



Balgray Wind Farm

Chapter 3: Description of Development

June 2025



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List of Abbreviations

Abbreviation	Description
BESS	Battery Energy Storage System
CDM	Construction Design Management
CEMP	Construction Environmental Management Plan
COSHH	Control of Substances Hazardous to Health
DNO	Distribution Network Operator
ECOW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
FCS	Forestry Commission Scotland, now Forestry and Land Scotland
GIS	Geographic Information Systems
GWDTE	Ground Water Dependant Terrestrial Ecosystems
HSE	Health and Safety Executive
LiDAR	Light Detection and Ranging
MoD	Ministry of Defence
MW	Megawatt
O&M	Operations and Maintenance
PAC	Pre-Application Consultation
PAN	Planning Advice Note
PMO	Planning Monitoring Officer
SCADA	Supervisory Control and Data Acquisition system
SEPA	Scottish Environmental Protection Agency
SNH	Scottish Natural Heritage, now NatureScot
SuDS	Sustainable Drainage System
UK	United Kingdom



3. Description of Development

3.1. Introduction

3.1.1. This chapter outlines the details of the Proposed Development as specified in Chapter 1: Introduction, of the EIAR, including specifications of turbines, battery energy storage system, access tracks and electrical infrastructure. It also describes the general construction methodology, timescales and typical construction equipment likely to be used. Operational and decommissioning phases are also described within this chapter.

3.1.2. The construction methods detailed below build on best practice methodologies developed at other wind farms to comply with Health and Safety requirements for construction and operations, and follow relevant guidance including:

- Scottish Environmental Protection Agency's (SEPA) Pollution Prevention Guidelines;
- Scottish Natural Heritage's (SNH, now NatureScot) Good Practice During Wind Farm Construction; and
- SNH/Forestry Commission Scotland's (FCS, now Forestry and Land Scotland) Floating Roads on Peat Guidance.

3.1.3. Further construction details and mitigation will be provided in the Construction Environmental Management Plan (CEMP). These along with other forms of embedded mitigation have been designed 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 EIA process is discussed throughout the remainder of this EIAR.

3.2. Site Location

3.2.1. Figure 1.1 (see Chapter 1: Introduction within this volume of the EIAR) shows the location and extent of the Proposed Development in a regional context. The Proposed Development is located approximately 6km northeast of Lockerbie. Most of the Proposed Development is on land owned by Balgray Estate, centred on British National Grid Coordinates: 316486 588010. The access route to the north of the site is in separate ownership.

3.2.2. Chapter 2: Site Selection and Design Evolution of the EIAR provides details of the design process that resulted in the final layout.

3.2.3. The application is for a wind farm generating station comprising of up to 6 wind turbines, with a height of up to 200 m from base to tip and a generating capacity of approximately 43MW.



- 3.2.4. The application also includes associated infrastructure, including: approximately 43MW of battery energy storage system, external transformer housings, control room, crane pads, turbine foundations, access tracks, substation, underground electricity cables between the turbines and the onsite substation, up to 2 temporary borrow pits, water crossings and drainage attenuation measures as necessary, forestry felling and restocking, Health and Safety signage, and, temporary construction and storage compounds and ancillary infrastructure.
- 3.2.5. As shown in Figure 1.1, the Proposed Development is located entirely within the Dumfries and Galloway Council area.

3.3. Site Layout

- 3.3.1. The turbine layout and associated infrastructure is presented in Figure 1.2 following Chapter 1: Introduction in this volume of the EIAR. This figure illustrates the relevant elements, including locations for the proposed 6 turbines, battery energy storage system (BESS), site tracks, crane pads and operational hardstandings, onsite electrical substation, control room, temporary construction and storage compound areas and potential borrow pit search areas (local temporary sources of construction aggregate which are solely for the purpose of the wind farm construction).
- 3.3.2. Micro-siting allows the exact turbine location and infrastructure to be modified post consent, following detailed ground investigation and ground clearance. Through industry experience, a micro-siting allowance of 50 m is considered appropriate for turbines and infrastructure. Table 3.1 below gives the centre point co-ordinates and proposed maximum tip height for each of the proposed turbines.

Table 3.1: Turbine Locations

Turbine number	Easting	Northing	Maximum tip height (m)
1	317391	587505	200
2	316590	587430	200
3	316359	588065	200
4	317141	587842	200
5	317032	588302	200
6	316614	588650	200

- 3.3.3. This layout was developed taking into account the ecological, geological, hydrological, archaeological, topographical, landscape, visual and noise constraints whilst ensuring optimal wind resource (see Chapter 2: Site Selection and Design Evolution of the EIAR for further details on site constraints which were taken into consideration).



- 3.3.4. Concerning layout alternatives, the layouts were tested from a series of 'design viewpoints' and the iterative process continued until a series of key design objectives had been met to an appropriate degree. These are set out in Chapter 2: Site Selection and Design Evolution of the EIAR.
- 3.3.5. Each turbine location, although constrained to some extent by on site constraints was considered in landscape and visual terms until it was felt that it met the design strategy principles set out in Chapter 2: Site Selection and Design Evolution and Chapter 6: Landscape and Visual Impact Assessment, of the EIAR, as judged from a selection of key viewpoints.
- 3.3.6. Once this 6-turbine layout was confirmed as being acceptable with respect to other on site interests (including ecology, hydrology, archaeology, existing land use/holdings), the layout was fixed, and the detailed assessment was continued and completed.
- 3.3.7. The total land take of the Proposed Development, after completion of reinstatement measures, including foundations, crane pads (see 3.16.4 and 3.16.5 of proposed reinstatement measures), site tracks and new sections of access track has been assessed to be approximately 99,687 m² excluding batter slopes. Indicative drawings for currently available technologies that suit site conditions are presented in Figure 3.1a – 3.11, Volume 3a of the EIAR. Drawings include, indicative turbines, turbine foundations, site track cross sections, crane pads, turbine transformer housing, cable ducts and the temporary construction compounds and signage.

