and fill impacts on setting and views. Note grid connection is not included. Construction would consist of the following phases which, although presented in a typical sequence, may overlap, or occur concurrently:

- Public highway improvements;
- Forest felling and export;
- Construction of site storage compounds for off-loading materials and components, and to accommodate site offices and mess facilities.;
- Construction of site tracks and excavation of cable trenches, geogrids & culverts;
- Crane pads and all other hardstands;
- Works to the on-site wind monitoring equipment, substation, and control building;
- Construction of turbine foundations;
- Laying of on-site cabling;
- Crane delivery;
- Delivery and erection of turbine towers, and installation of nacelles and blades;
- Installation of turbine transformers;
- Battery storage installation;
- Testing and commissioning of the turbines and the wind farm electrical system; and
- Site reinstatement (on-going during works).

5.6.13 Table 5.2 represents a typical 24-month construction programme listing the different construction elements in chronological order. It should be noted that there will be a degree of overlap between individual elements. It should also be noted that these elements relate to permanent infrastructure.

Table 5.2: Construction timeline for a typical wind farm with 18 turbines

Activity	Month 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mobilisation to site	■	■	■	■																				
Forestry felling and export		■	■	■	■																			
Abnormal Load Access enabling works		■	■	■	■	■	■																	
Construction of new access and site tracks				■	■	■	■	■	■	■	■	■	■	■										
Geogrid and culverts				■	■	■	■	■	■															
Cabling							■	■	■	■	■	■	■	■	■	■	■							
Crane hardstanding				■	■	■	■	■	■	■	■	■	■	■										
Substation, energy compound and all misc. hardstand				■	■	■	■	■	■	■	■	■	■	■										
Substation			■	■	■	■	■	■	■	■	■	■	■	■	■	■								
Energy storage compound											■	■	■	■	■	■								
Wind monitoring equipment										■	■	■												
Turbine foundation (steel)						■	■	■	■	■	■	■	■	■	■									
Turbine foundation (concrete)					■	■	■	■	■	■	■	■	■	■	■	■								
Crane delivery/demobilisation								■													■			
Turbine precast concrete tower deliveries								■																

Activity	Month 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Turbine Abnormal Loads																								
Turbine Assembly																								
Site Reinstatement/demobilisation																								

*Source: Natural Power *Restoration work around track edges, turbine bases and other areas of infrastructure will be ongoing to ensure reinstatement of any peat substrate occurs as soon as possible.*

Typical Equipment Used on Site

5.6.14 The following is an indicative list of equipment that would be required to construct the proposed development. The equipment would be in use on Y Bryn site boundary or stored on site within the construction compound. Where appropriate vehicles such as cranes, trucks, excavators, and bulldozers may be secured and left on the track at appropriate working areas overnight.

- Two types of cranes will be used on site - 800/1000 tonne capacity crane and 400/500 (or less) tonne capacity cranes. The 400/500 tonne crane would be used for general construction duties such as the preparation of the reinforcement cages at the turbine bases and as tailing cranes for steerage during the turbine erection. The larger crane would be used for the turbine erection to lift the heavy components into place.
- 30/40 tonne 360-degree excavators - these would be used at borrow pits for excavating stone and for excavation of turbine foundations. Ripper buckets or hydraulic breakers may be used for the excavators winning stone from the borrow pits.
- Smaller excavators in the range of 10 to 20 tonnes - these would be used for road construction and profiling, and restoration of verges, turbine foundations and for excavation of cable trenches.
- Tracked bulldozer - this would be used for a number of tasks such as stockpiling material from turbine excavations, management of stockpiles within the borrow pits, road construction, crane pad preparation and re-grading of the track running surface.
- Dump trucks - these would be used for moving material around the proposed development, e.g., for moving excavated peat or soils from cut site tracks, and stone from the borrow pits for track construction.
- Heavy duty vibrating rollers - the rollers are used to compact new roads, turbine foundation formations and are essential in compacting the crane pads and turbine backfill to the appropriate densities.
- A mobile concrete pump - the concrete pump would be used on-site during the concrete works for the turbine foundations. The pump would be lorry mounted and have a large boom to enable placement of the concrete within the turbine base excavations. The concrete wagons would reverse up to the rear of the pump and deliver the concrete into a hopper which would be connected to the pump. Using the pump allows a controlled and highly flexible method of pouring foundations.
- Cable laying vehicles - this would comprise a lorry or tractor with a revolving drum attachment for laying of cables in trenches alongside site tracks and a tracked excavator with drum attachment for the offsite cabling on stretches where it is not routed alongside a new or existing track.
- Small trucks or four-wheel drive vehicles with trailers - these would be used for transporting of small loads around the proposed development i.e., ducting pipes for cables in turbine foundations.
- Minibuses and four-wheel drive vehicles - these would be used for transporting construction workers and site managers around the proposed development. These would be likely to leave Y Bryn site boundary on a regular basis transporting workers to and from their billets off-site.
- A number of other vehicles would bring loads to the proposed development but would not themselves be stored at Y Bryn site boundary. These would include lorries with flatbed extendable trailers carrying all turbine components including transformers, lorries carrying cabling, steel rods for concrete reinforcement and concrete lorries with revolving drums.
- To prevent mud entering the public road system, if necessary, the wheels of all lorries leaving the proposed development would be washed either using a manual spray or a wheel washing drive through unit.
- Cabins/Welfare Facilities. Due to the requirement under Health & Safety Legislation and the Construction Design Management (CDM) Regulations for welfare facilities on site and the exposed nature of the proposed development, a number of cabins would be needed in the construction compound(s). These would have offices, canteens, drying-rooms, toilets and washing facilities. The units would be self-contained, and no discharge of drainage would be made to the surrounding land unless otherwise agreed with NRW and the local authority. Smaller, mobile self-contained units are likely to be required as work progresses throughout Y Bryn site boundary. These would be placed at suitable locations to tie in with the work interfaces as required. A typical layout of the construction compound area is presented in Figure 5.9.
- Fuel & Chemical Storage. Fuel would be required for the vehicles, generators, and other equipment on site. The storage facilities would typically comprise a bunded concrete pit containing a lockable, bunded fuel tank and a separate lockable housing for the storage of construction chemicals. In addition, there would typically be a wheeled, double skinned bowser for transport of fuel to tracked vehicles. Drip trays would be used when refuelling vehicles on Y Bryn site boundary. Emergency spill kits would be kept on site adjacent to the fuel storage area and with the mobile bowser. A Principal Contractor (PC) would have a 24-hour emergency response company on standby in the event of a spillage incident. Vehicles would be refuelled at their working location to prevent loss of time and use of fuel returning to any designated refuelling areas. All previous stated measures would be used when refuelling vehicles, taking into account all guidance and pollution prevention measures, and the bowser operator would be suitably trained to deal with any spillage.
- Construction Materials. A variety of materials would be utilised during the construction of the proposed development including, but not limited to; concrete, reinforcing steel, timber for joinery work and shuttering, stone and sand for road construction, general construction sundries and electricity cables. Wherever possible, the re-use of materials would be carried out, i.e., formwork to be re-used, excavated material from foundations to be reused in the preparation of crane pads and roads, topsoil for re-instatement and landscaping, etc. An indication of the materials used and the amount of resources (plant and labour) is generally included in the preparation of the CMS. Handling of potentially hazardous materials would be carried out in accordance with NRW Pollution Prevention Guidelines, but particularly; PPG 6; Working at Construction and Demolition Sites: PPG6 concerning the delivery, handling, and storage of materials. For example, the preparation of contingency plans and briefing operatives on the procedure to follow if a spillage occurs would be covered by the appointed civil engineering contractor, displayed on site, and contained within the CMS document prior to construction commencing.