3.4. Public Road Access

- 3.4.1. Chapter 12: Access, Traffic and Transport, of the EIAR, details the public road network proposed for the transportation of turbine components. The proposed route makes use of road networks that have previously facilitated the construction of wind farm developments.
- 3.4.2. Access to the site from the public road network would follow the A74(M) to the B7068, B7076 and Breckenry Road to Boreland, using the Unclassified Road from the B723 to the site access track.
- 3.4.3. Whilst it is acknowledged that details of any additional works that may be required along the public access route will have to be provided at a later stage, it is assumed for the purpose of determining this application that any such works will not have an adverse effect on the existing road network. It is expected that there will be options to enable the selection of turbine components and an appropriate mode of transport that enables delivery within the current parameters of highways surrounding the Proposed Development. This will be kept under review, as the consenting process progresses toward the proposed implementation of the wind farm.



- 3.4.4. Additional information on this matter will be provided as required to the planning authority and other relevant stakeholders.
- 3.4.5. The condition of the public road along the access route and other roads would be surveyed and recorded prior to it being used for wind farm construction. 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.
- 3.4.6. The impact of the Proposed Development construction and operation traffic on the public road system in Dumfries and Galloway is assessed in Chapter 12: Access, Traffic and Transport of the EIAR.

3.5. Construction Phase

- 3.5.1. Prior to the commencement of construction, a CEMP would be produced setting out in detail the individual items of works associated with the construction of the Proposed Development. It would consider relevant planning conditions and ensure that each activity is carried out safely, in accordance with best practice and the relevant guidelines¹, and to minimise environmental impact, in accordance with SEPA's pollution prevention guidance.
- 3.5.2. The CEMP will include specific details of timescales and contours for the implementation of the works, which will include the reinstatement of the development following the construction period. It shall also outline full details of baseline water quality, all construction which will be carried out on site, drainage, mitigation and restoration work and timetables.
- 3.5.3. Typically, the document would cover the following topics:
- Site Health and 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;
 - Pre-construction Survey Work Undertaken;
 - Turbine Description/Specification;
 - Construction Schedule;

¹ Good Practice during Wind Farm Construction, 4th Edition. (2019) Scottish Renewables, SNH, SEPA, FCS, HES, MSS and AEECoW. Available online from <https://www.scottishrenewables.com/publications/498-guidance-good-practice-during-wind-farm-construction> (last accessed 04/11/2024)



- Public Highway Works;
- Site Tracks;
- Temporary Construction Compound;
- Crane Pads;
- Cable Trenches;
- Foundation Works;
- On-site Substations;
- Borrow Pits;
- Monitoring - Ecological, Hydrological, Geotechnical and Archaeological;
- Emergency Procedures;
- Pollution Control and Waste Management – potential waste material, materials that can be reused onsite or elsewhere and mitigation measures;
- Peat Management; and
- Drainage attenuation measures - in order to mitigate any potential adverse impact on the hydrological environment from the construction and ongoing operation of the site a series of drainage attenuation measures will be included.

3.5.4. A Site Pollution Control and Waste Management Plan will be drawn up as part of the CEMP. The Site Pollution Control and Waste Management Plan considers the types and quantities of waste arising from the Proposed Development during the construction, operation and decommissioning stages, offers options to avoid and manage the levels of waste and plans for disposal and details any necessary mitigation measures. This is discussed in more detail in Section 3.19 of this chapter. Further details on drainage, the control of pollution and the treatment of wastewater are considered in Chapter 9: Hydrology, Geology and Hydrogeology of the EIAR.

3.5.5. The Site Pollution Control and Waste Management Plan will be written in accordance with relevant guidance including SEPA Land Use Planning System Guidance Note 4². The Site Pollution and Waste Management Plan will outline the mitigation measures that are proposed to prevent or reduce the likelihood of pollutant leaks at the Proposed Development.

3.5.6. Waste management measures used to reduce the amount of waste produced as a result of the Proposed Development will be detailed as well as the methods

² Land Use Planning System SEPA Guidance Note 4. (2017) SEPA. Available online from [Scottish Government - DPEA - Document](#) (last accessed 29/07/2025)



used to ensure that such small amounts of waste are safely stored (see Section 3.19 below for more information on Waste Management). The potential to reuse waste on site as a method of waste reduction will be discussed in the Site Pollution and Waste Management Plan and discussed in detail within the Peat/Soil Excavation and Preparatory Felling Section of the CEMP. In addition, measures put in place to ensure that waste generated from the construction phase of the Proposed Development does not have a significant cumulative effect on local waste management infrastructure will also be detailed.

- 3.5.7. 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 the pre-construction phase, additional data is available for consultation in the form of detailed site investigations. Furthermore, the civil engineering contractor and the turbine supply contractor would have been chosen by this stage, enabling more detailed preparation of individual method statements. During the preparation of the CEMP, correspondence and meetings with SEPA, the planning authority and other relevant consultees would be undertaken to review the working methods proposed and if necessary, incorporate changes. This iterative process of preparing the CEMP ensures that when construction commences there is a documented procedure and risk assessment. 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 straightforward.
- 3.5.8. Each section of the CEMP will provide a detailed description of the task to be completed along with risk assessments, where necessary, covering items such as waste management and reuse, pollution prevention, control of waters, nuisance and material use.
- 3.5.9. Waste materials such as peat will be re-used on site where those materials are deemed suitable for reuse. Such materials will be reused on site during reinstatement works and habitat restoration.
- 3.5.10. A Section of the CEMP regarding the handling and storage of peat would be prepared which details the techniques used to maximise the potential for excavated material to be reused on-site during reinstatement works (see Section 3.16 below for more details) in accordance with recommended guidance such as SEPA Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and Minimisation of Waste (SEPA, 2012), Developments on Peat and Off-Site Uses of Waste Peat (SEPA, 2017) and in accordance with recommendations from a suitably qualified geotechnical designer, ecologist and hydrologist following a detailed site investigation. The site specific peat depth probing shows that there is limited peat recorded at the site and therefore in accordance with best practice there is no requirement for a site specific Peat Slide Risk Assessment (see Chapter 9: Hydrology, Geology and Hydrogeology, of the EIAR for details of the assessment works that have been carried out). Additional detailed ground investigation would be conducted prior to



construction. In respect of matters regarding construction methodology and peat stability at the site, the following general recommendations would be adhered to and would form part of the overall CEMP documentation.

- 3.5.11. A Stage 1 Outline Soil and Peat Management Plan (SPMP) (Technical Appendix 9.5) has been developed to accompany this Application. It outlines the overall approach of minimising disruption to peatland, and it aims to ensure that all further opportunities to minimise peat disturbance and extraction would be taken during detailed design and construction of the Proposed Development. It is intended that the SPMP is a working document to be used throughout the key stages of the design, construction, operation, decommissioning and re-instatement phases of the Proposed Development as part of the overall CEMP. These stages are outlined as follows:

Stage 1: Environmental Impact Assessment (EIA)

The Outline SPMP is submitted as part of the EIA Report. From this initial report the SPMP will be developed into a Stage 2 Pre-Construction SPMP.

Stage 2: Post Consent / Pre-Construction

The soil and peat mass balance calculations may be further developed prior to the works commencing, following detailed ground investigations of further survey works required to inform the detailed design, or that may be required under planning consent conditions.

Stage 3: Construction Stage

Actual soil and peat volumes excavated during construction will be recorded against the overall predicated volumes. Within micro-siting allowances, the alignment and design of tracks, turbine and infrastructure foundations and associated construction methods will be reviewed to avoid/minimise peat disturbance as much as possible considering the more detailed information available once construction commences. A regular review and update of the peat mass balance table will be undertaken by the appointed Principal Contractor (PC) and monitored by the Ecological Clerk of Works (ECoW) on-site and made available to regulators as required.

- 3.5.12. Environmental awareness to be provided to all staff entering on to site; this will include a basic environmental site induction:

- 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 practices are suitable for the encountered ground conditions. Ground conditions are to be assessed by a suitably experienced geotechnical engineer.
 - Form a contingency plan to detail the level of response to observed poor ground conditions.
 - Routinely inspect the development area by maintenance personnel including an assessment of ground stability conditions.
 - Carry out an annual inspection of the site following completion of works by suitably experienced and qualified geotechnical personnel.
 - Maintain stored peat in a suitable condition to minimise the peat drying out.
 - Minimise the need to handle stored peat so as to reduce any drying or changes to the peat.
- 3.5.13. Other sections relating to site-specific items including landslide hazard and geotechnical risk register, identified during the pre-construction phase could also form part of the CEMP. It is intended that the CEMP 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, as and when necessary.

3.6. Wind Farm Construction and Reinstatement Techniques

- 3.6.1. Construction of the Proposed Development would begin after a period following granted consent from the Scottish Ministers. The Applicant is seeking a 5-year consent commencement period condition to allow time for the discharge of conditions, procure the turbine equipment and associated infrastructure delivery and reach an investment decision for the project. The Proposed Development is estimated to connect and integrate into the wider grid network in 2032; however, this is subject to change due to factors out with the Applicant's control, including the timescales of a grid offer.
- 3.6.2. This section of the EIAR describes the construction phase in detail, however, the general order of on-site activities is summarised in Table 3.2 below. These items generally follow chronologically but some items will run concurrently. Any construction works required at the on-site substation and the grid connection can be lengthy processes which will commence early in the construction



programme to allow a live grid connection to coincide with the commissioning of the turbines.

Table 3.2: Construction Elements

Construction Elements
Site investigation
Mobilisation of civil and electrical contractor
Construction and upgrades to access and site tracks
On-site temporary construction compound and site storage compound
Track reinstatement
Excavation and construction of turbine foundations
On-site cabling
Construction of the substation and BESS compound
Preparation of crane pads
Installation of turbine transformers
Mobilisation of turbine supply contractor
Turbine delivery
Turbine erection
Reinstatement around turbines
Turbine fit-out
Connection to substation and grid connection
BESS installation
Commissioning of wind farm
Commissioning of BESS installation
Reliability testing
Demobilisation

3.6.3. It should also be noted that these elements relate to permanent infrastructure. Some temporary works are required during the construction phase, which are not included in this description due to their minor nature and duration, such as construction of temporary hardstanding areas for crane components, pads for supporting the rotors during construction or drainage measures in turbine excavations.

Construction Environment Management Plan

3.6.4. A CEMP will be produced and finalised setting out the means by which each element of the Proposed Development will be constructed on site. A CEMP will be produced when the main contractor has been selected and distributed for approval by the consenting/planning authority prior to commencement of works. The CEMP will be agreed with Dumfries & Galloway Council, in consultation with NatureScot and SEPA.



Construction Timetable

3.6.5. The construction period for the whole of the Proposed Development is envisaged to last for approximately 12 months, from commencement of construction through to installation and commissioning of the turbines and battery energy storage system, ending with site reinstatement (as shown on the construction programmes). Construction would consist of the following phases which, although presented in a typical sequence, may overlap or occur concurrently:

- Construction of a site storage compound for off-loading materials and components and to accommodate site offices and mess facilities. Depending on where the site storage compound is, normally some tracks would be required.
- Construction of site tracks and excavation of cable trenches.
- Public highway improvements.
- Construction of turbine and crane pads.
- Delivery and erection of turbine towers, and installation of nacelles and blades.
- Delivery and installation of BESS containers.
- Laying of on-site cabling.
- Installation of turbine transformers.
- Construction of new substation.
- Testing and commissioning of the turbines, BESS and the wind farm electrical system.
- Site reinstatement (on-going during works).

3.6.6. A typical 12-month construction programme is presented in Table 3.3 below:



Table 3.3 Outline 12-month construction programme

Month > Task Name	1	2	3	4	5	6	7	8	9	10	11	12
Mobilisation and site set up	X											
Access and site tracks	X	X	X	X	X	X						
Crane pads		X	X	X	X	X						
Foundations		X	X	X	X	X	X					
Substation constriction and battery energy storage installation					X	X	X					
Cabling/electrical installation								X	X	X		
Turbine deliveries and erection						X	X	X	X	X	X	
Site reinstatement	X	X	X	X	X	X	X	X	X	X	X	X
Commissioning of wind farm										X	X	
Demobilisation												X

Typical Equipment Used at the Site

3.6.7. The following is an indicative list of equipment that would be required to construct the Proposed Development. The equipment would be in use on the site 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.

3.6.8. *One 800/1000 tonne capacity crane and three 400/500 (or less) tonne capacity cranes.* The 400/500 tonne cranes 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.

3.6.9. *Two 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.