5.7 SPECIFICATION OF TURBINES AND WIND MONITORING EQUIPMENT

Description

5.7.1 The selected turbines would be of a modern design with three blades mounted on a horizontal axis, attached to a nacelle, housing the generator, gearbox, and other operating equipment. The nacelles would be mounted on a tubular tower which allows access to the nacelle. It is expected that the turbine cut in wind speed will be around 3 m/s and will rotate clockwise.

5.7.2 Chapter 15: Aviation and Existing Infrastructure provides details of a lighting scheme proposed for the turbines which the Civil Aviation Authority (CAA) have been consulted on.

5.7.3 It is expected that some of the wind turbine towers will be constructed from steel only, and some may be steel/concrete hybrids towers subject to individual turbine manufacturer specifications. All of the blades will be constructed from fibreglass. It is proposed that the turbine tower, nacelle, and blades be finished in a semi-matte, off-white/pale grey colour, and the final finish will be agreed through a planning condition with the local planning authorities. Typical turbine specifications, of the type being considered for use on Y Bryn site boundary, are presented in Figure 5.1 in Volume 2 of the ES. In order to comply with Health and Safety requirements for the proposed development, the applicant would propose to apply identification numbers to the sides of the turbines. Numbers would be approximately up to 1000 mm tall by 900 mm wide and would be positioned between 1.5 m and 3 m from ground level so to be visible from the approaching access track. Details of these would be agreed as part of the CMS.

5.7.4 There may be a need for transformer housings to be situated adjacent to each of the turbine towers (some turbine models have an internal transformer housing), in accordance with the preference expressed by the Health and Safety Executive's (HSE) Principal Inspector to industry body RenewableUK in correspondence received 2018. The requirement for such structures, along with their dimensions, will vary based on the final turbine choice (some turbine types require two stacked transformer housings). Indicative size for typical transformer housing is shown in Figure 5.1.

5.7.5 Wind monitoring equipment, including wind speed and direction measurement sensors, would be positioned at prescribed height and near the top of the anemometer masts on booms. There are two anemometer masts proposed on Y Bryn site boundary; one in the north section west of turbine 1 and one in the south section west of turbine 18. The base of each anemometer mast will measure 10 m x 10 m with a top height of up to 131 m. A typical drawing is included in Figure 5.7. Should the technical and/or economic conditions make possible then alternatively ground-mounted lidar equipment could be located in the same positions as the planned anemometer masts, enclosed within palisade fencing alongside electrical equipment, as indicatively illustrated on Figure 5.7. However, for the time being, given limited long-term testing and certification in the field of lidar equipment, for project bankability the applicant expects to be required to install permanent anemometer masts.

Erection of Turbines

5.7.6 Two types of cranes are required for the erection of the turbines; 800/1000-tonne capacity cranes and 400/500-tonne capacity tailing cranes. The cranes would use the crane hard standing area as indicated in Figure 5.3.

5.7.7 Where possible, the delivery of the turbine components would be scheduled, weather dependent, to allow for direct lift off the transport trailers. Otherwise, turbine components would be stored on, or adjacent to, the crane pad areas. Alternatively, components may be delivered to the construction compound for internal distribution by a separate tractor unit. The tower sections would be erected, followed by the nacelle and hub. Following erection of the tower sections and the nacelle, the blades would either be lifted and attached individually to the hub in position, or the hub and blades would be raised together, as a unit, and attached to the nacelle. The cranes would then move to the next turbine location.

Operation

5.7.8 Once installed and fully commissioned, the wind turbines would operate automatically and can be controlled remotely or from the on-site metering building. Regular visits will be made by technicians to the infrastructure and turbines in four-wheel drive vehicles or similar. In addition, longer servicing visits would be required, typically every six months, along with reasonable unscheduled maintenance, as may be necessary. Occasional use of larger vehicles, such as cranes or lorries similar to those used during construction, may be necessary should there be a requirement for replacement of major turbine components.

5.7.9 Wind farm performance would be remotely monitored using the existing permanent anemometer masts, together with a Supervisory Control and Data Acquisition system (SCADA) that would monitor the individual turbines and the grid connection.

Environmental Considerations

5.7.10 All turbine transformers would be sited on bunded foundations that are able to contain 110% of the oil contained within it. Any leaks from equipment within the nacelle would be contained within the turbine.

5.7.11 Infrastructure for the proposed development will have a direct impact on some sensitive habitats, however, a CEMP and HMP will be implemented to reduce any impacts from construction and to restore and enhance habitats during the operational phase of the project. This is provided within Chapter 6: Ecology.

5.8 TURBINE FOUNDATIONS

Construction

5.8.1 Reinforced concrete gravity foundations are envisaged for use on the proposed turbines. This foundation type is typically an inverted T shape consisting of a large pad with a protruding upstand with approximately 150 mm proud of the finished ground level. The pad is back filled with selected as-excavated material or stone material placed and compacted over the foundation. The base tower section of the turbine is subsequently connected to the foundation by using holding down bolts that are cast into the upstand section of the foundation. Stability of the turbine is provided through the weight of the foundation and the material replaced and compacted over it.

5.8.2 A typical turbine foundation specification is presented in Figure 5.2. Detailed design specifications for each foundation would depend on the site-specific factors such as ground conditions, the specific turbine used and various other engineering considerations. Typically, a circular concrete base of approximately 33 m diameter usually suffices for turbines with the dimensions identified in Figures 5.1. Combined with the protruding upstand, the overall depth of the foundation would be around 4 m. Following construction of the foundations, a layer of peat, peat turfs and/or mineral soils that was excavated from the turbine foundation area would be reinstated. Transformers would be expected to be located within housings, as shown in Figure 5.1, adjacent to the turbines with power cables from the turbines passing through ducts cast into the foundation.

Environmental Considerations

5.8.3 Depending on the height of the water table at the foundation location, a drainage system may be installed around the foundation to prevent the build-up of water pressure under the foundation. Alternatively, in locations that were particularly sensitive to hydrological disturbance, a submerged foundation design could be employed which would not require a drainage system around the foundation.

5.8.4 Cement entering a watercourse can have a detrimental effect by drawing oxygen from the water and increasing its alkalinity. On-site batching plants will be situated away from watercourses, either within a construction compound, vacant borrow pit area or at another secure location which would be agreed in advance with NRW as the land manager and NRW as statutory consultee. Particular care would be taken when pouring concrete at turbine foundations in the vicinity of watercourses and in areas of deeper peat (however the turbine layout has

minimised locating turbines on deep peat). NRW's Pollution Prevention Guidelines 6: Working at Construction and Demolition Sites would be adhered to and NRW would also be consulted during the preparation of the CMS to ensure that the appropriate measures are put in place. This may include construction of a settlement pit within the construction compound or elsewhere for treating rinse water from concrete lorries, and measures to prevent water from entering excavations in the vicinity of watercourses.

5.9 PERMANENT CRANE HARDSTANDINGS

Description

5.9.1 Permanent crane hardstandings (pads) as well as temporary lay down areas will be constructed to facilitate the cranes required for the erection of turbine components and wind monitoring equipment. To provide stable, firm ground for safe operation of the cranes, areas of hardstanding would be laid down on one side of each turbine foundation.

Construction

5.9.2 Typically, construction of the hardstanding areas would be similar to construction of the site tracks (on shallow soils) with 100 mm - 150 mm of topsoil removed and stored adjacent to the sites and remaining soil removed down to a suitable bearing stratum. Geotextile material would be laid down with crushed stone on top, to a depth of around 700 mm. The crushed stone would be sourced from borrow pit locations identified indicatively in Figure 1.2.

5.9.3 Additional temporary hardstandings may be required at various stages during turbine construction and erection. This may include temporary hardstanding to facilitate the erection of crane components, lattice boom or turbine components e.g., rotor assembly.

Environmental Considerations

5.9.4 Prior to excavation for the crane pad, the vegetation layer would be carefully removed followed by any underlying peat. The crane pad will be excavated to form a level, solid platform with suitable graded stone excavated from borrow pits and turbine foundation excavations. On completion of erection and installation works, it is proposed that the areas of hardstanding will remain as they may be required during the operational phase of the wind farm. It is envisaged that the surrounding land will be reinstated as forestry and trees will be replanted up to an appropriate distance from infrastructure. A diagram of a typical crane pad can be found in Figure 5.3, although the final detail may vary depending on the exact make and model of turbine chosen.

5.10 SITE TRACKS AND BORROW PITS

Description

5.10.1 The access route for turbine component delivery from port to site is discussed in Chapter 11: Traffic and Transport and the proposed route can be viewed in Appendix 11.2 In Volume 3 of the ES. The detailed assessment for component delivery minimises uncertainties or potential problems with delivery of abnormal loads using public roads.

5.10.2 Figure 1.2: Site Layout shows the proposed new access track and existing tracks to be upgraded for the proposed development. The tracks allow plant to dig new cable trenches and thereafter to access the proposed development for operational and eventual decommissioning purposes. Y Bryn site boundary design made use of existing access tracks wherever possible to minimise the environmental effect.

5.10.3 It is expected that all stone for new track construction and existing track upgrades will be won from borrow pits identified onsite (however, worst case scenario for traffic volumes assumes importing the top layer of stone and this is assessed in Chapter 11: Traffic and Transport). From initial site assessments, the indicative location of the borrow pits are shown on Figure 1.2 and final locations would be within the micrositing allowance and subject to detailed ground investigations to confirm suitability of material. Should further stone be required, any further borrow pit locations will be subject to the successful outcome of a relevant Mineral Extraction Licence application which would be made to the relevant authority. The final reinstatement of these borrow pits would be agreed with the local authority in consultation with NRW (as land manager) prior to reinstatement works commencing.

5.10.4 After construction is complete the tracks will be left in place for routine maintenance of turbines and for multi-use trails leading to improve recreational access for walking, mountain biking and horse riding, as the NRW forestry is classed as open access under the Countryside Right of Way Act 2000.

Construction

5.10.5 There is one new watercourse crossing required for the proposed development for a new access track located in the north section, and the use or upgrade of thirteen existing watercourse crossings, one within Y Bryn Site Boundary in the north section and thirteen within Y Bryn Site Boundary south of the B4282 mostly within the south section. The crossings are assessed in Appendix 10.1: Water Crossing Assessment.

5.10.6 Approximately 8.9 km of new on-site tracks would link the proposed turbines and infrastructure to the public highway. The design philosophy behind the track layout has taken into account a number of factors including topography, hydrology, watercourse crossings, ground conditions, felling and construction parameters, and has been based on best practice methodology developed at other wind farm sites. The proposed track layout has been designed following an onsite review and minimised the number of water crossings necessary and made use of existing access tracks wherever possible.

Environmental Considerations

5.10.7 The initial stripping of topsoil for the new tracks and placement of stone material for construction of new tracks has the biggest potential to release sediment into watercourses. Therefore, using methods consistent with industry best practice would be put in place ahead of the track construction activities. Sediment would be transported the furthest by existing surface water channels and manmade drainage systems, therefore proactive mitigation measures would require these to be identified prior to the track construction. Within the channels, drains and any necessary settlement ponds, silt traps would be constructed prior to track construction. The silt traps would likely be constructed using straw/hay bales or specialised siltation fencing, pinned into place, allowing water to either percolate through the bale or flow over. Where machinery is required for any of these up-front activities, they would have low pressure bearing tracks. Sediment transport mitigation drainage systems would be subject to regular maintenance during the lifetime of the proposed wind farm. Chapter 10: Hydrology, Geology and Hydrogeology provides an assessment of the potential effects on hydrology.

5.10.8 For construction of new sections of track, alternative methods would be utilised for different areas of Y Bryn site boundary, depending on site specific conditions. For each method, the track running width (excluding drainage channels and cable trenches) would be a minimum of 4.5 m wide, with the exact width depending on the local ground conditions. Track widths may be wider for short sections such as lengths with passing places and at sharp bends and track junctions. Excavated road would be used for the majority of the access tracks, where overlying soil or peat material would be removed with a foundation formed on the underlying glacial till or the weathered rock horizon, as shown in Figure 5.5a (Volume 2).