- 3.6.10. *Three 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.
- 3.6.11. *One 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.
- 3.6.12. *Approximately four dump trucks.* These would be used for moving material around the site, e.g. for moving excavated peat or soils from cut site tracks to any stretches of floating track over deeper peat, and stone from the borrow pits for track construction.
- 3.6.13. *One or two 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.
- 3.6.14. *One mobile concrete pump.* The concrete pump would be used on-site during the concrete works for the turbine foundations and the metering building. 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.
- 3.6.15. *Two 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.
- 3.6.16. *Two small trucks or four wheel drive vehicles with trailers.* This would be used for transporting of small loads around the site i.e. ducting pipes for cables in turbine foundations.
- 3.6.17. *Two minibuses and six four wheel drive vehicles.* These would be used for transporting construction workers and site managers around the site. These would be likely to leave the site on a regular basis transporting workers to and from their billets off-site.
- 3.6.18. A number of other vehicles would bring loads to the site but would not be stored at the site. 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.
- 3.6.19. To prevent mud entering the public road system, if necessary, the wheels of all lorries leaving the site would be washed either using a manual spray or a wheel washing drive through unit.



- 3.6.20. *Cabins/Welfare Facilities.* Due to the requirement under Health & Safety Legislation and the CDM Regulations for welfare facilities on site and the exposed nature of the site, 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 SEPA and the local authority. Smaller, mobile self-contained units are likely to be required as work progresses throughout the site. 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 3.2, Volume 3a.
- 3.6.21. *Fuel & Chemical Storage.* Fuel would be required for the vehicles, generators and other equipment on site. The storage facilities would typically comprise of 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 the site. Emergency spill kits would be kept on site adjacent to the fuel storage area and with the mobile bowser. A Principal Contractor (please see Section 3.15 below which details site representatives and support staff) 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.
- 3.6.22. *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, 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 CEMP. Handling of potentially hazardous materials would be carried out in accordance with SEPA Pollution Prevention Guidelines, but particularly; Guidance for Pollution Prevention; Working at Construction and Demolition Sites: GPP 6 (NIEA/SEPA, 2023) 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 CEMP document prior to construction commencing.



3.7. Specification of Turbines

Description

- 3.7.1. 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. The height from base to tip for each of the 6 turbines will not exceed 200 m – see Table 3.1 for further details. It is expected that the turbine cut in wind speed will be approximately 3m/s and will rotate clockwise.
- 3.7.2. Up to 6 turbines will be fitted with mandatory aviation lighting. See chapter 6: Landscape and Visual Impact Assessment for details including mitigation proposed.
- 3.7.3. Wind turbine towers will likely be constructed from steel and the blades from fibreglass. It is proposed that the turbine tower, nacelle and blades will be finished in a semi-matt, off-white/pale grey colour. A typical turbine specification, of the type being considered for use on the site, is presented in Figure 3.3 following this chapter of the EIAR, indicating the turbine height proposed. In order to comply with Health and Safety requirements for the site, the Applicant would propose to apply identification numbers to the sides of the turbines. Numbers would be up to 1000 mm tall by 900 mm wide and would be positioned between 1.5 m and 3 m from ground level in order to be visible from the approaching access track. Details of these would be agreed as part of the CEMP.
- 3.7.4. There may be a need for transformer housings to be situated adjacent to each of the turbine towers. 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 design for typical transformer housing is shown in Figure 3.4, Volume 3a.

Erection of Turbines

- 3.7.5. 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 3.5 following this chapter of the EIAR.
- 3.7.6. 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

- 3.7.7. 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 infrastructure and turbines in four-wheel drive (4WD) vehicles or similar. In addition, longer servicing visits would be required, typically every six months, along with irregular 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.
- 3.7.8. Wind farm performance would be remotely monitored using a Supervisory Control and Data Acquisition system (SCADA) that would monitor the individual turbines and the grid connection.

Environmental Considerations

- 3.7.9. 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.

3.8. Turbine Foundations

Construction

- 3.8.1. Reinforced concrete gravity foundations are envisaged for use for the proposed turbines. Aggregate for the foundations is proposed to be sourced from the 2 proposed borrow pits on site. This foundation type is typically an inverted T shape consisting of a large pad with protruding upstand approximately 200 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 either via an embedded end (short tower section) which is cast into the foundation or alternatively 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.
- 3.8.2. A typical turbine foundation specification is presented in Figure 3.6 following this chapter of the EIAR. 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 26-32 m diameter usually suffices for turbines with the dimensions identified in Figure 3.3 following this chapter of the



EIAR. Combined with the protruding upstand, the overall depth of the foundation would be around 3-3.5 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 located within housings, as shown in Figure 3.4 following this chapter of the EIAR, adjacent to the turbines with power cables from the turbines passing through ducts cast into the foundation.

Environmental Considerations

- 3.8.3. 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.
- 3.8.4. Cement entering a watercourse can have a detrimental effect by drawing oxygen from the water and increasing its alkalinity. Although the site has been designed to avoid sensitive areas as far as possible, particular care would be taken pouring concrete at turbine foundations in the vicinity of watercourses and in areas of deeper peat. Guidance for Pollution Prevention; Works and Maintenance in or Near Water: GPP 5 (NIEA/SEPA, 2018) as well as Guidance for Pollution Prevention; Working at Construction and Demolition Sites: GPP 6 (NIEA/SEPA, 2023) would be adhered to and in addition SEPA would be consulted during the preparation of the CEMP 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.

3.9. Battery Energy Storage System

- 3.9.1. A BESS facility with an expected upper capacity of 43MW forms part of the Proposed Development alongside the wind farm. Battery storage facilities are increasingly playing an important part in the UK energy network in providing grid stabilisation services. When connected to a wind farm such as the Proposed Development, they allow wind turbines to generate electricity in periods of high wind but low demand (when wind farms may otherwise be depowered); and provide electricity when this scenario reverses (lower wind speeds but higher electricity demand). Battery storage technologies are rapidly



advancing and are seen as a necessary component in the energy network to reach net zero targets (National Grid, 2021)³.

- 3.9.2. The battery storage facility for the Proposed Development is to be installed to the south of the wind farm. It will indicatively comprise of 78 containers not exceeding approximately 3m high (Figure 3.13 following this Chapter of the EIAR). The maximum dimensions of the facility will be approximately 120 m x approximately 100 m, and it will be surrounded by a security fence of approximately 2.5m in height. Figure 3.7 following this chapter of the EIAR illustrates the indicative layout of the battery storage facility.