5.10.9 In addition, there would be a requirement for drainage channels along one or both sides of each section of track depending on ground conditions (see Figure 5.5b, Volume 2) to prevent the track itself acting as a watercourse. Tracks would be designed with a crossfall, towards the drainage ditches, to prevent build-up of water on the running surface. It is important that the water flowing along the drainage ditch is not able to build up enough volume and velocity to act as a major sediment transport route. To prevent this happening, cross drainage pipes would be placed under the road at regular intervals. This also helps minimise the effect the road construction would have on the hydrology in the adjacent area and prevent concentration of water flow higher in the catchments' area than

would necessarily occur. The drainage ditch would also be blocked just above the cross drainage inlet, thus preventing water from simply flowing past the inlet. Using stone available onsite, a head wall would be constructed to prevent erosion around the inlet. A silt trap would also be constructed at the inlet to the cross drainage, to minimise sediment entering the pipes. The outlet of the cross drainage would allow the water to filter through the adjacent vegetation.

5.10.10 Drainage management of site tracks proposed by the applicant will complement a Natural Flood Management (NFM) pilot project NRW is progressing in the Ffrwd Wyllt catchment (northern part of the south section and southern part of the north section) aiming to take a holistic approach to catchment management, comprising interventions in the headwaters to slow the flow of water and reduce flooding. Further details on the NFM can be found in Chapter 10.

5.10.11 For safety reasons, marker posts may be placed in the ground by the edge of the track in order to guide on-site vehicles during times of poor visibility or at night.

5.10.12 Tracks between turbines and the wind monitoring equipment are required during the operational period of the proposed wind farm to allow for routine maintenance operations and the replacement of larger turbine/electrical components.

5.11 ON-SITE CABLING, SUBSTATION AND CONTROL BUILDING

Description

5.11.1 The wind turbines envisaged for use on the proposed development will initially generate electricity at 690-1000 Volts. This needs to be converted to 33,000 Volts (33 kilovolts (kV)) via a transformer located within the turbine or immediately adjacent to the tower of each turbine. Typical specifications for possible external transformer housings currently available are given in Figure 5.1. Any external transformer would be linked to the turbines through cable ducts in the turbine foundations. Underground cable routes between turbines and the substation compound would generally follow track routes. These would be placed up to 2 m from the track verge and drainage ditches.

5.11.2 The onsite substation and control building compound will be approximately 100 m x 75 m and will accommodate metering equipment, switchgear, transformers, the central computer system, and electrical control panels. A spare part storeroom and domestic facilities will also be located in the control building. Figure 5.4 shows a typical compound and layout. Although not permanently staffed, the buildings would be visited periodically by maintenance personnel. Electrical vehicle charging points would also be available for staff during operational and maintenance works. The implementation of electrical vehicle charging points would support the Well-being of Future Generations (Wales) Act 2015[3] goal – '*A globally responsible Wales*'. There is no requirement for any other permanent buildings on Y Bryn site boundary.

Grid Connection

5.11.3 The 33 kV cables routed from the proposed turbines would be brought together via underground cables to the on-site substation. The electricity will be connected to the grid (see Appendix 5.1 for further details).

Battery Storage

5.11.4 A battery storage unit approximately 50 m x 75 m is proposed to be located adjacent to the substation compound, on hardstanding area first used as a construction compound for the substation itself. Therefore, the combined area of the substation compound and battery storage area will be approximately 150 m x 75 m.

5.11.5 Battery storage facility is anticipated to comprise a lithium-ion battery technology, with modular elements comprising a number of battery housings (either standard International Organisation for Standardisation) ISO containers, electrical-houses ((eHouses) or otherwise) with associated 'heating, ventilation and air-conditioning' (HVAC) systems, along with paired power conversion systems (PCS) comprising bi-directional inverters and transformers, as well as central switchgear, metering and transformer, and space for access and operations.

5.11.6 This area of technology is currently fast-evolving in terms of:

- Technological advances in battery energy density and performance;
- The design and existence of various potential grid balancing service markets for providing revenues; and
- Opportunities for time-shifting of wind farm generation

5.11.7 For this reason indicative designs for the installation have been provided in Figure 5.4b based upon certain parameters, which form the basis of the impact assessments herein. These indicative parameters are considered to represent the realistic worst case scenario in impact assessment terms.

5.11.8 The detail on numbers, dimensions, housing type, finish, arrangement, security fencing and landscaping of the battery storage elements will be subject to approval via a planning condition prior to construction.

Construction

5.11.9 The transformers would be linked to the on-site electrical substation and metering/control building via 33 kV underground cables placed in trenches. The route within Y Bryn site boundary would generally run adjacent to the route of on-site tracks where possible. The underground cables from the proposed turbines to the on-site substation will likely be routed adjacent to site tracks but may occasionally cross or even run within site tracks. The route would be marked above ground with clearly identified posts, spaced at suitable intervals along the length. This would be agreed as part of the CMS.

5.11.10 Cables would be laid from a drum attached to a suitable vehicle. Each 33 kV cable would arrive as three insulated cores. These would be gathered in the trench and bound together along the entire length of the trench in a trefoil arrangement. Communication cables and earth tapes would also be laid in the same trench. The cables would be protected from mechanical damage by a sand bed and surround. Two layers of marker tape and/or tiles would be buried above the cables to prevent accidental excavation. The developer will install route markers which are visible from each other with a maximum spacing of 30 m and at least 1000 mm in height. Design of markers to be agreed with NRW as land manager.

5.11.11 Silt, scour and run-off could pose a problem as the cable trench can act as a preferential drainage channel. Backfilling of the trench should be carried out as soon as is practicable and the road drainage installed should be set up with suitable silt traps as the construction proceeds. In steep sections, impermeable plugs should be used in the cable trench to prevent the channel becoming a preferential drainage run, ideally using locally won clay material.

Environmental Considerations

5.11.12 Where cabling is required, pre-commencement surveys will be undertaken to give a contemporary assessment of any ecological and other environmental sensitivities and will inform the CMS. Pre-construction surveys, as per the rest of the development, will be carried out by the on-site ECoW to ensure construction is not having an unacceptable impact on any habitats or species of concern. Cabling will be carried out in a staged process, with tree felling and vegetation clearance and topsoil temporarily removed to be back filled as soon as the cables are laid. This method ensures that any disturbance during the works is kept to an absolute minimum and is temporary in nature.

[3] *Well-being of Future Generations (Wales) Act 2015.* Available from - https://www.futuregenerations.wales/wp-content/uploads/2017/01/WFGAct-English.pdf [Accessed 28/03/2023]

5.11.13 Following the pre-commencement and pre-construction surveys (and due to the staged nature of the cabling process) the impact on habitats, the wider environment and any species of concern will be reduced to a minimum and will be a short-lived disturbance where it exists.

5.11.14 In areas where the surrounding soils are very coarse gravel or peat, the cable trench footprint shall have a geo-textile wrap placed within it to prohibit fines migrating from the backfill into the surrounding sub-soils. These areas shall be identified on site during the commencement of the works. Where surplus mineral soil material is present, this shall be transported back to a borrow pit for use in reinstatement and final profiling.

5.11.15 On-site cable trenches would be located to minimise the area of disturbance, up to 5 m beyond the edge of the site track in case of multiple circuits. Trench excavation, cable laying and backfill would be carried out in a continuous operation (minimising the length of trench open at any one time) and may occur subsequent to the construction of on-site tracks or after the erection of turbines. Prior to excavation, the topsoil/turfs would be stripped and placed to the side in a temporary stockpile. A trench would then be dug with a small excavator or backhoe to approximately 1 m in depth and up to 1.5 m in width for single array or approximately 3 m for multiple arrays.

5.11.16 Alternatively, cable ploughing may be adopted if ground conditions permit. The final choice of method will depend on the appointed contractor and the results of further site investigation.

5.11.17 Indicative details of the cable/service trenches are shown in Figure 5.6. Cables would be laid in sand for protection with warning tapes/boards placed above to mitigate the risk of unintentional excavation. Impermeable barriers (plugs) would be placed in the sand layer at regular intervals to prevent the trench acting as a water conduit with more frequent spacing between plugs on steeper gradients.

5.11.18 In all cases, the cables would be buried to a minimum depth of 1.0 m. Reinstatement would be carried out to relay the previously stripped top layer of peat turfs containing the seed bank, over the top of the cable trench. This reinstatement would be conducted following the backfilling of each cable trench section.

5.11.19 At track crossings and within concrete foundations, the cables would be laid within plastic ducts. Armoured cable crossings will be installed to enable machinery to safely access the woodlands in accordance with NRW specifications.

5.11.20 Existing watercourses should be monitored during the works, both to prevent water entering the excavation, and also for runoff and silt escaping and entering these. These may need temporary diversions/piping until the track is complete and the watercourses can be reinstated.

5.11.21 On decommissioning of the proposed development, on-site cabling will be left in-situ, unless ducted. Most modern cables are aluminium and are relatively benign and inert; over time these will break down to clay. These can be electrically isolated and left in-situ, as is common practice.

5.12 TEMPORARY CONSTRUCTION COMPOUND AND FACILITIES

Description

5.12.1 During the construction phase of the proposed development, temporary compound and laydown areas will be required. The construction compounds will be built by carefully removing topsoil or peat turfs down to a firm substrate, laying down geotextile material and then constructing a working surface of stone extracted from the borrow pits. The topsoil/peat would be stored adjacent to the proposed development for reinstatement or used elsewhere on Y Bryn site boundary. The compounds will be reinstated with topsoil such that they can be re-used if needed during the operation phase for major maintenance or emergency works.

Construction Compounds

5.12.2 There are currently plans for four temporary construction compounds (in addition to the substation construction compound which will subsequently be repurposed for a battery storage facility), all with different dimensions. The compound near Turbine 18 is approximately 11,850 m^2; the compound east of Turbine 8 is approximately 15,690 m^2; the smaller compound at the entrance to the north section is approximately 4,320 m^2; and the larger one in the north section is approximately 7,690 m^2. Each would be surrounded by a security fence. Due to the requirement under health and safety legislation, the CDM Regulations for welfare facilities on site, a number of cabins would be needed in the construction compounds. These would have offices, canteens, drying-rooms, toilets and washing facilities. Smaller mobile, self-contained units are likely to be required as work progresses throughout Y Bryn site boundary. These would be placed at suitable locations to tie in with the work interfaces as required. A typical layout of a compound area is presented in Figure 5.9.

5.12.3 The compounds would be used, where necessary, for temporary storage of the various components and materials which are required for construction.

5.12.4 A settling pit/concrete washout bay and wheel wash may be included near the construction compounds. When concrete lorries have deposited their loads, there is a requirement to wash out the inside of the concrete drum. This requires a few gallons of water that would then be washed out from the drum into a settlement pit. The size of this pit would depend upon the flow of concrete lorries up to the proposed development (or within Y Bryn site boundary if an on-site batching plant is employed) but would be lined with an impermeable sheet and granular fill to assist in the settling process.

5.12.5 The settlement pit would be located away from watercourses with details included as part of the CMS following consultation with NRW (as land manager). Any drainage from these facilities would be collected and treated prior to discharge via the SuDS. The washout bay would be maintained as necessary by replacing the granular fill with clean stone. At close of construction, all material within the washout bay would be removed from site and the area reinstated.

5.12.6 The construction compounds will be reinstated at the end of the wind farm construction period. The stored subsoil and the stored topsoil would be laid over the geomembrane separating it from the underlying stone surface and then reseeded using a seed mix selected or, where possible, turfs would be reinstated.

Concrete Batch Plant

5.12.7 A concrete batching plant allows for concrete to be mixed in-situ for use throughout Y Bryn site boundary and relieves pressure on the road network by avoiding additional transportation of materials onto the site during construction. This is proposed to be located either within construction compounds, borrow pit or another secure location. This will be confirmed post-consent.

Environmental Considerations

5.12.8 Fuel would be required for the vehicles, generators, and other equipment on site. The storage facilities would typically be located on a bunded impervious base containing a lockable, bunded fuel tank and a lockable housing for the storage of construction chemicals. In addition, there would typically be a wheeled, double-skinned bowser for transport of fuel to tracked vehicles. All construction equipment would be inspected on a daily basis to check for spillages. Drip trays would be used when refuelling vehicles on Y Bryn site boundary. A designated fuel truck/bowser will be used for refuelling in designated refuelling areas. The refuelling area shall be equipped with a mobile spillage control kit containing oil absorbent booms and mats. Nominated personnel will be trained and responsible for refuelling. Site operatives would be briefed on the emergency procedures (as part of the proposed development induction training or toolbox talks) to be undertaken in the event of a large spillage. Special attention will be paid to spillage control at/near watercourses. All previous stated measures would be used when refuelling vehicles and the bowser operator would be suitably trained to deal with any spillage. The units would be self-contained, and no discharge of drainage would be made to the surrounding land unless otherwise agreed with NRW and the local authority.

5.12.9 Cement entering a watercourse can have a detrimental effect by drawing oxygen from the water and increasing its alkalinity.

5.13 SIGNAGE

5.13.1 Due to the industrial operations occurring during construction, signs are required on-site for safe day-to-day navigation for works traffic and personnel; access for emergency vehicles; and for the health and safety of the public. To further protect the health and safety of all those visiting the proposed development, a comprehensive risk assessment for visitors will be produced. Signage would be bilingual and consist of non-illuminated post and panel sign locations and non-illuminated turbine identification signs with a maximum of three signs per post facing at the proposed development. Signs would also be placed on the turbines to help identify them as indicated in Figure 5.8.