3.10. Crane Pads

- 3.10.1. Cranes would be required during the erection of each turbine at the turbine site, typically one 800/1000-tonne crane and three smaller 400/500-tonne cranes. To provide stable, firm ground for safe operation of the cranes during the installation of turbines, areas of hardstanding would be laid down on one side of each turbine foundation. These would need to be suitable for the outriggers of the respective cranes; leading to an area of approximately 140 m x 20 m for simultaneous use of all cranes (see Figure 3.5 following this chapter of the EIAR). Their locations will be finalised following further site investigation, but will maximise use of the access tracks, where possible, to minimise the carbon footprint of the Proposed Development. Typically, construction of the hardstanding areas would be similar to construction of the site tracks (on shallow soils) with 100-150 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 the borrow pit locations identified indicatively in Figure 1.2 following Chapter 1: Introduction of the EIAR. These hardstandings may also be utilised during the operational lifetime of the Proposed Development.
- 3.10.2. 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

- 3.10.3. 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. The removed peat will either be

³ <https://www.nationalgrid.com/stories/energy-explained/what-is-battery-storage#:~:text=Battery%20storage%2C%20or%20battery%20energy,when%20customers%20need%20power%20most> (Accessed 09/12/2024)



relocated to the nearest restoration area or re-used to sympathetically reinstate around the turbine foundations or temporarily stored for relocation as soon as is practical. Stored peat would be prevented from drying out by storing the turfs close together to prevent drying of the edges. They will be monitored during storage and irrigated if required. On completion of erection and installation works, it is proposed that the areas of hardstanding will remain as it may be required during the operational phase of the Proposed Development. It is envisaged that the surrounding grassland vegetation will re-colonise the area. A diagram of a typical crane hardstanding can be found in Figure 3.5 following this chapter, although the final detail may vary depending on the exact make and model of turbine procured.

- 3.10.4. Reuse and storage of peat will be fully discussed within the CEMP and will follow best practice contained within SEPA Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste (SEPA, 2012) and SEPA Land Use Planning System Guidance Note 4 (SEPA, 2017).

3.11. Site Tracks and Borrow Pits

Description

- 3.11.1. It is expected that new stone for access tracks will be won from borrow pit locations identified onsite (note that this has not been the assumption to calculate traffic volumes as set out in Chapter 12: Traffic and Transport, where stone has been assumed to be coming from off-site, in order to reflect the worst case scenario with regards to traffic impacts). From initial site assessments, the indicative locations of the borrow pit search areas are shown on Figure 1.2 following Chapter 1: Introduction of the EIAR; however final locations would be agreed as part of the CEMP for the scheme and subject to detailed ground investigations to confirm suitability of material. Should any additional borrow pit locations be required these will be subject to the outcome of a separate Mineral Extraction Licence application, which would be made to the planning authority. The final reinstatement of these borrow pits would be agreed with the local authority in consultation with SEPA and SNH prior to reinstatement works commencing.

Borrow Pit Working Methodology

- 3.11.2. Detailed borrow pit designs will be completed by the appointed BoP contractor prior to commencing operations. The final geometry of the borrow pits is dependent on the bedrock geological conditions, with benching and rock cuttings designed to ensure adequate stability. The final borrow pit design will specify a maximum single lift face height and a maximum face angle. The borrow pit would be subject to inspection by a suitably experienced geotechnical engineer.
- 3.11.3. The borrow pit floor will be designed for a shallow gradient to allow adequate drainage away from the working area. A perimeter fence and/or adequate edge



protection will be erected around each borrow pit working area, and a cut-off drain also installed to reduce surface water accumulation within the borrow pit excavation of safeguard against sediment loaded run-off. The detail of the cut-off ditches and suitable surface water treatment measures will be specified within the CEMP.

- 3.11.4. The upper most vegetated layer of soil will be stripped from the borrow pit excavation in a progressive movement up the slope as the excavation extends. As the excavation expands laterally into the terrain, the topsoil and overburden shall be stripped and stored to build up peripheral bunds. These bunds will also provide a cut off for water coming down the slope to be diverted to reduce ingress of additional water into the excavation area. The bunds will be limited in height and side slope angle to ensure that they are stable for the duration of the operations, typically no greater than approximately 2m in height and one in three side slopes. The stability of bunds will be monitored by an experienced geotechnical engineer throughout the construction of the borrow pit.
- 3.11.5. Underlying subsoils will be removed in strips ahead of the working face and places a safe distance, a minimum of approximately 3m back from the excavated face. If necessary, they will be they will be stripped and stored in a separately in a secure area until the excavation is complete and the overburden soils can be utilised for the restoration of the borrow pit area. Any topsoil or peat excavated will be stored separately from overburden.
- 3.11.6. Where possible, stockpiled overburdened materials will be used in reinstating site borrow pits and tracks. Spoil from other working areas, such as turbine bases, may also be used to achieve the restoration profile. Overburden shall only be removed over the area necessary for safe removal of the rock to prevent impacting land out-with the extraction area. It should be noted that overburden volumes can only be estimated following intrusive site investigation works.
- 3.11.7. Suitable fencing or protection barriers will be installed around the proposed borrow pit excavation areas on the slope to ensure the safety of both people working within the excavation area and anyone who may be within the Proposed Development. Full details will be provided as part of the detailed Construction Method Statement.
- 3.11.8. Due to the nature of the rock, the excavation is likely to be achieved through ripping, hydraulic breaking and blasting. The rock is likely to require crushing for secondary fragmentation and screening to gain a suitable aggregate size and prevent weathered material from contaminating the site won rock. Primary fragmentation shall be used to achieve a suitable material size.
- 3.11.9. Restoration blasting could be implemented, including blasting at the borrow pit face edges to achieve a shallower restoration rock face profile.



Construction

- 3.11.10. Approximately 5.4 km of new on-site tracks and 1.4 km of upgraded tracks would link the proposed turbines and infrastructure to the road network. The design philosophy behind the track layout has taken into account a number of factors including topography, hydrology, watercourse crossing, ground conditions and construction parameters and has been based on best practice methodology developed at other wind farm sites. It is proposed that existing tracks are used where possible to reduce the need for construction of further tracks. Using existing tracks will also further reduce the degree of disturbance to the local environment. The proposed track layout has been designed following an onsite review and minimised the number of water crossings necessary and used as far as possible the existing infrastructure in place to minimise impacts on the environment.
- 3.11.11. The initial stripping of topsoil for the tracks and placement of stone material for construction of tracks has the biggest potential to release sediment into watercourses. Therefore, using methods consistent with industry best practice sediment measures 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 and 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 specialized 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 Development.
- 3.11.12. For construction of new sections of track, alternative methods would be utilised for different areas of the site, depending on site specific conditions. For each method, the track running width (excluding drainage channels and cable trenches) would generally be approximately 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 roads would be used for on-site track construction and for 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 3.8 following this chapter of the EIAR. Where a localised area of peat averaging over 1 m depth for over 100 m in length occurs or for any other area where it is thought to be necessary following detailed design, floating roads could be used. As detailed in Figure 3.8 following this chapter of the EIAR, floating tracks would be constructed by placing layers of geogrid directly on top of the vegetation with as-dug or imported stone placed on top. Where more strength is required, due to ground conditions, additional geogrid layers or timber rafts would be used. Excess



peat from excavated or cut track sections would be used to dress the batters of floating road sections.

- 3.11.13. In addition, there would be a requirement for drainage channels along one or both sides of each section of track depending on the ground conditions along each track segment (see Figure 3.9 following this chapter of the EIAR) 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 function 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.
- 3.11.14. For safety reasons, marker posts may be placed in the ground by the edge of the track to guide on-site vehicles during times of poor visibility or at night to turbines and site infrastructure. In addition, safety and/or directional signs would be placed at strategic points across the site area to inform members of the public that they are entering a wind farm area, make them aware of potential hazards and provide directions to emergency services should the need arise. Any signage would be agreed with the relevant authorities as part of the CEMP.

Off-site Access Route

- 3.11.15. Appendix 12.1: Abnormal Loads Assessment in Volume 4 of the EIAR provides details of the off-site access route for the Proposed Development.

3.12. On-site and Off-site Cabling

Description of On-site Cabling and External Turbine Transformers

- 3.12.1. 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 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 3.4 following this chapter of the EIAR. The indicative dimensions of the external transformer housing shown within Figure 3.4 are 3.5 m (length) x 2.5 m (width) x 2.5 m (height). It is proposed that the external transformer housing will be dark



green in colour; however, this is subject to confirmation with Dumfries and Galloway Council. Any external transformer would be linked to the turbines through cable ducts in the turbine foundations. Underground cable routes between turbines, the BESS compound and the substation compound would generally follow track routes. These would generally be placed around 2 m from the track verge and drainage ditches.

Construction

- 3.12.2. 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 the site would generally run adjacent to the route of on-site tracks where possible. The underground cables from the Proposed Development to the on-site substation will likely be routed across open ground away from 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 CEMP.
- 3.12.3. 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, and concrete marker posts would be placed at regular intervals to enable the cables to be located in the future.
- 3.12.4. 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

- 3.12.5. 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 the borrow pit for use in the reinstatement and final profiling.
- 3.12.6. 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.

- 3.12.7. Where cables cross contours on steeper areas of ground, clay plugs would be placed at intervals within the trench to prevent the trench acting as a water conduit. Figure 3.10 following this chapter of the EIAR gives an indicative outline of the cable trench. The final cable positions would be surveyed and supplied in 'as built' drawings for the Operations and Maintenance team.
- 3.12.8. 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.
- 3.12.9. Indicative details of the cable/service trenches are shown in Figure 3.10 following this chapter of the EIAR. 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.
- 3.12.10. In all cases, the cables would be buried to a depth of approximately 1 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.
- 3.12.11. At track crossings and within concrete foundations, the cables would be laid within plastic ducts.
- 3.12.12. Existing watercourses should be monitored during the works, both to prevent water entering the excavation, and 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.
- 3.12.13. On decommissioning of the wind farm, on-site cabling can be removed, if required. 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 practise. Further information on decommissioning can be found in section 3.18 below.

Off-site Cabling

- 3.12.14. An electricity cable will be laid between the onsite substation control building and the SSE grid connection point once this is confirmed by the Distribution Network Operator (DNO), subject to confirmation and approval of exact



specification and cable route from SSE as the grid operator. Onsite, cables will be laid alongside the access tracks.

3.13. Construction Compound and Ancillary Facilities

Description

- 3.13.1. During the construction phase of the Proposed Development, a temporary compound and laydown site will be required. The construction compound 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 site for reinstatement or used elsewhere on the site. Final details of the compound and laydown area will be agreed as part of the CEMP.

Construction of Compound

- 3.13.2. The dimensions of the compound would be in the region of 50 m x 100 m and would be surrounded by a security fence. Due to the requirement under health and safety legislation, the Construction Design Management (CDM) Regulations for welfare facilities on site, and the exposed nature of the site, a number of cabins would be needed in the construction compound. 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 the site. 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 3.2 following this chapter of the EIAR.
- 3.13.3. The compound would be used, where necessary, for temporary storage of the various components and materials which are required for construction.
- 3.13.4. A settling pit/concrete washout bay and wheel wash may be included near the construction compound. 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 site but would be lined with an impermeable sheet and granular fill to assist in the settling process. The construction compound will be reinstated at the end of the 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.

Environmental Considerations

- 3.13.5. Fuel would be required for the vehicles, generators, and other equipment on site. The storage facilities would typically be comprised of a bunded concrete area containing a lockable, bunded fuel tank and a lockable housing unit 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 the site. Emergency spill kits would be kept on site adjacent to the fuel storage area and with the mobile bowser. Site operatives would be briefed on the emergency procedures to be undertaken in the event of a large spillage. The principal contractor 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 and the bowser operator would be suitably trained to deal with any spillage.