5.13.2 The implementation of bilingual signage would support the Well-being of Future Generations (Wales) Act 2015 goal – '*A Wales of vibrant culture and thriving Welsh language*.'

5.13.3 The signage on site would comprise of two elements; directional signs and roundels displaying the site speed limit. The directional and speed roundel signs measure approximately 300 mm x 400 mm x 3 mm and 300 mm x 300 mm x 3 mm respectively and will be mounted on an approximately 2500 mm x 76 mm grey aluminium pole as shown on Figure 5.8. The poles will be set within approximately 585 mm deep concrete foundation. This will ensure the stability of the signs, in line with current guidance for such installations.

5.13.4 The sign fixtures allow back-to-back mounting and are used on sign locations where more than two signs are specified. The signs will be hard wearing using tamperproof fixtures, securing the signs in place. A high-quality typeface is used to maximise readability. The signage is uncluttered and designed to be legible from vehicle or from foot.

5.13.5 The exact number of signs required at any of the post locations will be decided post-consent, following a full review of the health and safety requirements, and will be confirmed in the CMS.

5.14 EMPLOYMENT DURING CONSTRUCTION

5.14.1 During the construction period there will be construction operatives carrying out the works on site which have been described. There would be indirect local benefits arising from the construction phase, including use of hotels, Bed & Breakfasts, and other accommodation, hire of local equipment and plant, temporary employment of local work force and potential contracting of local subcontractors. The construction would likely be spread over a 24-month period. Such effects are assessed in Chapter 11: Traffic and Transport and Chapter 16: Socioeconomics.

Site Representatives and Support Staff

5.14.2 It is envisaged that the proposed development would be constructed employing a number of main contractors; probably one for the civil infrastructure works, one for the electrical works, and one for the supply, erection, and commissioning of the wind turbines - all of whom would be coordinated and overseen by a project manager. In order to monitor the progression, a number of site representatives would be employed full-time to ensure the quality and health and safety aspects of the construction, and to ensure the development is carried out in accordance with the CMS methodologies. The site representatives would be individuals with previous experience of wind farm construction and would, as required, be supported on site by a suitably qualified ECoW. The site representatives would carry out daily checks on the proposed development to monitor on-going activities, particularly when subcontractors are being used on site. In addition to this, and in conjunction with the ECoW (or other ecological/hydrological surveyors), environmental audits of the site operations would be undertaken on a regular basis accompanied by representatives of the relevant contractors. Where necessary, additional specialists may attend the proposed development including geotechnical and archaeological representatives.

5.14.3 In line with guidance, appropriately competent operatives would be employed for handling, storing, and arranging for the disposal of potentially polluting substances. Licensed waste disposal companies would be used to dispose of potentially polluting wastes.

5.15 SITE REINSTATEMENT

5.15.1 Areas requiring to be made clear only for the construction period – particularly, for temporary construction compounds (8.03 ha) – shall by replanted with trees, leaving a setback of 10 m from the edges of any wind farm infrastructure (in the relevant areas, including roads and cabling).

Access Tracks

5.15.2 During track excavation works following on from forestry felling, where appropriate the vegetated top layer of material, which holds the seedbank, will be stripped, and carefully set to the side of the worked area for re-use in the re-profiling and track verge reinstatement works. Where practical, if storage is required, the layers will be correctly stored in their respective soil/peat horizons, i.e., in the layers that they were stripped in, so when reinstated they can be put back in the correct order. If temporary storage of excavated materials is required, then such material will be stored safely, and the method of storage will not lead to any areas of additional disturbance.

Cable Trenches

5.15.3 The reinstatement and storage of any excavated materials for the cable trenches will involve replacement of previously stripped soils, vegetated layers, or turves. Timing of trench reinstatement works will also take into account adjacent construction activities which may disturb any reinstatement works already carried out. The amount of time between the excavation of the trench and subsequent reinstatement following cable laying will be minimised as much as practically possible. The reason for this is that the longer the stripped turves are stored for the more they will degrade and become unsuitable for successful reinstatement. The optimum scenario for the cable trench works will be to ensure that no cable trenches are excavated until the electrical contractor has their cables ready for installation on site.

Turbine Foundations

5.15.4 Reinstatement methods associated with turbine foundations will include where practical the storage of turves and topsoil around the perimeter of the foundation excavation. A plan showing where the material is to be stored will be created prior to the works commencing. In areas where storage of the turves or excavated material adjacent to the works is not possible, then the material will be taken to the nearest agreed storage areas as soon as possible.

Crane Hardstandings

5.15.5 Due to the requirement for crane hardstandings (pads) to remain in place, reinstatement of the crane pad will not take place. There will however be reinstatement of the area around the crane pad and any exposed batters using the stripping, storage and reinstatement methods described above.

Construction Compounds

5.15.6 All temporary construction areas will be reinstated as quickly as possible following construction. Following removal of temporary site accommodation, storage, equipment and materials, all areas will then be reinstated. Suitable materials, i.e. topsoil, will be replaced over the area in appropriate horizons, i.e.in the correct order. The material used for the reinstatement works (often that which was excavated for the temporary construction area), will be stored and managed adjacent to the temporary construction areas but away from watercourses and other sensitive receptors. It is highly probable that the temporary construction areas, such as the site compound will be required for the duration of the construction period and may be required at times during the operation and decommissioning phases. Therefore, it is unlikely that any stripped turves would be suitable for reinstatement, as the vegetation

would have decomposed if stored for any length of time. Vegetation will therefore be allowed to regenerate naturally, or trees will be replanted in locations agreed with NRW, for more information see Chapter 13: Forestry.

5.16 OPERATIONAL PHASE

5.16.1 Operation of the proposed development would be mostly automated. Each individual turbine would operate independently of the other turbines. Turbine operation would be managed by control and monitoring systems. These systems control the rotational speed of each individual turbine and ensure its continued safe operation. Should any malfunction in operation occur or should wind speeds exceed safe limits, then the braking system of the wind turbine would automatically be applied, and each turbine would shut down to a safe condition.

5.16.2 If the cause of the shutdown is due to high wind speeds, then the turbine would automatically begin operation again once average wind speeds reduce to below 25 m/s. Under other causes of shutdown, for example through malfunction, the turbine would remain shut down in a safe condition (e.g., with the rotor blades orientated 90 degrees to the wind direction) until manually restarted by a member of the Operations and Maintenance team, following satisfactory inspection and/or repair.