- 3.13.6. Cement entering a watercourse can have a detrimental effect by drawing oxygen from the water and increasing its alkalinity. In line with best practice guidance, measures would be taken to avoid this.
- 3.13.7. Turfs would be regularly monitored to prevent excessive desiccation. The subsoil would be removed and stored separately from the topsoil (or peat turfs). Geotextile and stone would be laid down to an approximate depth of 300-500 mm.
- 3.13.8. The units would be self-contained, and no discharge of drainage would be made to the surrounding land unless otherwise agreed with SEPA and the local authority.
- 3.13.9. The settlement pit would be located away from watercourses with details included as part of the CEMP following consultation with SEPA. Any drainage from these facilities would be collected and treated prior to discharge via the Sustainable Drainage System (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.
- 3.13.10. Diesel fuel would be stored on site for all construction vehicles. The storage tank would be placed within the construction compound and measures would be taken to mitigate the risk of leakage using either a double skinned tank, or the tank placed within a bund capable of containing 110 % of the maximum stored volume as required by the SEPA guidelines.
- 3.13.11. In line with SEPA guidance, appropriately competent operatives would be used 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 (see Section 3.18 below for more information on Waste Management). This will be discussed in greater detail within the Pollution Control and Waste Management Plan contained within the CEMP.



3.14. Signage

- 3.14.1. For Health and Safety purposes there may be the need for signage at the Proposed Development as it presents a place of work for site staff which is in an isolated environment, in combination with safe day-to-day navigation, for emergency vehicles to navigate to emergencies, should they arise as well as aid the development of comprehensive risk assessment for those visiting and using the site. To achieve recognised Health and Safety requirements on site, signage would 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.
- 3.14.2. The signage would comprise of two elements; directional signs and roundels displaying the site speed limit. The directional and speed roundel sign measure approximately 300 mm x 400 mm x 3 mm respectively, which will be mounted on a 2500 mm x 76 mm grey aluminium pole as shown on Figure 3.11, following this chapter. The poles will be set within an approximately 600 mm deep concrete foundation as indicated in Figure 3.12, following this chapter. This will ensure the stability of the signs, in line with current guidance for such installations.
- 3.14.3. Figures 3.11 and 3.12, following this chapter, illustrate the typical appearance and dimensions of the proposed signs. 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.
- 3.14.4. 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 addressed in the CEMP.

3.15. Employment During Construction

Site Representatives and Support Staff

- 3.15.1. 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, one for the supply, installation and commissioning of the battery energy storage system and one for the supply, erection and commissioning of the wind turbines - all of whom would be coordinated and overseen by a project manager. A Principal Contractor will be appointed who will be responsible for the construction of the laydown areas, tracks, turbine bases and any modification required to the under-construction substation. The Principal Contractor will formally appoint a Site Manager prior to construction who will be responsible for the day-to-day management of the site, including environmental responsibilities. 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 CEMP 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 Planning Monitoring Officer (PMO) and an Ecological Clerk of Works (ECoW). The site representatives would carry out regular checks on the site to monitor on-going activities, particularly when subcontractors are being used on site. In addition to this, and in conjunction with the ecologist/hydrologist, 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 site including geotechnical representatives and PMO.

- 3.15.2. 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.
- 3.15.3. During the construction period there could be approximately 100 - 150 construction operatives carrying out the works on site that have been described. There would be indirect local benefits arising from the construction phase, including use of hotels, B&Bs and other accommodation, hire of local equipment and plant, temporary employment of local work force and potential contracting of local subcontractors. The construction mobilisation would likely be spread over a 12 month period. See Chapter 13: Socioeconomics, Tourism and Recreation of the EIAR for further information.

3.16. Site Reinstatement

- 3.16.1. Site reinstatement works will occur prior to the operational phase of the Proposed Development and will include the targeted re-use of peat. Prior to construction excavation works, consideration will be given to methods for handling and holding any excavated materials, particularly peat or peaty soils as peat has the potential to lose structural integrity upon excavation particularly when double handled or moved around the site (see Appendix 9.5: Peat Management Plan in Volume 4 of the EIAR).

Access Tracks

- 3.16.2. During track excavation works, where possible 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 (see Appendix 9.5: Peat Management Plan in Volume 4 of the EIAR).

Cable Trenches

- 3.16.3. 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

- 3.16.4. Reinstatement methods associated with turbine foundations will include where practical the storage of peat 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 peat 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 (see also Appendix 9.5: Peat Management Plan in Volume 4 of the EIAR).

Crane Hardstandings

- 3.16.5. Due to the requirement for crane hardstandings 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 (see also Appendix 9.5: Peat Management Plan in Volume 4 of the EIAR).

Construction Compound

- 3.16.6. All temporary construction areas will be removed and reinstated as quickly as possible following construction (although, these areas could be potentially reused throughout the life of the wind farm if major maintenance or repair is required). Following removal of temporary site accommodation, storage, equipment and materials, all areas will then be reinstated. The reinstatement will involve reprofiling/landscaping to ensure that the reinstated area blends in with the surrounding area. Suitable materials i.e. topsoil, and peat will then 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 only be required for the duration of the construction period. 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 (see Appendix 9.5: Peat Management Plan in Volume 4 of the EIAR).

Monitoring

- 3.16.7. Any re-use of peat across the Proposed Development area will be monitored to ensure that effects on the peat land environment are appropriately understood and subsequently reduced via any remedial works that can be undertaken. The details of any required monitoring would be discussed and agreed with SEPA, SNH and DGC prior to commencement. For further details see Appendix 9.5: Peat Management Plan in Volume 4 of the EIAR.

3.17. Operational Phase

- 3.17.1. The majority of the operation of the Proposed Development would be 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.
- 3.17.2. The operational lifetime of the project is envisaged to be up to 35 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 are performed on each turbine. A typical maintenance programme is outlined below. Additionally, there may be a need to conduct irregular, ad hoc. maintenance in the event of mechanical breakdowns.
- 3.17.3. Tracks and cranes pads giving access to turbines will be required during the operational period of the Proposed Development to allow for routine maintenance operations and occasional replacement of larger components.

Maintenance Programme

- 3.17.4. 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.



- 3.17.5. 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.
- 3.17.6. 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 to maintain awareness of the integrity of the electrical properties of these oils.
- 3.17.7. Maintenance of the high-voltage switchgear will also be conducted routinely, and annual checks will be performed.
- 3.17.8. 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 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 Proposed Development area, where necessary.
- 3.17.9. All maintenance of any equipment item would be performed according to the Original Equipment Manufacturer's stated schedules, Health and Safety and Construction, Design and Management procedures.
- 3.17.10. All maintenance would also occur according to the environmental procedures aforementioned in this chapter.