5.16.3 The lifetime of the project is envisaged to be up to 50 years from completion of commissioning to commencement of decommissioning. To ensure that turbines continue to operate with acceptable reliability (i.e., with each turbine capable of operating on average, between 95% and 98% of the time), regular pre-planned maintenance and servicing programmes will be performed on each turbine. A typical maintenance programme is outlined. Additionally, there may be a need to conduct irregular, ad hoc maintenance in the event of mechanical breakdowns.

5.16.4 Tracks giving access to turbines will be required during the operational period of the wind farm to allow for routine maintenance operations and occasional replacement of larger components.

Maintenance Programme

5.16.5 Maintenance regimes commonly begin shortly after commissioning with a 'post-construction' check on the torque levels of all bolts within the structure. This is normally performed 10 days after commissioning and again, 3 months after commissioning.

5.16.6 After this, minor and major service regimes continue on a six-monthly basis with both services being performed annually throughout the lifetime of the turbine.

5.16.7 Routine oil sampling and testing of lubricant maintains awareness of the integrity and condition of these lubricants. This allows cost-effective oil changes to be performed as the oil quality degrades. Routine oil sampling and testing of transformer oils is also performed in order to maintain awareness of the integrity of the electrical properties of these oils.

5.16.8 Maintenance of the high-voltage switchgear will also be conducted routinely, and annual checks will be performed.

5.16.9 In the case of major component maintenance being required, such as generator or blade replacement, large vehicles similar to those used during construction may need to return to site. These would be subject to similar conditions of planning as agreed for the initial construction period. From time to time, when such maintenance is being undertaken, it may be necessary to restrict access to areas close to the replacement turbine components in order to maintain the health and safety of visitors. In such cases, the areas affected would be clearly marked and fenced and alternative routes would be provided for any visitors seeking passage through the wind farm, where necessary.

5.16.10 All maintenance of any equipment item would be performed according to the Original Equipment Manufacturer's stated schedules, and health and safety procedures.

5.16.11 All maintenance would also occur according to the environmental procedures aforementioned in this chapter.

Storage and Use of Polluting Substances

5.16.12 Storage of polluting substances at the proposed development during the operational period of the proposed wind farm would only take place where agreed with the relevant authorities in accordance with Control of Substances Hazardous to Health (COSHH) regulations. Generally, substances of this nature are transported in minimum quantities on an 'as required' basis.

Employment during the Operational Phase

5.16.13 It is envisaged that the turbines at the proposed development would be included within a wider portfolio of operational wind turbines and that persons and/or technicians would be on site as required. For the first few years of operation the turbines would be under warranty and maintenance would be performed by the turbine manufacturer. During annual servicing thereafter, the number of technicians on site would increase. The proposed development would also support a site manager to be based in the local area. Other contract personnel would attend the proposed development as required to maintain the civil and electrical infrastructure as well as carrying out duties in relation to ecological monitoring and reporting. Site personnel would make use of the onsite control building, which would include office space and welfare facilities. Chapter 16 assesses the socio-economic effects of the proposed development.

5.17 DECOMMISSIONING

5.17.1 At the expiry of the consent or the end of the proposed development's useful life, it is proposed that the turbines and transformers would be removed. The upper sections of the turbine foundations, to a depth of at least 1 m, would be removed and backfilled with appropriate material. Peat or topsoil would be replaced, and the area reseeded or replanted. Some tracks will be left and allowed to grass over or would be covered with soil and reseeded or replanted and other track will be maintained to enable ongoing forestry management. Cabling would be left in-situ, unless ducted. At least six months prior to the decommissioning of the proposed development, a Decommissioning Method Statement would be prepared, for agreement with the local authorities and relevant consultees.

5.18 WASTE MANAGEMENT

5.18.1 The proposed development will produce small amounts of general, municipal, and hazardous waste during its construction, operation, and decommissioning. Where waste is generated, the waste hierarchy will be applied:

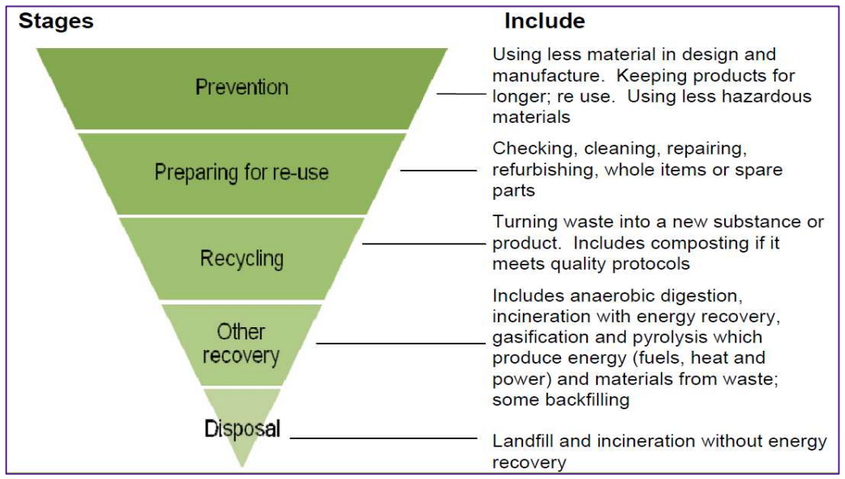

Figure 5.17.1: Waste hierarchy

5.18.2 Waste materials generated during the construction phase include excavation waste such as vegetation, some forestry residues, soil, stone, rock, and similar materials. Excavated materials can be reused on site or elsewhere if it is deemed suitable for reuse. Excavated peat is not classed as waste if it is deemed suitable for a required and predetermined end-use as part of construction works and reinstatement on a site. Other construction waste streams include municipal waste from welfare facilities, including food waste, paper, plastics, glass, cardboard, paper, and other typically domestic refuse. Industrial waste chemicals, fuel, oil and polluted water from plant, vehicle and wheel washes may also be generated as a result of the proposed development.

5.18.3 The operational phase of the proposed development is unlikely to generate significant amounts of waste except for minor quantities of material collected during routine maintenance inspections. Waste streams during this phase include municipal waste, waste chemicals, fuel and oil, sewage and polluted water from vehicle and wheel washes.

5.18.4 During the decommissioning phase of the proposed development wastes includes demolition waste, turbine components, electrical cabling as well as municipal waste, waste chemicals, fuel and oil, sewage, and polluted water. Wind turbines and electrical cables can be reused subject to potential ready markets for the material.

5.18.5 Currently between 85-95% of a wind turbine can be recycled[4], with in the past breaking down composite materials in the blades presenting an economic challenge. However now that we are reaching the point where significant volume of turbines from the initial growth of the late 1990s/early 2000s are reaching their end of life, presenting greater opportunity for economies of scale, there are now a number of projects and programmes underway which aim at ensuring that turbines will be 100% recyclable[5]. It is the expectation that, come the end of life of the proposed development, the turbines will be 100% recyclable.