Storage and Use of Polluting Substances

- 3.17.11. Storage of polluting substances at the site during the operational period of the Proposed Development 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

- 3.17.12. 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 expected to be under warranty and maintenance would be performed by the turbine manufacturer. Up to 12 jobs are expected to be created annually in Scotland during the operation and maintenance phase, with around 6 jobs being created in Dumfries and Galloway. Other contract personnel would attend the site as required to maintain the civil and electrical infrastructure as well as carrying out duties in



relation to ecological monitoring and reporting. See Chapter 13: Socioeconomics, Tourism and Recreation, of the EIAR for further information.

3.18. Decommissioning

- 3.18.1. At the expiry of the consent, or at the end of the wind farm's useful life, it is proposed that the turbines, transformers and the on-site substations would be removed. The upper section 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 at the area reseeded (see section 3.15 above for information on site reinstatement and 3.18 below for more information waste management). This process will be discussed in greater detail within the Pollution control and Waste Management Plan contained within the CEMP. Tracks will be left and allowed to grass over or would be covered with soil and reseeded. Seed mixes used for site reinstatement would be agreed with the Planning Authority in consultation with SNH.
- 3.18.2. The timeline and actions for the ultimate reinstatement of the site will be conditioned and agreed with the Planning Authority in consultation with SNH and SEPA.

3.19. Waste Management

- 3.19.1. The Proposed Development will produce small amounts of general, municipal and hazardous waste during its construction, operation and decommissioning.
- 3.19.2. Waste materials generated during the construction phase include excavation waste such as vegetation, soil, stone, rock and similar materials. Excavated materials can be reused on site or elsewhere if it is deemed suitable for reuse. Excavated peat associated with development on peatland 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.
- 3.19.3. The operational phase of a 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.
- 3.19.4. During the decommissioning phase of a development wastes include 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 re-used subject to potential ready markets for the material.



- 3.19.5. 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 CEMP.
- 3.19.6. 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.
- 3.19.7. 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 sent 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 re-use, 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.
- 3.19.8. Pollution prevention measures will also be put in place, and these will be detailed fully within individual chapters of the EIAR and within the CEMP. 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 onsite.
 - The waste storage area will be isolated from surface drains and bunded to contain any spillages.
 - A wastewater collection system will be used to prevent contamination of local water courses.



3.20. Health and Safety

Health and Safety of Construction Workers

- 3.20.1. 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
 - Electricity Safety, Quality and Continuity Regulations 2002
- 3.20.2. In awarding any civil, electrical or other contracts for the construction of the Proposed Development the appointed contractor is obligated by law to follow the CDM Regulations implemented by the Health and Safety Executive (HSE). These are based on standard procedures that are adapted to take account of all site specific requirements. The Regulations require 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 the site.
- 3.20.3. A CDM Coordinator would be contracted by the developer to make sure all the regulations are correctly implemented, and to compile a health and safety file, which would be used in the operation and maintenance phase of the Proposed Development. The developer remains ultimately responsible and would be required to provide a timescale and start date for the project, to allow the CDM coordinator to review the adequacy of the contractor involved against the description of the required works. Additionally, a developer representative would be on site during the construction period. This person would be empowered to halt any or all construction works if they believe correct health and safety procedures are not being adhered to. Similar procedures for site workers, visitors and civilians must be drawn up for the operational phase of any wind farm. The HSE can question any aspect of the project and visit site at any time if they have any concerns.

Safety of the Public

- 3.20.4. Throughout the construction phase of the Proposed Development the relevant statutory requirements would be adhered to. All potentially hazardous areas would be fenced off and all unattended machinery would be stored in the site compound or immobilised to prevent unauthorised use. In addition, temporary construction safety signs would be placed at each possible entrance to the site and in areas where there may be further danger, e.g. around settling lagoons and borrow pits.



- 3.20.5. Throughout construction, measures to manage diversion routes would be put in place. The diversion routes would be clearly marked and for safety reasons would direct the user away from any areas of construction.

Operational Phase

- 3.20.6. Wind farms have a proven track record for safety. A very small number of wind turbines have been known to suffer mechanical damage through lightning strikes or mechanical failure. Experience on existing sites has shown that public access to operational wind farms does not lead to a compromise with respect to safety issues.
- 3.20.7. 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 IEC 61400-1: 2019 "Wind turbines generation systems – Design requirements".
- 3.20.8. Public access to the site after construction has been completed would remain, subject to various health and safety measures. Appropriate warning, directional and identification signs would be installed directing to and on the turbines, transformers and onsite substations, 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 site area to make people aware of potential hazards and provide direction for emergency services should the need arise. Any signage would be agreed with the relevant authorities as part of the CEMP (see Section 3.13 above).
- 3.20.9. No resulting safety risks are expected as a result of public access to the Proposed Development area. Turbine models being considered for the site would operate automatically and have sensors to detect any instabilities or unsafe operation during high wind speeds. Should sensors placed within 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.
- 3.20.10. If the cause of the shutdown was high wind speeds, then the turbine would automatically begin operation once the average wind speed reduced to within operational levels. Under other causes of shutdown, e.g. through malfunction, the turbine would remain shut down and in a safe condition (i.e. commonly with the blades orientated 90° to the wind direction) until manually restarted by a member of the Operations and Maintenance (O&M) team following satisfactory inspection and/or repair. This procedure ensures safe operation of turbines to protect members of the public walking, cycling or riding past turbines during the operational phase. In addition, the vibrometers in the nacelles 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.

- 3.20.11. Consideration will be given during the procurement of turbines to minimise the residual impact of ice throw. This is considered further in Chapter 15: Other Issues, of the EIAR.
- 3.20.12. The safety record and features of wind turbines are identified above, and it is concluded that the Proposed Development would not present a significant safety risk to the public.

3.21. Conclusion

- 3.21.1. 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.
- 3.21.2. There is sufficient detail to provide consultees with a reasonable understanding of the Proposed Development. Further construction details will be provided in the CEMP, which will be submitted by the principal contractor for approval by the planning authority prior to the construction of the wind farm. These and other embedded mitigation measures highlighted throughout this chapter can be secured by appropriately worded planning conditions.





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