5.18.6 Measures will be put in place to ensure waste generated from the proposed development is kept to a minimum and does not have a significant cumulative effect on local waste management infrastructure. Such measures will be detailed fully within the CMS.

5.18.7 Embedded mitigation to reduce the quantity of waste from the proposed development will include the design of the proposed development in such a way that new turbines can be accessed by existing access tracks wherever possible, minimising the need to construct additional access tracks and reducing the potential for waste. All construction and decommissioning activities will be planned effectively to ensure that any materials associated with these activities are predicted well in advance, reducing the chance of over-ordering of materials which would result in waste.

5.18.8 Materials will be reused on site or elsewhere and materials will be sent for recycling where recycling facilities are available. Other measures to ensure that waste materials sent to local waste management facilities and to landfill are kept to a minimum include the nomination of an approved person(s) to be responsible for waste management on site; this will include the coordination of waste collection to suitable disposal and/or recycling facilities. In addition, a system to record and monitor waste will be implemented, keeping a record of reuse, recycling, and disposal. It may also be possible to schedule certain activities that generate large volumes of waste to avoid overloading local infrastructure if other construction projects in the area are also producing large volumes.

5.18.9 Pollution prevention measures will also be put in place, and these will be detailed fully within individual chapters of the ES and within the CMS. Pollution prevention measures include:

- Storage of waste materials within the construction compound only. If waste materials are generated outside the construction compound, they will be taken to the compound on a daily basis;
- All waste products will be removed from site by registered waste carriers and taken to a waste management facility permitted to receive each specific waste type;
- Bonfires and the burning of waste products will be prohibited on-site;
- Labelled, double skinned waste tanks will be utilised for the storage of waste oils on-site;
- The waste storage area will be isolated from surface drains and bunded to contain any spillages; and
- A wastewater collection system will be used to prevent contamination of local watercourses.

5.19 HEALTH AND SAFETY

Health and Safety of Construction Workers

5.19.1 The construction site will be managed and operated in accordance with Health and Safety at Work etc. Act 1974 and comply with relevant Health and Safety Regulations, including:

- The Management of Health and Safety at Work Regulations 1999;
- Construction (Design and Management) Regulations 2015; and
- Electricity Safety, Quality and Continuity Regulations 2002.

5.19.2 In awarding any civil, electrical, or other contracts for the construction of the proposed wind farm, the appointed contractor is obligated by law to follow the CDM Regulations implemented by the HSE. These are based on standard procedures that are adapted to take account of all site-specific requirements. The Regulations require due consideration is given to construction workers and the public, with risk assessments and method statements created to cover all risks identified including access rights across Y Bryn site boundary.

5.19.3 A Principal Designer (PD) will be contracted by the applicant to take overall control of health and safety measures at the pre-construction phase, (as defined by CDM 2015), and are responsible for planning, managing, and coordinating health and safety for any pre-construction activities. The PD ensures all relevant information is provided to other CDM duty holders, seeking to identify, eliminate or control foreseeable risks, ensuring designers comply with their duties as well as liaising with the PC to help with planning, management and monitoring of the construction phase, including compiling of the Health and Safety File.

5.19.4 Under CDM 2015 the applicant isn't expected to manage the project themselves, however they remain ultimately responsible and must ensure all required duty holders are appointed and that suitable arrangements are in place for the work to be carried out safety.

[4] Siemens Gamesa, (2021). Available from - https://www.siemensgamesa.com/newsroom/2021/01/210125-siemens-gamsa-press-release-decomblades-launched [Accessed 28/03/2023]

[5] Catapult, OGTC, (ND). *Sustainable Decommissioning: Wind Turbine Blade Recycling.* Available from - https://ore.catapult.org.uk/wp-content/uploads/2021/03/CORE_Full_Blade_Report_web.pdf [Accessed 28/03/2023]

Safety of the Public

5.19.5 Throughout the construction phase of the development the relevant statutory requirements would be adhered to in relation to safety of the public, see Chapter 14: Health and Public Safety for further information.

5.19.6 Throughout construction, measures to manage diversion routes would be put in place. See Chapter 15: Aviation and Existing Infrastructure for further information on effects on public rights of way and other trails (including mountain biking trails).

Operational Phase

5.19.7 Wind farms have a proven track record for safety. A very small number of wind turbines have been known to suffer from mechanical damage through lightning strikes or mechanical failure. Experience on existing sites has shown that allowing the public to access an operating wind farm does not lead to a compromise in safety, see Chapter 14 Health and Public Safety for further information.

5.19.8 Companies supplying products and services to the wind energy industry operate to a series of international, European, and British standards. A set of product standards for wind energy equipment has been developed by the International Electrotechnical Commission – IEC 16400. There are a number of British Standards that correspond to it, for example BS EN 61400-1: 1995 '*Wind turbine generator systems – safety requirements*'.

5.19.9 The applicant would commit to installing wind turbines and components that meet BS EN 61400-1: 1995 or IEC 16400 as appropriate.

5.19.10 Public access to the proposed development area after construction has been completed would be improved with the provision of easily accessible multi-use tracks.

5.19.11 Appropriate warning, directional and identification signs would be installed on the turbines, transformers and on-site electrical control building, and access to these would be restricted to wind farm personnel. At all times these facilities would be locked. Additionally, safety and/or directional signs would be placed at strategic points across the proposed development, particularly on any Public Rights of Way to inform members of the public that they are entering a wind farm area, to make them aware of potential hazards and provide direction for emergency services should the need arise. Any signage would be agreed with the relevant authorities prior to installation as part of the CMS.

5.19.12 No resulting safety risks are expected as a result of public access to the proposed wind farm site. Turbine models being considered for the proposed development would operate automatically and have sensors to detect any instabilities or unsafe operation during high wind speeds. Should sensors placed on the nacelle and tower of the turbine detect any other malfunction in operation or should wind speeds increase over maximum operational thresholds, the brakes would be automatically applied in order to rapidly shut the turbine down.

5.19.13 Vibrometers are located in the nacelles and would detect rotor imbalance in blades caused by icing and the wind turbine's control and monitoring system would shut the turbines down under these conditions. The turbines are also equipped with lightning protection equipment so that strikes will be conducted from the nacelle down the tower into the earth.

5.19.14 The safety features and record of wind turbines are identified above, and it is concluded that the proposed wind farm would not present a significant safety risk to the public.

5.20 CONCLUSION

5.20.1 This chapter has set out a description of the proposed development and provided details of the activities that will be undertaken throughout the construction, operation, and decommissioning phases of the proposed development.

5.20.2 There is sufficient detail to provide consultees with a reasonable understanding of the proposed development. Further construction details will be provided in the CMS, which will be submitted by the PC for approval by the local planning authority prior to the construction of the proposed development.